RS&H

APRIL 2025

Gerald R. Ford International Airport
Relocate Cell Phone Lot

Project Manual

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GERALD R. FORD International Airport

REQUEST FOR BIDS

Relocate Cell Phone Lot

REQUEST NUMBER: 2510

DUE DATE: April 25, 2025

DUE TIME: 10:00 AM

Contents

INTRODUCTION

The Gerald R. Ford International Airport Authority (GFIAA) is requesting bids for the Cell Phone Lot Relocation project. The project consists of repurposing an existing parking lot for use as a Cell Phone Lot. Improvements include a new concrete access drive, concrete curb and gutter installation, fencing modifications, pavement markings, and site restoration.

The Gerald R. Ford International Airport is the second busiest airport in Michigan, serving business and leisure travelers with nonstop and connecting flights on six airlines. The Ford Airport is managed and operated by the Gerald R. Ford International Airport Authority.

This solicitation will be publicly opened at the Gerald R Ford International Airport Authority, located on the second floor of the Gerald R Ford International Airport Terminal Building at 5500 44th St SE, Grand Rapids, MI, 49512. All submissions will be sealed until the date and time specified, at which time they will be opened and read aloud.

SOLICITATION AND PROJECT SCHEDULE

ACTIVITY	DATE
BID Issue Date	April 2, 2025
Question Deadline	April 17, 2025
Submission Due Date	April 25, 2025
Contract Start Date	May 2025

GFIAA reserves the right to modify the deadline set forth in the above table in its sole discretion. Any such modifications will be stated in an addendum.

VOLUNTARY ON-SITE CONFERENCE

CONFERENCE DETAILS	
Conference Date	April 9, 2025
Conference Time (local)	1:00 pm
Conference Location	International Room A & B of the airport terminal building, 5500 44th St. SE, Grand Rapids, MI 49512
Virtual Attendee Option	Join the meeting now Meeting ID: 232 128 064 319 Passcode: ub2WK6uj

A voluntary pre-submission conference is scheduled for this request. Equal opportunity will be provided for all Respondents to ask questions.

Attendees should arrive a minimum of five (5) minutes before the scheduled date and time.

Attendees requiring special services are asked to provide their requirements to the GFIAA at least forty-eight (48) hours in advance to allow for accommodations.

An optional site visit will be available following the on-site conference.

SITE INSPECTION

Respondents may request an on-site inspection by appointment only. Discussions between the Respondent and airport staff during the on-site inspection do not override any written specification or correspondence provided in this solicitation.

CONTACT FOR AN APPOINTMENT	
Contact Name	Jack Bryan
Contact Phone Number	(616) 233-6132

Respondents shall not communicate with the above contact for any reason other than for on-site inspection purpose. Any Respondent requesting a modification to the written specification should contact the Purchasing Department as instructed within this request.

WORK SCOPE

See Attached Technical Specifications and Contract Drawings.

REQUESTS FOR INFORMATION

Questions regarding this solicitation are to be submitted in writing to *purchasing@grr.org* prior to 5 p.m. on April 17, 2025

GFIAA reserves the right to publish and respond to an inquiry, respond directly to the inquirer without publishing or not respond to the inquiry at its sole discretion. Unless otherwise indicated, all questions will be complied into one document and answers will be issued as a Questions & Answers document within 4 days after the question deadline.

It is the firm's responsibility to become familiar with and fully informed regarding the terms, conditions, and specifications of this solicitation. Lack of understanding or misinterpretation of any portions of this solicitation shall not be cause for withdrawal after opening or for subsequent protest of award.

Addendums will only be published by the GFIAA Purchasing Department and available for review at www.grr.org.

CONSTRUCTION

All work is to be done in a first-class workmanlike manner. All debris (packing materials, replaced materials, etc.) are to be cleaned up and removed by the workers.

The successful Respondent is responsible for obtaining all necessary permits and licenses so the completed work complies with all applicable codes, ordinances, regulations, standards, and laws. The cost of such permits and licenses is understood to be a part of the bid price. Any fines, fees, or other costs taxed or charged to Kent County because of the successful bidder's violation(s) of any laws, standards, etc. will be paid by the successful bidder.

Dimensions furnished are for general reference only. Respondents must take their own measurements as necessary for preparing their response.

All materials are to be new, not refurbished, and free from corrosion, scratches, or other such defects which present other than a new appearance.

REQUEST FOR BID SUBMISSION

Responses may be delivered physically or electronically. To be considered, complete submissions must be received prior to the due date and time specified (local time).

- Hard copy responses can be mailed or otherwise delivered to the address below.

  Submission address:
  Attn: AJ Nye, Procurement Specialist
  Gerald R Ford International Airport Authority
  5500 44th St SE
  Grand Rapids, MI 49512

- Electronic responses can be securely uploaded as a single pdf document to:

  https://www.dropbox.com/request/HYvbtHv6u2kiSHHURLke

Electronic submissions shall be named with a form or portion of the firm's name as part of the document name.

The firm certifies the response submitted has not been made or prepared in collusion with any other respondent and the prices, terms or conditions thereof have not been communicated by or on behalf of the respondent to any other respondent prior to the official opening of this request. This certification may be treated for all purposes as if

it were a sworn statement made under oath, subject to the penalties for perjury. Moreover, it is made subject to the provisions of 18 U.S.C. Section 1001, relating to the making of false statements.

Submissions may be withdrawn by written request only if the request is received on or before the opening date and time.

Submissions not meeting these criterions may be deemed non-responsive.

GFIAA is not liable for any costs incurred by any prospective firm prior to the awarding of a contract, including any costs incurred in addressing this solicitation.

BONDS

Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to 100% of the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due.

TERMS AND CONDITIONS

GFIAA reserves the right to require that its standard terms and conditions apply to any actual order placed in response to a firm's submission. No attempt to modify GFIAA's Standard Terms and Conditions shall be binding, absent agreement on such modification in writing and signed by GFIAA.

No payment shall be made to the Respondent for any extra material or services, or of any greater amount of money than stipulated to be paid in the contract, unless changes in or additions to the contract requiring additional outlay by the Respondent shall first have been expressly authorized and ordered in writing by contract amendment or otherwise furnished by the GFIAA.

The intent of these specifications is to solicit a properly designed and all-inclusive response. Any requirements not in the specifications, but which are needed for such a response, are to be included in the submission.

The Gerald R Ford International Airport Authority, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that for any contract entered into pursuant to this advertisement, disadvantaged business enterprises and airport concession disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

The Respondent shall not discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions or privileges of employment, or a matter directly or indirectly related to employment, because of race, color, religion, national origin, age, sex, height, weight, marital status, or disability that is unrelated to the individual's ability to perform the duties of a particular job or position.

The Respondent shall observe and comply with all applicable federal, state, and local laws, ordinances, rules and regulations at all times during the completion of any contract with the GFIAA.

The terms of this request shall be interpreted, construed and enforced pursuant to the laws of the State of Michigan, and the Parties irrevocably consent to the jurisdiction of the federal and state courts presiding in Michigan.

The GFIAA is tax-exempt and a regional airport authority organized under 2015 P.A. 95, being MCL 259.137 et. seq.

Vendor Representation and Warranty Regarding Federal Excluded Parties List: The Respondent acknowledges that the GFIAA may be receiving funds from or through the Federal Government; such funds may not be used to pay any Respondent on the Federal Excluded Parties List (EPLS). The Respondent represents and warrants to the GFIAA that it is not on the Federal EPLS. If the Respondent is in non-compliance at any time during execution or term of this agreement (including any extensions thereof), the Respondent shall be in breach and the GFIAA shall be entitled to all remedies available to it at law or equity, specifically including but not limited to recovery of all moneys paid to the Respondent, all consequential damages (including the loss of grant funding or the requirement that grant funding be returned), and attorney fees (including the costs of in-house counsel) sustained as a result of the Respondent's non- compliance with this warranty and representation.

Pursuant to the Michigan Iran Economic Sanctions Act, 2012 P.A. 517, by submitting a bid, proposal or response, Respondent certifies, under civil penalty for false certification, that it is fully eligible to do so under law and that it is not an "Iran linked business," as that term is defined in the Act.

Insurance requirements are posted on the Documents and Forms page of the GFIAA website within the Purchasing Terms and Conditions document.

Termination For Cause: Should the firm fail to perform the Work as required by and in accordance with the schedule or time requirements, or otherwise violate any of the terms set forth in the Solicitation Request, it shall constitute breach of the Contract. Other than in force majeure situations, Respondent shall have five (5) calendar days to cure a breach of the Contract (the "Cure Period") following issuance of GFIAA written notice. Failure to cure a breach of the Contract within said Cure Period shall allow the GFIAA to, without further notice to the Respondent, declare the Contract terminated and proceed with the replacement of the Respondent and the GFIAA shall be entitled to all remedies available to it at law or in equity including a claim against any required payment/performance bonds.

Termination Without Cause: Notwithstanding any other provision, at any time and without cause, GFIAA shall have the right, in its sole discretion, to terminate the contract by giving sixty (60) days written notice.

Although it is the intent to contract with one provider, the GFIAA reserves the right to contract with alternate sources if the Respondent is unable or unwilling to service its obligation, or it is deemed by GFIAA to be in its best interest to use alternate sources.

Assignment: Neither party shall assign or delegate any of its rights or obligations under this Agreement without the prior written consent of the other party.

Respondent warrants that they are an authorized provider of products or services of his/her submission.

MICHIGAN FREEDOM OF INFORMATION ACT

Information submitted in this solicitation is subject to the Michigan Freedom of Information Act and may not be held in confidence after the Respondent's submission is opened. A submission will be available for review after the project has been awarded.

GFIAA cannot assure that all of the information submitted as part of or peripheral to the Respondent's submission will be kept confidential. Any Respondent submission language designated as confidential is considered automatically invalid and void. GFIAA is subject to the Michigan Freedom of Information Act, which prohibits it from concealing information on or associated with responses, successful or unsuccessful, once they are opened.

EVALUATION, STATUS UPDATES/AWARD NOTIFICATION

The Authority reserves the right to request additional information it may deem necessary after the submissions are received.

The Authority reserves the right at its discretion to waive irregularities of this solicitation process.

In the event of extension errors, the unit price shall prevail and the Respondent's total offer will be corrected accordingly. In the event of addition errors, the extended totals will prevail and the Respondent's total will be corrected accordingly. Respondent must check their submission where applicable. Failure to do so will be at the Respondent's risk. Submissions having erasures or corrections must be initialed in ink by the Respondent. Respondents are cautioned to recheck their submissions for possible errors.

The Respondent shall not be allowed to take advantage of error, omissions or discrepancies in the specifications.

The Authority, at its sole discretion, reserves the right to award to the Respondent whose response is deemed most advantageous to the Authority. The Authority, at its sole discretion, shall select the most responsive and responsible Respondent and evaluate all responses based on the requirements and criterion set forth in this solicitation while reserving the right to weigh specifications and other factors in the award. The Authority reserves the right to reject any and all submissions as a result of this solicitation.

The Authority reserves the right to award by line item when applicable and to accept or reject any or all parts of a submission.

Accelerated discounts should be so stated at the time of submission. If quick-pay discounts are offered, The Authority reserves the right to include that discount as part of the award criterion. Prices must, however, be based upon payment in thirty (30) days after receipt, inspection, and acceptance. In all cases, quick-pay discounts will be calculated from the date of the invoice or the date of acceptance, whichever is later.

Award notifications are posted on the Authority website. It is the Respondent's responsibility to monitor the website for status updates.

Low bid shall be determined based on the lowest responsive and responsible bid. The Authority may elect to award only specific portions of work based on the availability of funding.

EXHIBITS

Exhibit A – Bid Form

Location: Gerald R. Ford International

GFIAA Request #2510

Bid Form

Project Description:
RELOCATE CELL PHONE LOT

BASE BID

ITEM NO.	ITEM NO.	WORK ITEM DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	AMOUNT
1	SP-01	CONTRACTOR QUALITY CONTROL PLAN (CQCP)	LSUM		1	
2	SP-02	REIMBURSED UTILITY MODIFICATIONS	ALLOW	$ 20,000.00	1	$ 20,000.00
3	110-1	MOBILIZATION, MAX (10%)	LSUM		1	
4	204-1	CURB AND GUTTER, REM	LFT		110	
5	204-2	PAVT, REM	SYD		25	
6	204-3	SIDEWALK, REM	SFT		250	
7	204-4	FENCE, REM	LFT		55	
8	205-1	SUBGRADE UNDERCUTTING, TYPE IV	CYD		50	
9	208-1	EROSION CONTROL, SILT FENCE	LFT		55	
10	208-2	EROSION CONTROL, INLET PROTECTION, FABRIC DROP	EACH		8	
11	308-1	GEOTEXTILE, SEPARATOR, NON-WOVEN	SYD		140	
12	801-1	DRIVEWAY, REINF. CONC., 6-INCH, INCLUDING AGGREGATE BASE	SYD		110	
13	802-1	CURB AND GUTTER, CONC., INTEGRAL, DET F4, INCLUDING AGGREGATE BASE	LFT		100	
14	810-1	POST-MOUNTED ROAD SIGN, TYPE IIIA, 24-INCH X 24-INCH, INCLUDING	EACH		1	
15	811-1	PAVT MRKG, REM.	SFT		750	
16	812-1	PROJECT SAFETY & MAINTENANCE OF TRAFFIC	LSUM		1	
17	816-1	MISC. HYDROSEED, MIXTURE TURF WITH FERTILIZER, WOOD FIBER MULCH, TOPSOIL	ACRE		0.25	
18	824-1	CONTRACTOR SURVEY AND STAKEOUT	LSUM		1	

BASE BID TOTAL PRICE = $

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GERALD R. FORD INTERNATIONAL AIRPORT AUTHORITY

BID FORM SIGNATURE PAGE

Total Base Bid Amount (In Words)

_____Dollars

_____Cents

Total Base Bid: $_____

Name of Bidder: _____
(typed or printed)

Signature of Bidder: _____

Title:_____

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Exhibit B – Addenda Acknowledgement

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GERALD R. FORD INTERNATIONAL AIRPORT AUTHORITY

ADDENDA ACKNOWLEDGEMENT

TO: **Gerald R. Ford International Airport Authority**
Administration Office
5500 44th Street SE
Grand Rapids, Michigan 49512-4055

PROJECT: **RELOCATE CELL PHONE LOT**

ADDENDA

The Bidder hereby acknowledges that he has received the following Addenda:

Addenda No.	Dated
_____	_____
_____	_____
_____	_____

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GERALD R. FORD INTERNATIONAL AIRPORT
RELOCATE CELL PHONE LOT

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Technical specifications generally follow the guidelines of Michigan Department of Transportation (MDOT) *Standard Specifications for Construction, 2020 Edition*. Refer to Michigan Department of Transportation (MDOT) *Standard Specifications for Construction, 2020 Edition* for all specifications referenced, but not included within this Project Manual. All references to “Department” shall be replaced by “Owner”.

The standard MDOT specifications have been modified to better serve Gerald R. Ford International Airport and meet specific requirements for a construction project on airport property. Where portions of text are in bold/italic font (***example***), this text has been changed from, or added to the standard specification and is binding to this project. Standard specification language may also have been deleted if deemed not applicable to the project.

SP-01. Contractor Quality Control Plan (CQCP) and Contractor Quality Control Testing

SP-01.01. Description

The Contractor shall prepare, provide, and maintain a Contractor Quality Control Plan for each item included in these Specification Section(s):

Section 302 – Aggregate Base Course
Section 801 – Concrete Driveways
Section 802 – Concrete Curb, Gutter and Dividers

As a part of the QC Plan, the Contractor shall implement a QC testing schedule, as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by each technical specification item, as well as any additional QC tests that the Contractor deems necessary to adequately control production and/or construction processes and submit to the engineer for approval.

The Contractor shall provide sufficient qualified QC personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location.

Although guidelines are established and certain minimum requirements are specified here and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose of the QC Plan.

Contractor Quality Control Testing shall be in accordance with the QC plan prepared and general handbooks provided for the control of materials by MDOT including but not limited to the *HMA Production Manual* and *Density Testing and Inspection Manual.* The Engineer, or his designated representative will perform Quality Assurance material testing as generally performed by the Michigan Department of Transportation, unless otherwise mentioned below.

SP-01.02. Measurement and Payment

SP-01.02.01 Method of Measurement.

No direct measurement for Contractor Quality Control Plan (CQCP) shall be made.

SP-01.02.02 Basis of Payment

Contractor Quality Control Plan (CQCP) is for the personnel, quality control testing, facilities and documentation required to implement the Quality Control Plan and for all Contractor Quality Control Testing necessary to complete the project. The CQCP will be paid as a lump sum with the following schedule of partial payments:

a) With first pay request, 25%.
b) When 25% or more of the original contract is earned, an additional 25%
c) When 50% or more of the original contract is earned, an additional 40%

After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials, the final 10%.

Pay Item **Pay Unit**

Contractor Quality Control Plan (CQCP)……..... Lump Sum

SP-02. Allowances

SP-02.01. Summary

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:

1. Unit-cost allowances.

C. Related Requirements:

1. Reference MDOT Section 103 "Scope of Work" for procedures for submitting and handling Change Orders.

SP-02.02. Definitions

A. **Allowance:** A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

SP-02.03. Action Submittals

A. Submit proposals for purchase of products, systems, and labor included in allowances in the form specified for Change Orders

SP-02.03. Informational Submittals

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

SP-02.04. Contingency Allowances

A. Use the contingency allowance only as directed by Engineer for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

SP-02.05. Schedule of Allowances

A. **Allowance No. 1: Reimbursed Utility Modifications.** Contingency Allowance.

There are known utilities within the project limits. The Engineer has made every effort to indicate known utilities on the existing conditions of the contract drawings. There may be instances where utilities conflict with the installation of the proposed items of work. In these circumstances, the utilities in direct conflict with proposed work items may need to be relocated or adjusted. This includes both private and public utilities, including but not limited to, communication, electricity, natural gas, water, or sanitary utility networks. If in the case any such public or private utility needs to be modified for the installation of proposed work items, the contractor may submit for reimbursement of these modifications under “Reimbursed Utility Modifications”.

The scope of work shall also include the following services:

1. For privately owned utilities, when authorized by the Engineer and Owner, the contractor shall hire (or self-perform if licensed and authorized) the relocation, modification, or removal of utilities in conflict with proposed work items. Utility modifications shall be coordinated with the Engineer and Owner prior to and during work on privately-owned utilities.

2. For publicly owned and operated utilities, when authorized by the Engineer and Owner, the contractor shall coordinate with the utility owner, the relocation, modification or removal of utilities in conflict with proposed work items. The Contractor shall pay the utility owner for such changes and submit associated invoices to the owner for reimbursement.

3. Utility work shall not disrupt airport operations nor vehicle and/or pedestrian traffic within without written permission from the Owner. If disruptions are expected, the Contractor must coordinate such disruptions with the Owner at least 48-hours in advance of commencing work causing any disruption.

SP-02.06 Payment

Pay Item	**Pay Unit**
Reimbursed Utility Modifications…….....	Allow

Section 110. Mobilization

110.01. Description

This work consists of preparatory work and operations including, but not limited to, the following:

A. The movement of personnel, equipment, supplies, and incidentals to the project site;

B. The establishment of the Contractor's offices, buildings, and other facilities to support work on the project including associated job site posters;

C. Other work and operations the Contractor must perform;

D. Expenses incurred before beginning work on pay items at the project site; and

E. Pre-construction costs, exclusive of bidding costs, that are necessary direct costs to the project rather than directly attributable to other pay items under the contract.

110.02. Materials

None specified.

110.03. Construction

All jobsite posters and employment notices required by state and federal regulations and the contract are to be posted in a conspicuous place. Posting of jobsite posters and employment notices (posted display, foreman vehicle binder, etc.) for short-term or mobile operations will be as approved by the Engineer.

110.04. Measurement and Payment

110.04.1 **Method of Measurement**.

No direct measurement for Mobilization shall be made.

110.04.2 **Basis of Payment**

The work and incidental costs covered under this item for mobilization and general conditions, concrete batch plants and other items listed will be paid for at the Contract lump sum price. The Engineer shall make the final determination of the allowable percentage of completion for the payment of mobilization and shall approve the percentage paid based on the percent of contract amount actually earned which will be based upon actual work completed.
Lump sum partial payments will be allowed as follows:

a) With first pay request, 25%.
b) When 25% or more of the original contract is earned, an additional 25%
c) When 50% or more of the original contract is earned, an additional 40%

d) After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials, the final 10%.

Pay Item	**Pay Unit**
110-1 Mobilization, Max (10%)	Lump Sum

Section 204. Removing Miscellaneous Structures and Materials

204.01. Description

This work consists of removing miscellaneous structures and materials to clear the right-of-way, salvaging or disposing of removed materials and backfilling the resulting excavated sites.

204.02. Materials

Provide materials in accordance with the following:

Sound Earth	205
Granular Material Class III	902

204.03. Construction

A. **Breaking Down and Removing**. Remove structures or portions of structures entirely or to the limits required, including attached parts and connections. Do not damage the remaining portion of an existing structure.

1. **Partial Removal.** Break down portions of existing miscellaneous structures, not interfering with the new construction, to 3 feet below the pavement surface within the limits of the roadbed and to 1 foot below the finished grade outside the limits of the roadbed.

2. **Pavement, Curb, and Sidewalk.** Remove pavement, curb, gutter, curb and gutter, sidewalk, downspout headers, and similar structures to an existing joint or to a sawed joint. Saw concrete full depth unless otherwise approved by the Engineer. Provide for proper grades and connections to new work.

All anticipated pavement removal operations conducted over utilities and other critical areas identified on the plans must be saw cut and the pavement removed full depth in such a manner as to not disrupt or damage these utilities or critical areas. Impact- or vibratory-type equipment is not permitted.

Replace adjacent soils or base materials removed with concrete removal operations with similar material approved by the Engineer.

3. **Masonry and Concrete Structures.** Remove entirely or break down walls, foundations, and similar structures, excluding bridges, culverts, and retaining walls, in accordance with subsection 204.03.A.1.

4. **Basement Cleanout.** ***Not used.***

5. **Structures and Retaining Walls.** During the removal operations, protect the remaining portions of existing structures and new work under construction from damage.

If the contract requires salvaging part of a steel structure, before dismantling, match-mark with paint the members designated for re-erection. Match-mark pins, nuts, loose plates, and parts to show proper locations. Treat pins, pin holes, and machined surfaces to prevent corrosion. Wire loose parts to adjacent members or pack in match-marked containers.

If the contract requires incorporating portions of an existing concrete structure into the new construction, use a concrete saw to make the concrete cuts that will be exposed in the final work. Do not overcut corners; drill and chip to provide square corners. Avoid cutting reinforcing steel wherever possible. Do not cut off steel reinforcement projecting from the existing concrete structure. Protect projecting steel reinforcement from damage and embed it in the new concrete.

Do not use explosives unless the Engineer provides written permission in accordance with subsection 107.17. The Engineer's written permission does not relieve the Contractor of liability or responsibility for damages resulting from the use of explosives.

6. **Culvert Structures.** Remove culvert structures or parts of culvert structures required for removal or that interfere with the new construction.
For contracts requiring extension or incorporation of existing culvert structures into the new work, remove only enough of the existing structure to allow a connection to the new work. Trim the connecting edges of the existing culvert structure to the lines and grades as required without weakening or damaging that part of the structure.

7. **Railway Track Work.** ***Not Used.***

8. **Guardrail.** Remove posts, beam elements, and anchorages, including concrete blocks and steel sleeves, or both; hardware; and other items.

9. **Utility Pole.** Remove poles, parts, and connections attached to utility poles.

10. **Fence.** Remove fence fabric, wire, posts, and foundations.

11. **Concrete Barrier and Glare Screen.** ***Not Used.***

B. **Disposal of Materials.** Assume ownership of removed materials. Without causing damage, remove materials salvaged for use by the Department, local agency, or others and store outside the construction limits in a location and manner approved by the Engineer. Dispose of materials

not incorporated into the new work in accordance with subsection 205.03.P before the Department accepts the project.

The Contractor may, ***with permission from the Engineer,*** salvage materials that meet specification requirements and use them in the new work.

Dispose of broken concrete, matted together by steel reinforcement, outside the right-of-way. Provide the Engineer with written permission from the property owner of the disposal site.

C. **Backfilling**. Backfill excavated sites or holes resulting from removals within the influence of the subgrade surface limit with granular material Class III. Place and compact the granular material in accordance with the controlled density method in subsection 205.03.H.4.a.

For excavated sites outside the influence of the subgrade surface, backfill with sound earth in accordance with subsection 205.03.H.4.a.

204.04. Measurement and Payment

204.4.1 Method of Measurement

Unless otherwise required by the contract, the Engineer will measure the structure or material quantities in their original position.

The cost of breaking down sawing, removing, disposing of materials, and providing, placing, and compacting backfill is included in the unit price for the related pay items. The cost of providing and placing replacement soils or base materials is included in the related pay items.

A. The unit of measurement for curb and gutter removal and shall be the number of linear feet removed by the Contractor. Any curb and gutter removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment. Curb and Gutter removal will be measured along the base of the curb face or along the flowline of the gutter.

B. The unit of measurement for pavement removal shall be the number of square yards of asphalt pavement removed and disposed of by the Contractor.

C. The unit of measurement for sidewalk removal shall be the number of square feet of sidewalk pavement removed and disposed of by the Contractor.

D. The unit of measurement for fence removal shall be the number of feet of fence removed and disposed by the contractor. Fencing removal shall include the removal of fencing, posts, and removal of concrete foundations and backfill of foundation holes.

204.4.2 Basis of Payment

The accepted quantities of for each Pay Item will be paid for at the established contract unit price. This price shall be full compensation for furnishing all materials and for all preparation, saw cutting, excavation, backfilling, and removal of the materials.

Pay Item	Pay Unit
204-1 Curb and Gutter, Rem	Foot
204-2 Pavt, Rem	Square Yard
204-3 Sidewalk, Rem	Square Foot
204-4 Fence, Rem	Foot

Section 205. Roadway Earthwork

205.01. Description

This work consists of the following:

A. Constructing earth grades by excavating soil or rock and placing embankments or
B. Salvaging and stockpiling selected materials;
C. Providing, placing, and compacting embankment materials;
D. Trimming the earth grade;
E. Disposing of surplus or unsuitable material; and
F. Maintaining the work in a finished condition until accepted by the Engineer.

Earth excavation consists of the work to excavate materials not otherwise addressed in the contract as separate work items. Rock excavation and subgrade undercutting are separate work items.

Investigate local conditions before bidding in accordance with subsection 102.04. Boring logs shown on the plans are for information only. Refer to MDOT's Geotechnical Manual for detailed data on soils.

G. **Definitions**

CIP. When used with an embankment item, CIP denotes compacted-in-place.

Frost heave textured material. Material with more than 50% silt particles by weight and a plasticity index of less than 10.

Loose measure (LM). Refer to section 109.01.B.2.

Silt. Material with a particle size from 0.002 mm to 0.075 mm.

Sound earth. Natural homogeneous material composed of soil or aggregate that can be compacted to the required density, contains no visible organic material, and has a maximum unit weight of at least 95 pounds per cubic foot.

205.02. Materials

Provide materials in accordance with the following sections:

Granular Material Class II, III	902
Open-Graded Aggregate	902
Geosynthetics	910

Do not use foundry sand from metal casting for roadway earthwork.

Refer to MDOT's Density Testing and Inspection Manual for maximum unit weight and in-place density test methods, unless otherwise specified below.

205.03. Construction

Before beginning earth-disturbing activities, install soil erosion and sedimentation control measures in accordance with section 208.

The Department considers buried rubbish and trash not identified in the contract a differing site condition in accordance with subsection 103.02.C. All buried rubbish and trash that are found must be disposed of properly.

A. **Preparing Roadway Foundation.** Remove material from the roadway foundation and salvage or dispose of. Compact the roadway foundation to the depth and density required.

Perform removal, salvage, and disposal operations in accordance with the following:

1. **Removing and Salvaging Topsoil.** Before removing topsoil, reduce vegetation to a height of 6 inches. Remove and dispose of cut vegetation, brush, rocks, and other unsuitable material.

Remove topsoil to the required depth from designated areas before excavating or placing embankment. Use equipment and methods that avoid lifting subsoil. Suspend topsoil removal if the Engineer determines that soil or weather conditions are unsuitable.

Submit a request to the Engineer in accordance with subsection 104.12 to temporarily stockpile topsoil inside the right-of-way.

Prior to temporarily stockpiling topsoil outside the right-of-way, obtain written permission from the owner of the property that has been designated for material placement and obtain required permits in accordance with subsection 208.03.A. Provide documentation to the Engineer before stockpiling topsoil. Do not stockpile temporarily or permanently in wetlands or floodplains.
Remove topsoil as follows:

a. In peat and muck areas, do not remove topsoil;
b. In borrow and clear vision areas, remove topsoil to the depth and width required;
c. At inlet, outlet, and berm ditch areas, remove topsoil within the construction limits; and
d. At roadway cut and embankment areas, remove topsoil within the limits of earth disturbance.

2. **Salvaging Materials**. Remove existing gravel, crushed stone, riprap or selected excavated materials. The Contractor may salvage these materials. The Engineer may approve the use of salvaged materials to construct earth shoulders, approaches, or temporary roadway surfacing or to use in other work the Engineer determines appropriate. Do not salvage foreign or undesirable material. Temporarily stockpile salvaged material outside the limits of Contractor's earth disturbance and within the right-of-way limits, as approved by the Engineer.

Surplus salvaged material is the property of the **Owner**. Dispose of surplus salvaged materials in accordance with subsection 205.03.P before project completion.

3. **Disposing of Stones, Broken Rock, and Boulders**. For materials that cannot be incorporated in the work, dispose of the materials in accordance with subsection 205.03.P.

B. **Rock Excavation**. Excavate boulders with a volume of at least ½ cubic yard. Excavate rock or cemented soils that do not soften when wet or that cannot be removed without continuous drilling, blasting, or continuous use of a ripper or other special equipment.

Expose the surface of the rock to allow the Engineer to measure before starting rock excavation. Remove rock encountered in the excavation to the required cross section and in accordance with all of the following:

1. Excavate so no rock extends more than 6 inches above the lines of the required cross section;
2. Excavate backslopes to the neat line slopes shown on the plans with no rock extending more than 12 inches from the true slope;
3. Excavate the rock surface to provide drainage. Do not leave undrained pockets in the rock surface; and
4. Remove rock or boulders loosened in the excavation and overhanging ledges on or outside the required cross section.

C. **Peat Excavation.** Remove peat, muck, marl, and very soft underlying clay. Coordinate removal with swamp backfill operations.

D. **Swamp Backfill.** *Not Used.*

E. **Subgrade Undercutting**. Undercut the subgrade and backfill to replace material susceptible to frost heaving or differential frost action and to remedy unstable soil conditions. ***Depth of undercut shall be as directed by the Engineer.***

Topsoil removal and peat excavation are not included in subgrade undercutting. Subgrade undercutting includes excavation below subgrade in cut sections, excavation at the transition from

cut-to-fill sections, and excavation, other than peat excavation, as required below the topsoil in fill sections.

Excavated material from subgrade undercutting is the property of the Contractor.

1. **Limits of Subgrade Undercutting.** Excavate the subgrade to the approximate grade. The Engineer will promptly inspect the grade to decide whether undercutting is necessary and to determine the limits of undercutting.

In shallow fill areas, the Engineer will inspect the fill area and determine the limits of the subgrade undercutting before the Contractor begins embankment placement.

Remove deposits of frost heave textured material within the subgrade surface limit. For areas north of the north boundary of Township 12 North, remove the frost heave textured material to a depth of 4 feet to 5 feet below the plan grade. For areas south of the north boundary of Township 12 North, remove the frost heave textured material to a depth of 3½ feet to 4 feet below the plan grade.

2. **Backfill of Subgrade Undercut.** Backfill subgrade undercutting Type I with selected clay or other Engineer-approved material.

Backfill subgrade undercutting Type II with granular material Class II.

Backfill subgrade undercutting Type III with the material excavated from subgrade undercut areas after mixing the excavated material to break up the undesirable strata of soils or with other Engineer-approved backfill material.

Backfill subgrade undercutting Type IV with 21AA dense-graded aggregate.

Compact subgrade undercutting backfill to at least 95% of its maximum unit weight.

F. **Subgrade Manipulation.** Scarify, mix, and blend the roadbed subgrade to a depth of 12 inches below the top of subgrade. Compact to at least 95% of its maximum unit weight.

G. **Earth Excavation.** Excavated material is the property of the Owner.

Compact the subgrade to at least 95% of its maximum unit weight and ***to a depth of at least 12 inches***. If the subgrade cannot be compacted to 95% of its maximum unit weight using conventional construction methods, the Engineer may authorize the use of other methods to attain compaction.

In cut sections where the existing material appears to meet the requirements of subsection 301.02***, the contractor may, with the Engineer's approval***, excavate the grade to top of subbase rather than to the bottom of subbase. The Engineer will then determine whether the

existing material meets subbase requirements. Shape material meeting subbase requirements to the top of subbase grade and compact to at least 95% of its maximum unit weight and to a depth of at least 12 inches. The Engineer will adjust earthwork quantities accordingly. Excavate material not meeting subbase requirements to the bottom of subbase. The Department will not consider claims for damage caused by the Contractor's halting of grading operations so the Engineer can make subbase determinations.

Maintain the roadbed and ditches and provide drainage at all times. Install and remove temporary drainage facilities at no additional cost to the Department.

Perform grading to avoid removing or loosening material outside the required slopes. Replace and compact material removed or loosened outside the slopes to the required density and cross section.

Dispose of surplus or waste material resulting from ditch construction in accordance with subsection 205.03.P. Remove roots, stumps, or other materials that are unacceptable to the Engineer in the slopes and bottom of the ditch and backfill the holes with suitable material. Maintain ditches until the Engineer's final acceptance.

H. **Roadway Embankment**

1. **Stepping Side Slope.** Step embankments constructed on existing side slopes of 1:6 or steeper before placing embankment. Form steps with a horizontal dimension of at least 3 feet according to the *MDOT Standard Plan R-105 series.*

2. **Borrow.** ***Not Used.***

3. **Winter Grading.** ***Not Used.***

4. **Placing and Compacting Embankment.** ***Not Used.***

I. **Structure Embankment**

1. **Compaction of Original Ground.** In fill areas on which a structure is required, remove the topsoil from the area within the toes of slope in accordance with subsection 205.03.A.1. Compact the area to at least 95% of the maximum unit weight and at least 9 inches deep.

2. **Placing Structure Embankment.** Place and compact structure embankment to the limits shown on the plans before casting overlying footings. Protect structure embankments from freezing until placement of overlying footings.

a. **Under Structure Footings Supported by Piling**. Construct structure embankment with granular material Class III within the limits shown on the plans. The Engineer may allow the use of sound earth as an alternate

material when placed between April 1 and November 15. Use sound earth as defined in subsection 205.01 except that for rocks, the greatest dimension must be less than 3 inches. Deposit and compact structure embankment in accordance with the controlled density method.

b. **Under Structure Footings for Which Piling is Not Specified.** Construct structure embankment with granular material Class III within the limits shown on the plans and deposit and compact in accordance with the controlled density method. Compact structure embankment to 100% of the maximum unit weight within the limits of 1:1 slopes, extending outward and downward from the bottom edges of the structure footings.

3. **Winter Grading for Structure Embankment.** ***Not used.***

J. **Machine Grading.** Machine grading consists of light grading, 12 inches deep, to develop the cross section shown on the plans and includes the following:

1. Scarifying;
2. Plowing;
3. Disking;
4. Moving;
5. Compacting; and
6. Shaping the earth.

Loading or hauling material is not required for machine grading.

Grade ditches to drain runoff water. Grade intersections, approaches, entrances, and driveways as shown on the plans or as directed by the Engineer. Obtain the Engineer's approval before using excavation from ditches and roadbeds for shaping shoulders and adjacent fills.

K. **Ditch Cleanout.** Perform ditch cleanout to a depth of no greater than 2 feet based on a typical cross section shown on the plans. Include the following work:

1. Remove cattails, brush, and miscellaneous debris;
2. Remove trees with a diameter of less than 6 inches;
3. Blend ditch profiles to match the existing ditch; and
4. Remove soils/spoils from the project site.

L. **Temporary Railroad Crossing.** ***Not Used.***

M. **Granular Blanket.** ***Not used.***

N. **Trimming and Finishing Earth Grade.** Construct the earth grade to the required grade. Remove exposed stones and rocks with a diameter greater than 3 inches.

Trim the subgrade to the grade shown on the plans. If a subbase is required, trim the subgrade to within 1 inch of the required grade. If a subbase is not required, trim the subgrade to within ¾ inch of the required grade.

Trim and shape the earth grade outside the subgrade to the required lines, grades, and cross sections. Finish slopes to Class B tolerance unless Class A tolerance is required.

Finish Class A slopes to within 1 inch of the average slopes shown on the plans. Make measurements at right angles to the slope.

Finish Class B backslopes to within 6 inches of the average slopes shown on the plans. Make measurement at right angles to the slope. Do not leave abrupt variations in the finished surface. Remove debris and unsuitable material.

Finish Class B fill slopes to within 2½ inches of the required grade and cross section from the outside shoulder line for 3 feet down the slope. Measure at right angles to the slope. Finish the remainder of the fill slope the same as a Class B backslope.

If trees or other obstacles do not interfere, round the tops of backslopes, bottoms of fill slopes, and other angles in the lines of the cross section to form vertical curves as shown on the plans or as directed by the Engineer. Make vertical curve transitions gradual such that they present a uniform and attractive appearance. The Contractor may omit vertical curves if constructing ditches in peat.

O. **Channel Excavation.** ***Not Used.***

P. **Disposing of Surplus and Unsuitable Material.** The Department assumes no legal obligation to ensure that the Contractor responsibly disposes of surplus and unsuitable material in accordance with this section. Permits must be obtained as necessary in accordance with subsection 107.02.

1. **Disposal Within the Right-of-Way.** Do not dispose of material, temporarily or permanently, beyond the normal plan fill slope across regulated or unregulated wetlands or floodplains. The Engineer may allow disposal of material, including associated restoration material, within the right-of-way to fill low areas or flatten slopes at no additional cost to the Department.

2. **Disposal Outside the Right-of-Way.** ***Not Used.*** ***All excavated soils must remain on Airport property, preferably within the project limits.***

3. **Contractor Responsibility**. The Contractor is directly and solely responsible for disposal of surplus and unsuitable material.

Contact the appropriate regulatory agencies to determine whether an area is a regulated or unregulated wetland or floodplain before disposing of surplus or

unsuitable material in areas outside the right-of-way and not shown on the plans as disposal sites.

Immediately move to an upland site any surplus or unsuitable material that was disposed of in portions of regulated or unregulated wetlands or floodplains not shown on the plans as disposal sites, at no additional cost to the Department. Restore the vacated area as directed by the applicable regulatory agencies at no additional cost to the Department.

The Engineer will not consider requests for extensions of contract time without an assessment of liquidated damages for delays associated with moving surplus or unsuitable material to an upland site.

4. **Notification to Regulatory Agencies**. ***Not Used.***

Q. **Berm Grading.** Remove existing earthen berms along shoulders of the roadway including under existing guardrail to facilitate drainage. Remove all berms from the paved shoulder to the hinge point of the fill slope and grade the slope to provide positive drainage or to the dimensions shown on the plans. Removed berm material, if approved for reuse, must be in accordance with subsection 107.15.

205.04. Measurement and Payment

205.04.1 Method of Measurement

A. No separate measurement shall be made for earth excavation. All necessary earth excavation, excluding subgrade undercutting and backfill, shall be considered incidental to the installation of the various proposed contract work items requiring excavation.

B. Measurement for subgrade undercutting and backfill, Type IV shall be made by the number of cubic yards of material undercut and backfilled in its final position.

205.04.2 Basis of Payment

A. No separate payment shall be made for Earth Excavation.

B. “Subgrade Undercutting, Type IV” payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all material, labor, equipment, tools, and incidentals necessary to complete the item.

Pay Item	**Pay Unit**
205-1 Subgrade Undercutting, Type IV…….....	Cubic Yard

Section 208. Soil Erosion and Sedimentation Control

208.01. Description

This work consists of installing and maintaining erosion and sedimentation controls to minimize soil erosion and control sediment from leaving the right-of-way and affecting water resources of the State of Michigan and adjacent properties. Complete this work in accordance with this section and MDOT's *SESC Manual*. The Department considers the terms "stabilization" and "erosion control measures" as defined in the *SESC Manual.*

Failure to install and maintain soil erosion controls may result in project shutdown, fines from the EGLE, or both. The Contractor is responsible for obtaining applicable federal, state, and local permits when disturbing areas outside a Department right-of-way or outside Department-acquired easement areas.

208.02. Materials

Provide materials in accordance with the following sections:

Coarse Aggregate, 6A	902
Granular Material Class II	902
Dense-Graded Aggregate, 21AA, 22A	902
Open-Graded Aggregate, 34R, 46G	902
Fencing Materials	907
Culvert Pipe	909
Geosynthetics	910
Cobblestone	916
Coarse Aggregate, 3×1	916
Riprap	916
Heavy Riprap	916
Sand and Stone Bags	916
Temporary Plastic Sheet	916
Turbidity Curtain	916

208.03. Construction

A. **Area Limitations.** Conduct work to minimize soil erosion.

Limit the area of earth disturbance to 50 stations of dual roadways or 100 stations of single roadway during clearing and grading. The Engineer may change the limits of exposed surface area based on the Contractor's ability to minimize erosion and prevent offsite sedimentation.

Do not disturb lands and waters outside the limits of earth disturbance within the right-of-way without prior approval from the Engineer. Restore Contractor-disturbed areas beyond the plan or Engineer-approved limits at no additional cost to the Department.

Obtain and give the Engineer copies of local, state, or federally required permits before disturbing sites outside the right-of-way, such as borrow, waste or disposal areas, haul roads, or storage sites. Provide temporary and permanent erosion and sedimentation controls in accordance with the permits.

B. **Time Limitations.** Bring grading sections to the final earth grade as soon as possible. Completion of the final earth grade does not include topsoil or other permanent restoration measures. The Engineer will consider the earth grade final and ready for placement of topsoil and permanent soil erosion control measures when the Contractor constructs a slope, channel, ditch, or other disturbed area in accordance with subsection 205.03.N.

Complete topsoil placement and stabilize slopes, channels, ditches, and other disturbed areas within 5 calendar days after final earth grade with permanent soil erosion control measures. Permanently restore and place topsoil on slopes and ditches within 150 feet of lakes, streams, or wetlands within 24 hours of achieving final earth grade using permanent soil erosion control measures.

Do not prolong trimming, finishing final earth grade, or both, to permanently stabilize the project at one time.

C. **Construction and Maintenance of Erosion and Sedimentation Controls.** Construct temporary or permanent erosion and sedimentation controls in accordance with the SESC Manual, details shown on the plans, or as directed by the Engineer.

Maintain temporary erosion and sedimentation controls as necessary to ensure their effectiveness until permanent stabilization of the disturbed area has occurred. Dispose of sediment and debris removed from temporary sedimentation control devices in accordance with subsection 205.03.P.

Maintain permanent erosion controls as necessary to ensure their effectiveness until project completion and acceptance. Repair damaged areas, replace lost devices, and remove sediment as required. Dispose of sediment and debris removed from permanent sedimentation control devices in accordance with subsection 205.03.P.

1. **Check Dams.** Install, maintain, and remove check dams across ditches.

2. **Sediment Traps and Basins.** Excavate 5 cubic yards or less for sediment traps and greater than 5 cubic yards for sediment basins. Construct, maintain, and fill sediment traps and basins.
Prevent the excavated material from eroding into lakes, watercourses, or wetlands. Install required check dams downstream from a trap or basin before excavating the trap or basin.

3. **Filter Bag.** Provide, place, and remove at least 225-square-foot filter bags constructed of geotextile blanket. Pump water from the construction area into the filter bag to filter the water before it enters a watercourse. Install gravel filter berms

on the downslope side of the filter bag for additional protection in sensitive areas or where the Engineer determines that the filter bag is not effectively removing the sediment. Place the filter bag in an upland vegetated area, on level ground, above, and as far as possible from watercourse banks. Use one pump discharge hose per filter bag. Hose must be of appropriate size for the filter bag. Use multiple filter bags as necessary to ensure effective filtration. The Engineer must approve the location of the filter bag before pumping begins.

Replace or dispose of the filter bag and its contents when no longer effective or required. Dispose of filter bag and contents in accordance with subsection 205.03.P.

The Contractor may discharge silt-free, sediment-free water directly to a watercourse.

4. **Sand and Stone Bags.** Provide, place, maintain, remove, and dispose of sand or stone bags. Use non-contaminated sediment-free materials. The stone from stone bags may remain in place after the required period if the bags are cut open and the stone spread evenly, as directed by the Engineer.

5. **Silt Fence.** Provide, install, maintain, remove, and dispose of silt fence consisting of woven geotextile fabric stapled to and supported by posts. Place material removed from trenching in the silt fence on the upslope side of the silt fence. In areas where water ponds behind the silt fence, provide a stone filter to channel away the water and prevent failure. Silt fence may remain in place after the required period if directed by the Engineer.

6. **Gravel Filter Berm.** Provide, place, maintain, remove, and dispose of gravel filter berms consisting of coarse aggregate 6A or open-graded aggregate 34R or 46G. Do not use a gravel filter berm instead of a check dam in a ditch.

7. **Inlet Protection, Fabric Drop.** Provide, place, maintain, and remove fabric drop inlet protection devices as directed by the Engineer. Remove and dispose of accumulated sediment as necessary.

8. **Inlet Protection, Geotextile and Stone.** Provide, place, maintain, remove, and dispose of geotextile blanket, coarse aggregate 6A or open-graded aggregate 34R or 46G, or both, for inlet protection. Remove and dispose of accumulated sediment as necessary.

9. **Inlet Protection, Sediment Trap.** Excavate, provide, maintain, remove, and dispose of sediment traps consisting of geotextile blanket and coarse aggregate 6A or open-graded aggregate 34R or 46G. Remove and dispose of accumulated sediment as necessary.

10. **Temporary Plastic Sheets or Geotextile Cover**. Provide, place, maintain, remove, and dispose of plastic sheets or geotextile cover. Secure temporary plastic sheets or geotextile cover as directed by the Engineer.

11. **Sand Fence.** Provide, maintain, remove, and dispose of fence to prevent sand from migrating onto roads.

12. **Aggregate Cover**. Provide, place, maintain, remove, and dispose of geotextile separator and dense-graded aggregate 21AA, coarse aggregate 3×1, coarse aggregate 6A, or other Engineer-approved material.

13. **Gravel Access Approach**. Provide, place, maintain, remove, and dispose of geotextile separator and coarse aggregate 3×1 or other Engineer-approved material.

14. **Turbidity Curtain.** Provide, install, maintain, remove, and dispose of shallow or deep turbidity curtain.

Use shallow turbidity curtain when the water is no greater than 2 feet deep. Use deep turbidity curtain when the water is greater than 2 feet deep.

Provide a floating or staked turbidity curtain. During removal, minimize sediment loss.

15. **Intercepting Ditch.** Construct and maintain intercepting ditches. Remove ditches when no longer needed or as directed by the Engineer.

D. **Removal of Erosion and Sedimentation Control Facilities.** Remove or obliterate temporary erosion and sedimentation controls when the permanent controls are complete and approved unless otherwise directed by the Engineer. Do not remove temporary controls next to lakes, watercourses, or wetlands until the establishment of turf on the adjacent slopes. Before placing topsoil, permanent seed, and fertilizer, remove or incorporate mulch placed for temporary erosion control into the slope. Minimize erosion and sedimentation into watercourses during removal of erosion controls. Repair damage caused during the removal of erosion controls at no additional cost to the Department.

208.04. Measurement and Payment

208.04.1 Method of Measurement

A. Temporary erosion and pollution control work required will be performed as scheduled or directed by the Engineer. Completed and accepted work will be measured as follows:

1. Silt Fence will be measured by the linear foot excluding overlaps.

2. Temporary inlet and outlet protection will be measured per each.

208.04.2 Basis of Payment

A. Accepted quantities of temporary water pollution soil erosion, and siltation control work ordered by the Engineer and measured as provided in paragraph 208.4.1 will be paid for under:

Pay Item	**Pay Unit**
208-1 Erosion Control, Silt Fence…….....	Foot
208-2 Erosion Control, Inlet Protection, Fabric Drop……....	Each

Section 302. Aggregate Base Course

302.01. Description

This work consists of constructing an aggregate base course on a surface approved by the Engineer.

302.02. Materials

Provide materials in accordance with the following section:

Dense-Graded Aggregate 21AA, 21A, 22A 902

Provide aggregate meeting the aggregate series shown on the plans.

302.03. Construction

A. **Placing and Compacting.** Provide a ticket with each load stating the following information:

1. Project number;
2. Aggregate source;
3. Aggregate series;
4. Date;
5. Time;
6. Truck identifier number;
7. Supplier name; and
8. Type of aggregate approval.

If the contract requires payment by weight, ensure the ticket includes the gross weight, tare weight, and net weight to the nearest 100 pounds.

Determine the truck tare weight at least once daily.

If the contract does not require payment by weight, the Engineer may accept written documentation instead of tickets. Written documentation must identify the pay item of the material and include all of the information listed above except time and truck identifier number.

Provide and place aggregate with a uniform gradation, free of contamination and segregation. Do not place aggregate base on frozen, soft, unstable or rutted subgrade, subbase, or aggregate base. Do not rut or distort the subbase material or aggregate base during spreading.

The Contractor may use additives to facilitate compaction, shaping, and maintenance of the aggregate surface.

Compact the aggregate layers to a uniform thickness, no less than 3 inches and no greater than 8 inches. If placing aggregate base in a layer less than 3 inches, blend the new aggregate base material with the layer below to ensure a total of 6 inches. Blending must be performed to ensure that the new aggregate base material is uniformly mixed with the layer below.

Compact each layer of aggregate base to at least 98% of the maximum unit weight at a moisture content no greater than optimum for aggregate base under hot mix asphalt (HMA) pavement.

Compact each layer of aggregate base to at least 95% of the maximum unit weight at a moisture content no greater than optimum for aggregate base under concrete pavement. Within the limits of bridge approaches, from the abutment wall to the typical roadway cross section, compact each layer of the aggregate base to at least 98% of the maximum unit weight. Shape the finished surface and the layer thickness ***to within -½ inch and +0 inch of the crown*** and grade shown on the plans.

Remove, dispose of, and replace aggregate base material that mixes with subbase or subgrade material at no additional cost to the Department.

B. **Conditioning Aggregate Base.** Shape the finished surface of the existing aggregate base course ***to within -½ inch +0 inch of the grade*** and cross section shown on the plans. Provide additional aggregate to address irregularities and obtain the required grade or cross section.

If placing aggregate base in a layer less than 3 inches, blend the new material with the layer below to ensure a total of 6 inches. Blending must be performed to ensure that the new material is uniformly mixed with the layer below and compacted as specified in subsection 302.03.A.

C. **Maintenance During Construction.** Maintain the aggregate base course layer at the required line, grade, and cross section until placement of the next layer. Ensure the exposed aggregate base course layer remains smooth, compacted, and uncontaminated.

If the subgrade, subbase, or aggregate base is damaged due to the Contractor's operations or construction traffic, restore to the required condition at no additional cost to the Department.

D. **Surplus Existing Aggregate Base Material**. Surplus existing aggregate base material meeting the material requirements described in this section may be used instead of providing new aggregate base material. Remove and dispose of surplus aggregate base material not being used elsewhere on the project and any unsuitable material in accordance with subsection 205.03.P.

302.04. Measurement and Payment

302.04.1 Method of Measurement

A. No separate measurement will be made for Aggregate base course. Aggregate base course proposed as base material beneath the various proposed contract work items shall be considered incidental to the installation of such work items.

B. Aggregate base course placed as backfill material in undercut areas shall be included and paid for at the established contract unit price for Undercut and Backfill and no separate measurement shall be made.

302.04.2 **Basis of Payment**

No separate payment shall be made for aggregate base course.

Section 308. Geosynthetics for Base

308.01. Description

This work consists of providing and installing geosynthetic products on a surface approved by the Engineer.

308.02. Materials

Provide material in accordance with the following sections:

Geotextile Separator	910
Stabilization Geotextile	910
Road Grade Biaxial Geogrid	910

308.03. Construction

A. **Geotextile Placement.** Place or install geotextile separator or stabilization geotextile products in accordance with the manufacturer's installation guidelines and this subsection.

Do not operate equipment that is required to place backfill directly on geotextile products. Eliminate wrinkles or waves that develop during placement. Place the products in direct contact with the soil below before placing backfill on the geotextile products. Do not expose geotextile to ultraviolet degradation for more than 7 days.

Shingle-lap longitudinal and transverse joints at least 2 feet or seam the joints in accordance with the manufacturer's recommendations. Ensure that field or factory seams meet the minimum grab tensile strength for the product application. Do not use nylon thread for geotextile seaming. Place seams facing upward for inspection purposes. Repair tears or damage to the geotextile in accordance with the manufacturer's recommendations.

B. **Geogrid Placement.** All areas immediately beneath the installation area for the geogrid must be properly prepared as shown on the plans, as specified, or as directed by the Engineer. Place or install the geogrid in accordance with the manufacturer's installation guidelines and this subsection.

To prevent undue exposure or damage to the geogrid, place only the amount of geogrid required for immediately pending work. Do not expose geogrid to ultraviolet degradation for more than 7 days.

The geogrid must be unrolled ***in the direction prescribed by the Engineer***. Place the geogrid taut prior to placement of subsequent aggregate layer. Anchor the geogrid in position after placement until placement of the subsequent aggregate layer. Overlap adjacent rolls of geogrid 2 feet minimum. Whenever possible, the placement of the subsequent aggregate layer must proceed from the centerline of the geogrid placed out to assist in tensioning the geogrid. Place at

least 6 inches of the subsequent aggregate layer over the geogrid before allowing construction vehicles on the geogrid.

C. **Aggregate or Granular Material Placement**. Spread and shape the subsequent layer of aggregate or granular material after placing geosynthetic to create a stable work platform before compaction. Place additional aggregate or granular material, as required by applicable sections, and compact. Fill ruts with additional aggregate or granular material and compact before placing each subsequent layer.

308.04 Measurement and Payment

308.04.1 **Method of Measurement**

A. Geotextile separator shall be measured by the number of square yards of separator placed and accepted.

308.04.2 **Basis of Payment**

A. Payment shall be made at the contract unit price per square yard for Geotextile, Separator, Non-Woven. This price shall be full compensation for furnishing all materials; for all preparation, hauling, and placing of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Pay Item	**Pay Unit**
308-1 Geotextile, Separator, Non-Woven…….....	Square Yard

Section 801. Concrete Driveways

801.01. Description

This work consists of constructing reinforced or non-reinforced concrete driveways as required by the contract.

801.02. Materials

Provide materials in accordance with the following sections:

Curing Compound	903
Steel Reinforcement	905
Joint Materials	914
Concrete, Grade 3500	1004

801.03. Construction

Construct driveways in accordance with subsection 803.03 and the MDOT Standard Plan R-29 series.

801.04. Measurement and Payment

Pay Item **Pay Unit**

801-1 Driveway, Reinf. Conc., 6-inch, including Aggregate Base.....Square Yard

A. **Acceptance.** Conduct concrete quality control (QC) as specified in section 1002. The Engineer will conduct quality assurance (QA) as specified in section 1003. The Department will apply adjustments to this work based on the QA results.

B. **Driveway, Reinf. Conc.** The Engineer will measure Driveway, Reinf Conc, …..inch,… by the width and length placed, for the specified thickness required on the plans. Payment shall include proposed reinforcement and saw cutting and sealing of all joints within concrete pavement, adjacent to the new concrete pavement and existing pavement and between curb and gutter.

Section 802. Concrete Curb, Gutter, and Dividers

802.01. Description

This work consists of constructing the following items on the prepared base, with or without reinforcement, as required by the contract:

A. Concrete curb, combination curb and gutter, and curb nose;
B. Valley gutter and shoulder gutter;
C. Downspout headers and spillways; and
D. Dividers.

802.02. Materials

Provide materials in accordance with the following sections:

Curing Compound	903
Asphaltic Materials	904
Steel Reinforcement	905
Geotextile Liner	910
Lane Ties	914
Joint Fillers	914
Concrete, Grade 3500	1004
Mortar, Type R-2	1005

802.03. Construction

A. **Preparation of Base**. Prepare the base in accordance with subsection 602.03.B.Construct a uniform base. Compact the base material to 95% of the maximum unit weight. Prepare the base and geotextile liner for concrete spillways in accordance with subsection 814.03.A.

B. **Placing Forms.** Place fixed forms in accordance with subsection 602.03.C.Use face forms, if necessary, to construct straight curbs.

If using slip-forming methods, match the dimensions of the form to the dimensions of the curb shown on the plans.

C. **Placing Steel Reinforcement.** Place steel reinforcement and lane ties in the correct position during concrete placement, as required.

Splice steel reinforcement bars by lapping them at least 10 inches. Tie bar laps with wire ties within 2 inches of each end of the lap.

D. **Placing Concrete.** Obtain the Engineer's approval of the base before placing concrete. Wet the base before placing concrete.

For concrete curbing constructed as an integral part of the concrete pavements, except at night headers, place concrete curbing within 30 minutes of placing the concrete for the pavement. At night headers, use ties and methods approved by the Engineer.

Construct transitions between concrete valley gutter and concrete curb and gutter in accordance with section 602.

Place concrete to the required depth and spade or vibrate to ensure consolidation.

Apply membrane-curing compound as soon as concrete has been placed and in areas requiring repairs after the repairs have been made.

Repair honeycombed areas or voids with Type R-2 mortar.

E. **Joints.** Construct joints perpendicular to the surfaces of the curb, gutter, or dividers in accordance with the MDOT Standard Plan R-30 or R-33 series. Seal joints in accordance with subsection 602.03.S.

1. **Contraction Joints and Plane-of-Weakness Joints**. Construct joints, in accordance with plans, to ensure a plane-of-weakness at least one-fourth the depth of the section.

2. **Expansion Joints.** Place expansion joint filler to the full depth of the joint. Recess the top of the joint filler ¼ to ½ inch below the finished surface of the structure.

F. **Finishing.** Round the exposed edges to a ¼-inch radius, including transverse joints. Shape the face of the curb to produce the radii shown on the plans. Fill low spots with the same concrete mixture used in the work.

Finish exposed surfaces smooth and even, and lightly brush using a broom or brush. Finish the gutter and top of curb to within 3⁄16 inch of the plan dimensions when checked with a 10-foot straightedge. Finish other exposed surfaces to within ⅜ inch of the plan dimensions.
Do not add water to the concrete surface to aid finishing.

G. **Stenciling**. ***Not Used.***

H. **Curing**. Cure concrete curb, gutter, and dividers in accordance with subsection 602.03.M.

I. **Weather and Temperature Limitations.** Protect concrete curb, gutter, and dividers in accordance with subsection 602.03.T.

J. **Backfilling.** Place and compact backfill after the concrete gains the needed strength to support placing and compacting. Grade the remaining excavated areas.

802.04. Measurement and Payment

Pay Item **Pay Unit**

802-1 Curb and Gutter, Conc., Integral, Det F4, including Aggregate Base ..... Foot

A. **Concrete Acceptance.** Conduct concrete QC as specified in section 1002. The Engineer will conduct QA as specified in section 1003. The Department will apply adjustments to this work based on the QA results.

B. **Curb and Gutter, Concrete.** The Engineer will measure **Curb and Gutter, Conc, …..**in place along the joint of the curbing with the pavement. The Engineer will not make deductions in the pay item measured length for catch basins, inlet castings, or Detail L driveway openings. Payment shall include expansion joints as proposed on the contract drawings, and plane of weakness joints regularly spaced throughout the curb line.

Section 810. Permanent Traffic Signs and Supports

810.01. Description

This work consists of providing, fabricating, and erecting traffic signs and supports in accordance with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD), Michigan Standard Highway Signs Manual, and MDOT's Sign Support Standard Plans.

A. Definitions

Defect. Physical imperfections affecting function, performance, or durability of a sign or support. Defects include dents, scratches, nicks, blemishes, mottles, dark spots, scuffs, streaks, warpage, sheeting lift, and bolt head dimples.

Patch. Small piece of reflective sheeting material used to cover a defect or imperfection on a sign surface.

Post Spacing. Center-to-center distance between posts.

Substrate. Material to which sheeting is applied (wood or aluminum). Warp. Deformation caused by bending or twisting in posts or substrate. Wedge. Tapered hardwood used to secure wood posts in sleeves.

810.02. Materials

Provide materials in accordance with the following sections:

Adhesive Anchoring	712
Curing Compounds	903
Steel Reinforcement	905
Structural Steel	906
Anchor Bolts, Nuts and Washers	908
Structure Anchors and Bolts	914
Electrical Conduit	918
Permanent Traffic Signs	919
Sign Supports and Mounting Hardware	919
Concrete, Grade 3000, 3500	1004

Provide Grade 3500 concrete for cantilever and truss sign support foundations. Provide Grade 3000 concrete for other sign support foundations.

810.03. Construction

Before beginning excavation or post-driving operations, determine the location of underground utilities as specified in Section 107.

Place signs at the bottom height shown on the plans or in accordance with MDOT's Sign Support Standard Plans.

Repair zinc coating on sign supports damaged during transportation, handling, or erection in accordance with subsection 716.03.E and at no additional cost to the Department.

A. **Fabrication**

1. **Trusses and Cantilevers**. Fabricate in accordance with MDOT's Sign Support Standard Plans and as provided on the plans and as required in sections 707 and 716.

2. **Steel Column Breakaway Sign Supports.** Fabricate in accordance with MDOT's Sign Support Standard Plans. Blast clean and galvanize structure components in accordance with section 716. Field verify the correctness of breakaway heights.

3. **Bridge Sign Connections**. Fabricate in accordance with MDOT's Sign Support Standard Plans. Blast clean and galvanize steel structure components in accordance with section 716. Field verify the correctness of bridge sign connection strut lengths for fabrication. The Engineer must approve the strut lengths prior to commencing fabrication.

4. **Signs.** Fabricate in accordance with the Michigan Standard Highway Signs Manual or as required by traffic sign graphic design layout plans.

B. **Delineators**. *Not Used.*

C. **Steel Post Sign Supports and Square Tubular Steel Sign Supports**. Drive or embed posts so sign faces and supports are within 3/16 inch of plumb over 3 feet. Place posts within 2% of the plan distance, as measured from center-to-center of posts.

Do not damage the top of posts during driving. Install steel sign supports and square tubular steel sign supports in accordance with MDOT's Sign Support Standard Plans.

D. **Wood Post Sign Supports**. Erect wood sign support posts to ensure that sign faces and supports are within 3/16 inch of plumb over 3 feet. Place the posts within 3% of the plan distance, as measured from center-to-center of posts.

For wood post sign supports that do not require pre-drilled holes, place the end with the most severe strength defects on the top. The Engineer will not require forms for concrete, provided the Contractor prevents earth from falling into the limits of the excavation.

The Contractor may use tubular shells in soils where boreholes will not stay open.

E. **Installing Steel Posts Through Concrete**. If installing steel sign posts, including square tubular steel sign supports or steel delineator posts through existing concrete, drill or saw cut a separate hole through the concrete for each post. Drill or cut post holes no greater than 1 inch larger than the largest cross-sectional dimension of the post. After drilling or sawing, remove the concrete debris from the hole. Clean and dry the area around the hole. Insert the galvanized steel post into the hole and embed to a depth of 3½ feet below the top of concrete grade. Fill the hole around the post with a silicone sealer.

If installing posts in new concrete, the Contractor may form holes before placing the new concrete.

F. **Installing Wood Posts Through Concrete.** If installing wood sign posts through existing concrete, drill or saw cut a separate hole through the concrete for each post. Drill or cut postholes to a diameter of at least 18 inches. After drilling or sawing, remove the concrete debris from the hole. Clean and dry the area around the hole. Center the galvanized steel sleeve and wood post in the hole.

If installing wood posts in new concrete, the Contractor may form holes before placing the new concrete.

G. **Sign Band**. Provide and install bands to fasten a single sign or route marker cluster bracket to the supports in accordance with MDOT's Sign Support Standard Plans SIGN 740 series or as directed by the Engineer.

H. **Concrete Glare Screen and Concrete Median Barrier Connections**. *Not used.*

I. **Foundations for Steel Column Breakaway Sign Supports**. *Not Used.*

J. **Cantilever and Truss Foundations**. *Not used.*

K. **Drilled Piles for Cantilever and Truss Foundations**. *Not used.*

L. **Cantilever Sign Supports**. *Not used.*

M. **Truss Sign Supports**. *Not used.*

N. **Anchor Bolts for Sign Support Structures and Lighting**

1. **Anchor Bolt Installation**. Place and hold anchor bolts plumb and aligned using a steel template. Secure the template before placing the concrete and leave in place at least 24 hours after concrete placement. Place concrete in accordance with 706.03.H and finish smooth and horizontal. Do not erect the sign support until the concrete attains 70% of the minimum 28-day compressive strength or until test beams or cylinders attain a flexural strength of 500 psi.

The Engineer will reject a foundation if the anchor bolts are out of position or greater than 1:40 out-of-plumb. Do not bend anchor bolts to straighten, move into position, or alter the structure base plate.

2. **Anchor Bolt Tightening**. Mark the flange and each nut and anchor to reference the required rotation. Place the bottom leveling nuts and washers onto the anchor bolts and thread down as close to the concrete foundation as possible. Level the leveling nuts, keeping them as close to the concrete foundation as possible. The distance from the top of the concrete foundation to the bottom of the leveling nuts must not exceed 1 inch. Place the upright column on to the anchor bolts and bring all leveling nuts into full bearing with the bottom of the structure base plate.

Apply beeswax, or an Engineer-approved equivalent, to the bearing face and threads of the top nuts. Place the top nuts and washers onto the anchor bolts and tighten loosely with a wrench or by hand. Ensure that the top nuts and leveling nuts fully bear on the structure base plate.

Tighten anchor nuts to a snug condition as defined below.

Apply beeswax, or an equivalent, to the top nut bearing face and threads before placing on the anchor. Tighten top nuts to a snug condition, defined as follows:

a. **Snug Condition.** The tightness attained by the full effort of a person using a wrench with a length 14 times the diameter of the anchor bolt but at least 18 inches. Apply the full effort as close to the end of the wrench as possible. Pull firmly by leaning back and using entire body weight on the end of the wrench until the nut stops rotating. Use at least two separate tightening passes. Tighten the top nuts first and sequence the tightening of each pass so the opposite side nut will be tightened until all the top nuts in that pass are snug. After all top nuts are tightened, repeat the procedure to tighten the bottom nuts. If present, lock washers must be fully compressed once tightening is complete.

Check the snug tightness of the top nuts in the presence of Department personnel ensuring that snugged nuts meet the torque requirements in Table 810-1.

Once a snug tight condition is verified, use a hydraulic wrench or a calibrated torque wrench to rotate the top nuts an additional one-third turn. Ensure that the hydraulic wrench or calibrated torque wrench has a current traceable accredited calibration. The calibration interval is 1 year unless otherwise approved by the Engineer. Calibration of the torque wrench must be performed by an accredited laboratory. Accurately mark the structure base plate, nuts, and anchor bolts to reference one-sixth and one-third required rotations. Tighten the nuts in two separate passes, turning the nuts

one-sixth of a turn with each pass. Use a tightening sequence to ensure that the nut opposite the tightened nut is subsequently

Table 810-1:
Anchor bolt Snug Condition Required Torque

Diameter (inch)	Minimum	Maximum
1	100	200
1¼	200	400
1½	300	600
1¾	400	600
2	500	700
2¼	700	900
2½	800	1,000
1¼	200	400

tightened. Do not allow the leveling nuts to rotate during top nut tightening. Once the tightening is complete, mark the upright column with the wrench operator's initials and the date of tightening.

Hydraulic wrench or calibrated torque wrench must have a calibration chart showing conversions between psi and lbf-ft throughout the entire range.

3. **Anchor Bolt Testing**. Check the tightness of the top nuts in the presence of Department personnel a minimum of 48 hours after the additional one-third turn. Using a hydraulic wrench or calibrated torque wrench, apply torque to the nuts in accordance with Table 810-2 and verify no movement of the nut occurs. Mark the upright column with the wrench operator's initials and the date of the 48-hour check.

Table 810-2:
Anchor Bolt Final Turn Required Torque

Anchor Bolt Diameter (inch)	Minimum Torque (lbf-ft)
1	300
1¼	630
1½	1,120
1¾	1,820
2	2,770
2¼	4,010
2½	5,550

If the nuts rotate during the 48-hour check, proper anchor bolt tension was not achieved. The ultrasonic testing and calibration procedures that are used by the Department for final acceptance are available upon request.

Tighten the nuts or washers, determined loose by the Department during acceptance procedures, in accordance with this subsection. The Engineer will determine if removal, disassembly, or re-erection of the structure is necessary. If the Department determines that nuts require tightening, after initial installation, remove and reinstall nuts and washers and, if the Engineer determines necessary, remove, disassemble, and re-erect the entire structure at no additional cost to the Department.

The Department will ultrasonically test the anchor bolts for acceptance after the 48-hour check is deemed acceptable. The ultrasonic testing and calibration procedures that are used by the Department for final structure acceptance are available upon request.

O. **Bridge Sign Connections**. *Not Used.*

P. **Bolt Replacement in Retained Bridge Mounted Sign Connections**. *Not Used.*

Q. **Overhead Lane Assignment Structures**. Not used.

R. **Signs**. Provide complete signs, free of defects. Provide reflectorized sign faces, smooth and free of dents, wrinkles, and other defects. Provide signs with uniform color and brightness, free of warps or other deformations, and without mottling, streaks, or stains. Replace signs that do not meet the size, font, or legend layout requirements. Replace signs with unacceptable wrinkles, as determined by the Engineer.

The Engineer will allow no more than three patches per sign. Use patches made of the same material as the sign. Extend patches 9/16 inch beyond the outer edges of the defect. The Engineer will determine the maximum patch size. Do not patch more than 2% of the total number of signs per project. For projects with 100 or fewer signs, the Engineer will determine the maximum number of patched signs.

The Engineer will provide installation date stickers to the Contractor at the preconstruction meeting.

At the time of installation, place an installation date sticker on the back lower portion of the signs. Ensure that the date sticker is fully visible after installation.

Store signs, delivered for use on the project, in accordance with the sheeting manufacturer's recommendations. Replace or repair signs that were damaged, discolored, or defaced during fabrication, transportation, storage, or erection.

Position and fasten signs to the support. Tighten nuts to the bolts, including nylon washers, in contact with reflective sheeting in accordance with the reflective sheeting manufacturer's recommendations. Erect signs clean and free of substances that would hide or obscure portions of the sign face.

Along roadways open to traffic, cover signs with messages not immediately applicable. Cover signs in accordance with subsection 812.03.D.2.

If replacing existing signs on project sections open to traffic, remove existing signs after erecting new signs visible to motorists. Remove replaced signs and supports from the right-of-way within 7 days. Remove signs and supports in accordance with subsection 810.03.U. Leave existing overhead signs in place until the installation of new signs. Retain existing signs, not shown on the plans, unless otherwise directed by the Engineer.

Do not install signs behind obstructions. Prune vegetation obstructing signs.

Remove packaging and protective materials from sign panels and clean the exposed sign faces in accordance with the manufacturer's specifications. Remove and dispose of excess material. If sign construction disturbs the site, level and repair the area.

Install signs and supports in accordance with the tolerances specified in this subsection.

1. **Extra Holes**. The Engineer will allow no more than two extra holes per sign. Patch extra holes on the front and back sign surfaces. Use patch material of the same reflectivity, color, and age as the reflective sheeting on the sign. Apply patches in accordance with the sheeting manufacturer’s recommendations.

2. **Offset.** Erect signs within 2 feet of the location shown on the plans, but do not erect signs closer to the edge of the traveled way than the distance shown on the plans or as specified in MDOT’s Sign Support Standard Plans SIGN 120 series.

3. **Bottom Height**. Erect signs with the bottom height in rural areas within 6 inches of the height shown on the plans, and in urban areas, within 6 inches above the bottom height shown on the plans.

4. **Sign Location**. Do not change the location of regulatory, gore, or no passing zone signs or signs on cantilevers, trusses, and bridge connections without the Engineer’s approval.

   Place advance warning signs within 10 feet longitudinally from the location shown on the plans. Place the advance warning signs at least the minimum longitudinal distance specified in the MMUTCD.

   Place other signs within 20 feet, longitudinally, of the location shown on the plans.

5. **Gaps**. Ensure that gaps between plywood sheets do not exceed 1/16 inch.

6. **Wedges**. Limit wedge thickness to between ¾ inch and 1 inch.

7. **Unacceptable Wrinkles**. Replace signs with the following defects:

a. Wrinkles ending at an outside edge of the sign;
b. Wrinkles greater than 3 inches long; or
c. Wrinkles that split or damage the sheeting.

S. **Installing Department Supplied Sign**. *Not Used.*

T. **Hanger Mounts and Wall Mounts**. Not Used.

U. **Removal of Signs and Sign Supports**. Remove and salvage cantilever and truss sign supports using the methods required for erecting the supports. Remove, haul, and stockpile Type I signs, cantilevers, trusses, column breakaways, bridge connections, and all associated attaching or fastening hardware at the offsite location required. Coordinate delivery of salvaged items with the Department contact person at least 72 hours before transporting to the Department property location as shown on the plans or as directed by the Engineer.

Take ownership of remaining signs, supports, and associated attaching or fastening hardware. Pull, do not cut, sign and delineator supports requiring removal or replacement. If the Engineer determines that posts or columns cannot be pulled, cut off at least 12 inches below grade and fill the hole. For sign supports in concrete surfaces, cut the support at the surface. Fill in the hole with grout or similar material completely. Finish to provide a smooth surface free from irregularities.

Remove bridge sign connections, welded to steel beams, by flame cutting. Leave a ¼-inch projection from the web. Grind the projection flush with the surface of the web to a surface roughness no greater than 250 micro inches per inch root mean square. Coat the surface with an Engineer-approved zinc-rich primer after grinding.

To remove bridge sign connections, bolted to steel beams, dismantle the bridge sign in reverse order from installation. If replacing an existing sign support, fill unused holes in bridge steel beams with galvanized high-strength bolts, installed in accordance with subsection 707.03.E.6.

Remove bridge mount sign connection anchor bolts to concrete surfaces by unbolting or cutting if the connection detail is not to be reused. Flame cutting of sign connections is prohibited. Cut and grind flush anchor bolts embedded in the concrete. Core drilling for anchor bolt or insert removal is prohibited. Coat the exposed ends of the anchor bolts with an epoxy grout or a tinted organic zinc-rich primer in accordance with section 715.

If removing trusses or cantilevers, separate the truss box or cantilever arms without damaging the unit. Remove the truss box or cantilever arms before removing end supports. Remove end supports in reverse order from installation. Do not torch cut uprights of the end supports for removal. Do not scratch, scorch, or nick the cantilever or truss members.

V. **Removal of Sign Support Foundations**. Remove foundations to 12 inches below the ground surface and backfill in accordance with subsection 204.03.C. If the contract requires complete

removal of a foundation, remove sign support foundations in accordance with subsection 204.03.A.3 and backfill in accordance with subsection 204.03.C after new foundation is installed Dispose of concrete and other deleterious material in accordance with subsection 205.03.P. Topsoil, seed, and mulch the removal area in accordance with subsection 816.03.

W. **Erection of Salvaged Sign Supports and Signs**. Handle and store signs and sign supports, salvaged for use on the project, in accordance with subsection 810.03.R. Transport, store, and erect salvaged supports and signs in accordance with subsection 810.03.U. Replace salvaged signs with damage or defects with new signs at no additional cost to the Department.

Upon erection of salvaged sign supports, stencil the structure support per subsections 810.03.L and 810.03.M as applicable.

810.04. Measurement and Payment

810.04.1 Method of Measurement

The quantity of signs shall be measured by each unit placed, completed, and accepted by the Engineer.

810.04.2 Basis of Payment

Payment for signs shall be made at the contract unit price per each sign placed and accepted. The unit price for post mounted road signs and placement of salvaged signs includes the cost of post furnishing and installation, foundation installation, attaching devices and hardware, including H-brackets, fabricating and erecting signs, pruning vegetation, and site cleanup in accordance with subsection 810.03.R.

Pay Item	**Pay Unit**
810-1 Post-Mounted Road Sign, Type IIIA, 24-inch x 24-inch, including Supports……....	Each

The unit prices for fabricated items include the cost of providing dimensional information for the relevant fabricated item.

Section 811. Permanent Pavement Markings

811.01. Description This work consists of removing existing pavement markings within the project limits. The Owner intends to self-perform the application of all proposed permanent pavement markings in accordance with the Michigan Manual on Uniform Traffic Control Devices.

811.02 Materials. Material shall meet Section 920, MDOT Standard Specifications for Construction, 2020 edition:

Provide the Material Safety Data Sheets to the Engineer for required materials and supplies. Dispose of unused material and containers in accordance with the Federal Resource Conservation Recovery Act (RCRA) of 1976 as amended, and 1994 PA 451, Part 111 Hazardous Waste Management.

811.03 Construction.

Construction Methods shall comply with Section 811.03 of MDOT Standard Specifications for Construction, 2020 edition.

811.04. Measurement and Payment

811.04.1 **Method of Measurement**

A. The quantity of pavement markings removed shall be measured by the number of square feet of markings removed.

811.04.2 **Basis of Payment**

A. Payment shall be made at the respective contract price per square foot for pavement markings removed. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

Pay Item	**Pay Unit**
811-1 Pavt Mrkg, Rem	Square Foot

Section 812. Temporary Traffic Control for Construction Zone Operations

812.01. Description

This work consists of protecting, regulating, warning, guiding, and maintaining traffic through and around the Construction Influence Area (CIA). This work also includes furnishing, placing, relocating, operating, maintaining, and removing traffic control devices.

The Department will provide, install, and maintain traffic control devices outside the CIA.

812.02. Materials

Provide material in accordance with the following sections:

Temporary Traffic Signs 922
Channelizing Devices 922
Temporary Pavement Markings 922
Lighting Devices 922
Temporary Traffic Signals 922
Traffic Regulator Equipment 922
Portable Changeable Message Sign 922
Temporary Concrete Barrier 922
Temporary Attenuation 922
Conspicuity Tape 922

812.03. Construction

A. **Contractor Notification.** Provide the traffic control certification letter to the Engineer. Notify the Engineer at least 72 hours, or as otherwise required by the contract, before starting work or installing initial traffic control devices on the project.

B. **Changes in Stage Construction Plans.** Provide written notice to the Engineer before making changes in stage construction. If the Department accepts the changes, the Engineer will provide written approval to the Contractor.

C. **Deficient Traffic Control Operations**

1. **Traffic Control Quality and Compliance.** The following applies to all aspects of the traffic control plan and traffic control devices.

a. **Traffic Control Not Anticipated in Design.** If at any time during the project, including during the seasonal suspension, the Engineer documents that the traffic control requires improvements beyond the scope of the traffic control plan, the Engineer will provide written instructions to the Contractor, the Contractor's appointed Safety Supervisor, and traffic control supplier on the improvements that are required. The Contractor must develop and submit to the Engineer for approval a written implementation schedule for improvements. If the schedule is not approved, or if the schedule is approved but is not followed, the Department will adjust the contract according to subsection 812.03.C.1.c.iii. If the

implementation schedule is not followed, the Engineer will notify the Contractor, the Contractor's appointed Safety Supervisor, and traffic control supplier in writing that they are in violation of this subsection. The work of making traffic control improvements directed by the Engineer that are beyond the scope of the traffic control plan will be paid for as extra work.

b. **As Designed Traffic Control.** If at any time during the project, including during the seasonal suspension, the Engineer documents that the traffic control is deficient, inadequate, or improperly placed, the Engineer will provide written notification with instructions for corrective action to the Contractor, the Contractor's appointed Safety Supervisor, and traffic control supplier. Acknowledgement of the Engineer's notification must be provided within 1 hour by the Contractor. The Contractor will have 4 hours from the Engineer's notification to address the issue or provide a written implementation schedule for the Engineer's approval. If the schedule is not approved, or if the schedule is approved but is not followed, the Department will adjust the contract according to subsection 812.03.C.1.c.iii. The Contractor is required to supply evidence that the corrective action has been taken if practical visual evidence should be provided. At this time, the adjustments in subsection 812.03.C.1.c.iii will be paused until the Engineer provides written approval of satisfactory corrective action or notifies the Contractor, the Contractor's appointed Safety Supervisor, and the traffic control supplier that the corrective action is not satisfactory; at this time, the adjustments will continue per subsection 812.03.C.1c.iii. The Engineer should provide details on the remaining items that are not satisfactorily addressed. If the implementation schedule is not followed, the Engineer will notify the Contractor, the Contractor's appointed Safety Supervisor, and traffic control supplier in writing that they are in violation of this subsection.

c. **Corrective Action.** The Engineer will give written notification to the Contractor, the Contractor's appointed Safety Supervisor, and traffic control supplier as identified above. Failure to make

   corrections within the required time frame may result in the following actions by the Engineer:

   i. Stop work on the project until the Contractor completes corrective action.

   ii. Order corrective action by others in accordance with subsections 107.07, 108.02, 812.03.B, and in the interest of public safety.

   iii. A contract price adjustment in the amount of $100 per hour for every hour or portion thereof the improvements or corrective action remains incomplete as described herein. If improvements or corrections have not been made to the satisfaction of the Department, the contract will be adjusted until the traffic control is acceptable.

D. **Placing Traffic Control Devices.** Provide and maintain traffic control devices meeting the requirements in the current version of the ATSSA *Quality Guidelines for Temporary Traffic Control Devices and Features*.

Apply and place traffic control devices within the CIA in accordance with the MMUTCD, as shown on the plans, or as directed in writing by the Engineer.

Do not place commercial or Contractor identification signs within the highway right-of-way.

Display only traffic control devices relevant to conditions. Cover, remove, store, modify, or move existing temporary or permanent signs with inapplicable legends. Do not place temporary signs not in use with the sign face parallel to traffic.

Inspect traffic control devices daily to ensure that the devices are relevant, in place, positioned, aligned, and oriented as required. Record inspections and make the records available to the Engineer upon request. The Department may take possession of the inspection records at project completion.

Maintain lights on traffic control devices in working order at all times.

Remove temporary traffic control devices from the project if no longer required.

Temporary traffic control devices provided by the Contractor will remain the property of the Contractor.

1. **Temporary Signs.** Signs must not be fabricated with vertical seams. Horizontal seams are not to cross through the sign legend. Mount signs of 20 square feet or less on portable or ground-driven sign supports. Mount larger signs on ground-driven supports. Place ground-driven sign systems as described in *MDOT Standard Plan WZD-100* series or use another *NCHRP Report 350* or AASHTO *Manual for Assessing Safety Hardware* (MASH) accepted design.

Mount signs at a bottom height of at least 5 feet above the near edge of pavement and at least 5 feet above ground. If placing a sign behind a retaining wall, provide a bottom height of at least 5 feet above the top of the wall and provide a minimum height above the ground behind the wall to ensure visibility.

If erecting signs behind a curb, or within 6 feet of a pedestrian walkway, mount signs at a bottom height of at least 7 feet above ground. If the sign is located in a closed section of a walkway, the bottom height must be at least 5 feet.

For ground-driven signs, if a secondary sign is required, mount the secondary sign below the primary sign with a bottom height 1 foot less than the bottom height required.

For portable signs requiring a secondary sign, mount on separate supports at the required bottom height. Mount the primary portable sign above the secondary sign on separate supports. The Engineer will allow portable sign clusters if the total area measures no greater than 20 square feet.

Erect signs with supports vertical and the legend or symbol horizontal.
Signs must be plumb with a tolerance of no more than 2 inches over 4 feet.

The Department will allow the use of flexible, roll-up signs only during daylight hours. The Department will not allow the use of mesh signs.

For shoulders with no barrier walls, if removing temporary signs on portable supports, remove the sign stands from the uprights. Lay the sign flat, off the shoulder, and place the

uprights facing downstream from traffic. Remove support stands and ballasts from the shoulder. Do not place sign covers on temporary sign systems on portable supports located on shoulders with no barrier walls.

For shoulders with barrier walls, if removing temporary signs on portable supports, remove the sign stands from the uprights, and place against the barrier wall. Place the uprights facing downstream from traffic and place support stands and ballasts close to the barrier wall.

Cover temporary signs on portable supports that straddle barrier wall that are required to remain on the project while not in use. Remove sign covers from the roadway or store against the barrier wall when not in use.

For locations with guardrail, if conditions require temporary removal of temporary signs on portable supports, remove the sign stands from the uprights. Lay the sign behind the guardrail, with the uprights pointing downstream from the traffic, and place the support stands and ballasts close to the guardrail. Do not store signs against cable barrier.

Do not obstruct or interfere with attenuation devices when storing temporarily removed temporary signs on portable supports.

a. **Type B, Temporary, Prismatic, Special.** Signs must meet the requirements for Sign, Type B, Temp, Prismatic, Furn and Oper as outlined in section 812.

   Ensure that Type B, Temporary, Prismatic, Special signs are not fabricated with vertical seams. Horizontal seams are not to cross through the sign legend.

   Install Type B, Temporary, Prismatic, Special signs on driven sign supports, in accordance with subsections 812.03 and 919.04 and section 912, unless otherwise indicated on the plans or proposal or approved by the Engineer.

b. **Concrete Barrier-Mounted Temporary Sign System.** Provide a sign system capable of being properly attached, as determined by the Engineer, to concrete barrier, temporary or permanent, with top width as narrow as 5 inches or as wide as 15 inches.

   Ensure that the sign system has the capacity to display a roll-up or rigid sign up to 48 inches wide by 60 inches high. Ensure that the sign system and design meet all of the applicable requirements in subsections 812.03.D and 922.02.

   Construct the sign system from materials that will not be susceptible to corrosion or deterioration due to the effects of weather or road de-icing agents throughout the duration of installation.

   Sign system must securely mount to the barrier section in a manner that displays the sign clearly above the barrier. Anchoring mechanisms must operate such that when engaged, they do not irreparably damage the barrier section.

   Deploy the concrete barrier-mounted sign system in accordance with the manufacturer’s recommendations and the following requirements:

   i. Install the sign system at locations shown on the plans or as directed by the Engineer such that the message displayed is easily visible to motorists and not

obscured by or in conflict with other signage. Make adjustments to the position of the sign system as directed by the Engineer.

ii. Ensure that any deformation or damage to a Department-owned concrete barrier section that occurred due to installation or use of this sign system is repaired as directed by the Engineer at the time of removal.

2. **Sign Covers.** For permanent signs, other than overhead signs and signs larger than 60 square feet, cover the entire front of the sign panel. Mount the sign coverings using Department-approved methods to avoid damaging the sign sheeting. Do not apply fastening devices or covers directly to the reflective sheeting. Use spacers that provide 2 inches of air space between the cover and the sign face to protect the sheeting from damage.

   Install Type I sign covers on Type I signs shown in the contract to obscure conflicting information. Submit shop drawings of the Type I sign covers to the Engineer and obtain the Engineer's approval before covering Type I signs on the project.

   For temporary signs on fixed supports, cover the entire sign legend.

   Do not use burlap or similar material to cover Department or local government owned signs. The Contractor may use approved soft covers on other temporary signs.

   Do not use sign plaque overlays that alter part of the legend or symbol.

3. **Sign Supports.** Place and construct sign supports to resist swaying, turning, and displacement. Provide fixed sign posts in accordance with subsection 919.04, except that painted or galvanized steel posts are allowed.

   Mount construction signs on portable sign support standards only if signs are to remain in place for 14 days or less or as allowed by the Engineer if fixed supports are not possible.

   a. **Reflective panel for temporary sign supports.** When used, match the sheeting of the reflective panel to the material type and background color of the sheeting of the sign mounted on the post, except for YIELD and DO NOT ENTER signs where the reflective strip will be red.

      The reflective strip must be at least 2 inches wide by 3 feet long.

      Attach the reflective strip to PVC or 0.080-inch-thick aluminum substrate. If aluminum is used on a u-channel post, a backing plate is required.

      Attach the sheeting to the post as recommended by the manufacturer and approved by the Engineer. Install the sheeting as soon as the support post is placed in the ground or the sign is placed over median concrete barrier.

4. **Supplemental Weights.** Maintain traffic control devices upright and aligned during use. Use sandbags or a Department-approved alternate as supplemental weights to achieve stability.

5. **Channelizing Devices.** Install the lead-in signing and lighted arrow before installing channelizing devices. Install channelizing devices in the direction of traffic flow. Remove

channelizing devices in the opposite direction of traffic flow. The reflective sheeting for all channelizing devices within the project limits must be the same ASTM type for the life of the project. Do not mix drums and cones within a traffic channeling sequence. Where lane closures are already in place, use the same type of channelizing devices to extend the closures.

The use of traffic cones is allowed only in the daytime. Ensure that cones remain upright and in place and do not interfere with traffic.

When using plastic drums, stand the plastic drums upright and stabilize them with weight to prevent overturning. Do not mount signs on drums.

6. **42-inch Channelizing Devices.** Provide and install 42-inch tall, retro-reflective plastic channelizing devices as shown on the plans or as directed by the Engineer. Do not attach lights.

   a. The Department will allow the daytime use of 42-inch channelizing devices in taper and tangents for the following:

      i. Capital Preventive Maintenance projects, pavement marking, chip seal, micro-surface, and crack-filling projects;

      ii. Any projects where the use of plastic drums restricts proposed lane widths to less than 11 feet including shy distance; or iii. Work durations of 12 hours or less.

      The devices must be placed such that spacing does not exceed the maximum values described in Table 812-1.

Table 812-1:
Daytime Maximum Spacing for 42-inch Channelizing Devices

Work Zone Speed Limit	Taper	Tangent
< 45 mph	1.0 S	2.0 S
≥ 45 mph	50 feet[(a)]	100 feet[(a)]

(a) For nighttime operations, place the devices a maximum of 25 feet apart in taper sections and a maximum of 50 feet apart in tangent sections. These spacing requirements apply to all speed limits during nighttime operations.

S = work zone speed limit (mph)

   b. **Temporary Tubular Markers.** Provide and install tubular markers as shown on the plans. Bond the devices to the roadway surface in accordance with the manufacturer's recommendations, using a thermosetting epoxy adhesive or a pad of flexible mastic adhesive. If a flexible mastic adhesive is used, ensure that both sides of the mastic pad are protected with pre-mask tape or release film.

      Space tubular markers not more than 100 feet apart in tangent areas and not more than 50 feet apart in tapers unless otherwise directed by the Engineer.

7. **Temporary Delineators.** Provide temporary delineators to delineate work zone shoulders that cannot support the use of plastic drums.

   Install temporary delineators panels or temporary flexible delineators in accordance with the manufacturer's recommendations and as shown on *MDOT Standard Plan WZD-126* series.

8. **Lighted Arrows.** If closing lanes, place a Type C lighted arrow on the shoulder at the beginning of the channelizing device taper. Place a shoulder closure taper in advance of the lighted arrows placed on the shoulders. Provide a minimum bottom height of at least 7 feet for Type C panels. For narrow or non-existent shoulders, place the lighted arrow panel behind the channelizing devices as near the beginning of the taper as physically possible. Place the lighted arrow panel level and visible to oncoming traffic.

   Ensure that the arrow remains clearly legible at distances from 2,500 feet to 200 feet from all traffic lanes and roadway entrances. Do not place the lighted arrow on a horizontal or vertical curve that may interfere with this legibility requirement. The Engineer will verify the legibility distances on a sunny day and a clear night.

   If the lighted arrow is in use, secure the tires on the ground with wheel chocks or elevate the trailer with the bottom of the tires above the ground. If the lighted arrow is not in use, park the device in accordance with subsection 812.03.G.5. The lighted arrow board must not be in travel mode when stored within 30 feet of the traffic lanes.

   If the contract includes standby Type C lighted arrows as a pay item, make a lighted arrow available for immediate use as a replacement unit. Locate the standby lighted arrow at the project or at a location approved by the Engineer.

9. **Type III Barricade.** Use Type III barricades to accentuate delineation or warning and for total or partial road closures. For complete road closures, extend the barricades, with no gaps, across the roadway and shoulders or from curb to curb.

   Light Type III barricades with two Type C or Type D warning lights, fastened to the uprights above the top rail, provided these warning lights each weigh 3.3 pounds or less. Construction signs placed behind barricades must be located on independent supports. Place the bottom of the signs above the top rail of the barricade. Stripes on the retro-reflective sheeting must be placed in accordance with Figure 6F-7 in the 2009 edition of MMUTCD. Place sheeting on both sides of Type III barricades if traffic, including local traffic, approaches the barricade from both directions.

   Do not place Type III barricades parallel to approaching traffic.

   If through-traffic is prohibited, use Type III barricades, including the required construction signs and lights. Arrange barricades and erect signs to allow the passage of local traffic and discourage through traffic. Install a sign with the required legend concerning permissible use by local traffic only.

10. **Temporary Concrete Barrier.** Place temporary concrete barriers before diverting traffic or beginning work. Provide clean barriers in sound structural condition. If placing temporary concrete barrier sections on the pavement, clean the pavement of any material that would reduce the 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.

Link sections together to fully engage the connection between sections. Maintain the barrier with end-attachments engaged and within 2 inches of the alignment shown on the plans.

Install Type B high-intensity lights on temporary concrete barriers in accordance with the *MDOT Standard Plan R-126* series.

If incomplete concrete barrier installations or removals expose barrier blunt ends to traffic inside the clear zone for more than 8 hours, make these ends crashworthy in accordance with the *MDOT Standard Plan R-126* series or as directed by the Engineer.

Install barrier reflector markers on the temporary concrete barrier. Remove dirt and other material that could diminish adhesion from the barrier before installing the reflectors. Install reflectors using the manufacturer's recommended adhesive and installation procedures. Install the reflector near the center of the barrier section and at a height of 18 inches ±1 inch from the bottom of the barrier section to the top of the reflector. Provide a maximum longitudinal spacing of 20 feet. Ensure that the color of the reflector matches the color of the edgeline pavement marking in that location.

If relocating or adjusting temporary concrete barrier, leave the existing reflector markers on concrete barrier intact if they are undamaged and the color is as required. If the reflector color is not as required, replace with the correct color reflector. Clean barrier reflector markers before placing the barrier back in operation.

Replace temporary concrete barrier sections structurally damaged during handling or by traffic. Repair non-structural damage that affects the performance of the section using Department-approved concrete or mortar mix if directed by the Engineer.

Remove and replace damaged barrier reflector markers. Position replacement markers directly in front of the damaged marker.

a. **Glare Screen Temporary.** Must be of a design and shape so that during hours of darkness, a driver traveling at the posted speed limit in the inside travel lane cannot view the headlights of other vehicles traveling at the posted speed limit in the opposing inside travel lane.

   Each completed section of temporary glare screen is to consist of a continuous base fitted with flexible, vertical blades spaced such that the headlight glare of opposing traffic is obscured. The length of a complete section of Glare Screen, Temp is defined as being equal to the length of the temporary glare screen base with flexible blades attached as fabricated by the temporary glare screen manufacturer. Modification of the temporary glare screen blades, mounting hardware, and/or the temporary glare screen base, including cutting or drilling of additional holes in the base or

   blades, is not allowed. The overall run of Glare Screen, Temp must be such that the entire length of temporary or permanent barrier, specified on the plans or proposal,

is covered. The distance between the temporary glare screen blades at the point of temporary barrier segment connections or at the temporary glare screen base joints must not be greater than the nominal blade to blade distance. Intermixing of different brands or types of temporary glare screen and/or components, within the same run, is not allowed.

Install the temporary glare screen in complete sections along the longitudinal centerline of the temporary or permanent barrier, identified on the plans or in the proposal, with no gaps between the bottom of the temporary glare screen base and the top of the barrier.

Attach the temporary glare screen using installation procedures and hardware specified by the manufacturer. Install the mounting hardware for the temporary glare screen in clean holes drilled into the top of the temporary or permanent barrier. Tighten all hardware and connections according to the manufacturer's specifications.

Adjust the temporary glare screen when the temporary barrier on which it is installed is adjusted.

Relocate the temporary glare screen, as required, to locations identified on the plans or proposal for stage construction.

Omit the temporary glare screen for a distance of 10 feet (maximum) approaching the face of a Type B high-intensity light when a Type B high-intensity light, required per the *MDOT Standard Plan R-126* series, falls within a run of temporary glare screen.

Replace the entire section of temporary glare screen when the number of damaged temporary glare screen blades on a section of temporary glare screen is equal to or greater than one-third the number of blades attached to that individual temporary glare screen base section.

Replace damaged temporary glare screen section(s) within 10 calendar days upon written notification by the Engineer.

i. **Temporary Glare Screen Base.** Provide temporary glare screen bases that are nonwarping, durable, impact resistant, non-metallic, polymeric material. These bases must be able to withstand, at minimum, the same number of impacts as the temporary glare screen blades without deforming, warping, twisting, cracking, or splintering. Provide bases with mounting holes pre-drilled by the manufacturer of the temporary glare screen. The bases must be in sound condition and free of checks, cracks, splinters, fins, tears, and warps at the time of initial installation and when the temporary glare screen is being relocated or adjusted.

ii. **Temporary Glare Screen Blades.** Provide blades that are green or gray. Attach each blade to a mounting bracket. Temporary glare screen blades and mounting brackets are to be supplied by the manufacturer of the temporary glare screen. The blade height, measured from the top of the base, must be 24 inches. The blade width must be constant from the top to bottom of the blade. No gaps will be allowed between the bottom of the blade and the top of the base. Attach the

mounting bracket, with the blade attached, flush to the base at a 22-degree angle +/- 2 degrees, rotated on the vertical axis, with the trailing edge of the blade being downstream from the flow of traffic. Attach the blades to the base according to the manufacturer's specifications. The blades must be flexible but have sufficient rigidity to remain upright in the wind turbulence generated by traffic traveling at the posted speed. The blades must be able to withstand impacts without deforming, warping, twisting, cracking, or splintering. The blades must be in sound condition; free of checks, cracks, splinters, fins, tears, and warps; and securely fastened to the base at the time of initial installation of the temporary glare screen and when the temporary glare screen is relocated or adjusted. The blades must be fade resistant and free of retro-reflective sheeting or reflective surfaces.

The blades, after being impacted, must be able to recover to within 15 degrees of their original orientation (vertical and horizontal).

11. **Temporary Concrete Barrier Ending.** Place the temporary concrete barrier ending in accordance with the *MDOT Standard Plan R-126* series and this subsection. Repair or replace damage to temporary concrete barrier endings. Temporary barrier endings subject to approach traffic and not terminated behind guardrail must be attenuated or, if applicable, shielded with a temporary concrete barrier sloped end section.

    a. **Detail 1.** Place the sloped temporary concrete barrier ending section as required for temporary concrete barrier placement.

    b. **Detail 2.** Install impact attenuation systems in accordance with the manufacturer's specifications. Do not use a sloped end section in combination with a Detail 2 ending.

    Install sand module attenuator components as shown on *MDOT Standard Plan WZD-175* series.

    Install impact attenuation devices as shown on the plans, as directed by the Engineer, or both.

    Place attenuation systems on concrete, HMA, or compacted aggregate surface in accordance with the manufacturer's specifications. If the required base does not exist, construct the base pad, foundation, anchor block, and backup unit in accordance with the manufacturer's specifications. Install the unit and connect to the backup and the front anchoring system as required.

    Provide and install an object marker as shown on *MDOT Standard Plan WZD-150* series. Do not attach unapproved appurtenances to the attenuator.

    Ensure that an individual trained by the manufacturer in the installation of impact attenuator systems is present during attenuator installation. The Department will not provide this individual.

    Install the following in accordance with the manufacturer's specifications:

    i. Attenuator transition assemblies;

ii. Transition panels;

iii. End panels; and

iv. Other miscellaneous accessories required for connecting the attenuator to concrete barriers.

Provide written certification to the Engineer verifying attenuator installation as shown on the plans and in accordance with the manufacturer's specifications.

If using temporary anchors in new or existing pavement, remove anchors to at least 1 inch below final pavement grade and backfill with an epoxy material approved by the Engineer. For temporary anchors in temporary pavement, remove temporary anchors flush with the paved surface.

If concrete pads contain steel reinforcement, use equipment capable of drilling or coring through steel reinforcement to obtain the required depth for the concrete anchors.

Place cable anchorages and backups to meet the required attenuator alignment.

If the Engineer directs the replacement, repair, or realignment of attenuators, respond within 24 hours. If the Contractor fails to respond or fails to complete repair work within 48 hours after notification, the Engineer may assign the work to others at the Contractor's expense.

c. **Detail 3.** Ensure that the temporary concrete barrier sections that extend past, and make contact with existing guardrail, are standard, full-height sections. Do not use a sloped end section in combination with a Detail 3 ending.

d. **Detail 4.** Install Detail 4 endings in accordance with subsection 812.03.D.11.b and this subsection.

Refer to the *MDOT Standard Plan R-126* series, Detail 4, to determine the offset between the toe of the existing concrete barrier wall and the attenuator.

Do not use a sloped end section in combination with a Detail 4 ending.

e. **Detail 5.** Install Detail 5 endings in accordance with subsection 812.03.D.11.b and this subsection. Do not use a sloped end section in combination with a Detail 5 ending.

12. **Temporary Pavement Marking.** The requirements for placing temporary pavement markings differ depending on the situation.

Place 4-foot dashes spaced 50 feet apart from center-to-center of the markings when temporary pavement markings are placed in the configuration of permanent markings and traffic is driving in the normal lanes. However, place solid markings, not 4-foot dashes, to temporarily mark a solid edgeline.

When temporary pavement markings are used to facilitate traffic shifts or when used to delineate traffic in other than the normal lanes, or both, place markings in the same configuration as permanent markings in accordance with section 811. All temporary pavement markings must be placed in accordance with the *PAVE-900 Series*. Local

agencies should follow the *PAVE-900 Series* unless other local standards are approved by the Engineer.

a. **Temporary Pavement Marking – Wet Reflective Type R**. Use temporary WR pavement marking Type R (removable tape) when temporary pavement markings must be placed on finished pavements and are not in the exact location as future permanent markings or at the discretion of the Engineer when temporary markings must be removed during the life of a project.

   Prior to installation, air blow or brush the pavement surface to remove surface dust and dirt. Remove curing compound from new concrete surfaces before applying Type R tape. Removal of curing compound is paid per section 811.04.

   Place WR Type R tape when it is used as a 4-foot dash or full-length skip line as defined in the contract to temporarily mark finished pavement prior to the placement of permanent markings in accordance with the manufacturer's specifications for existing temperature and pavement condition. Offset the dash or skip line 1 foot from the permanent marking so the permanent markings can be placed prior to the removal of the 4-foot dashes or full-length skip lines. Do not use 4-foot dashes or full-length skip lines to temporarily mark a solid edge line. Replace damaged or missing tape of more than two consecutive skip lines. Replace tape that fails due to improper installation within 24 hours after notification by the Engineer. Failure to replace the tape within the 24-hour period may result in a contract price adjustment as described in subsection 812.03.C.

   i. Between April 15 and November 1, place WR Type R tape not used as a skip line in accordance with the manufacturer's specifications for existing temperature and pavement condition. Replace WR Type R tape of more than 50 cumulative feet that fails within 24 hours after notification by the Engineer. Failure to replace the tape within the 24-hour period may result in a contract price adjustment as described in subsection 812.03.C.

   ii. From November 2 to December 1 and from March 15 to April 14, place WR Type R tape for all temporary shifts and tapers when pavement surfaces are dry and air temperatures are 40°F and rising. Ensure that all WR Type R tape placed during these times is placed during approved daytime hours negotiated by the Engineer and Contractor or the daytime hours required in the contract.

   Do not place WR Type R tape within 24 hours of predicted precipitation or 24 hours after any precipitation. The Contractor will be paid to repair locations that fail during these times unless the Engineer determines that the failure is due to improper surface preparation or failure to follow these requirements. Repairs, if required, will be paid for at a negotiated price by the Engineer and Contractor for the associated work.

   iii. Use temporary WR pavement marking Type NR paint instead of WR Type R tape for all tapers and shifts when ambient air temperature is less than 40°F. To remove the WR Type NR paint, use the least abrasive technique as directed by the Engineer to minimize scarring. If the approved pavement marking removal pay

item is not part of the contract, the cost of the removal of Type NR pavement markings will be negotiated by the Engineer and Contractor.

iv. WR Type R tape is not to be placed between December 2 and March 14.

b. **Temporary Pavement Marking – Wet Reflective Type NR.** Place Type NR tape and Type NR paint in accordance with section 811.

i. **Wet Reflective Type NR Paint**. Use temporary pavement marking WR Type NR paint when temporary pavement markings must be placed on pavement to be removed or replaced during construction. It also must be used when temporary markings line up exactly with the placement of permanent markings and may be grooved out prior to recessing permanent markings. The temporary pavement marking material must be compatible with the material specified for the permanent markings if permanent markings are to be placed on top of temporary markings.

Place the binder at a thickness of 18 mils while driving at a maximum rate of 8 miles per hour. Drop WR optics and glass beads at a rate recommended by the manufacturer for an approved WR system. Ensure that the proposed WR optic is approved by the Engineer.

Place WR Type NR paint, used as a 4-foot dash or full-length skip line as defined in the contract, to temporarily mark finished pavement prior to the placement of permanent markings, in the exact location as the permanent marking such that its removal is not necessary. Only use WR Type NR paint markings compatible with the permanent pavement marking material specified on the project as a 4-foot dash or full-length skip line unless the permanent markings are to be recessed, whereas the temporary Type NR paint line will be removed during the recessing process. Do not use 4-foot dashes or full-length skip lines to temporarily mark a solid edge line.

ii. **Wet Reflective Type NR Tape**. Use temporary pavement marking WR Type NR Tape as a 4-foot dash or full-length skip line as defined in the contract to temporarily mark a white skip line or yellow centerline on base or leveling course pavement. WR Type NR tape must not be used to temporarily mark a solid edge line. WR Type NR tape is not to be used on the wearing course of asphalt or on existing pavement.

c. **Temporary Special Pavement Markings (Transverse, Legend, and Symbol)**. Use Type R temporary WR special markings if the markings applied during the project require removal during the life of the contract. Use Type NR temporary special markings if the markings applied during the project can remain in place or are located on pavement to be removed or replaced during construction, or if the manufacturer’s temperature requirements for temporary tape cannot be met.

Install temporary special pavement markings in accordance with the contract and section 811.

i. **Wet Reflective Type NR Paint**. Provide Type NR temporary special markings as paint reflectorized with glass beads from the Qualified Products List. Use

pavement marking Type NR temporary special markings when temporary pavement markings must be placed between November 2 and April 14 or if the removal of the temporary marking will occur after December 1.

ii. **Wet Reflective, Type R, Tape.** Provide Type R temporary special markings from the Qualified Products List. Apply and remove tape in accordance with the manufacturer's instructions. The tape must remain flexible and conform to the texture of the pavement surface during use. All curved arrows, curved legends, and curved symbols must be precut or fabricated prior to being placed in the field.

Between April 15 and November 1, place Type R WR tape in accordance with the manufacturer's specifications for existing temperature and pavement conditions.

Utilizing 4- or 6-inch lines to create a symbol or stop bar is prohibited when these items are set up in the project. Exceptions will only be made when the pay items are added to a project in the field and the appropriate materials are not on hand. Otherwise, ensure that the symbol is fabricated prior to being placed in the field and the stop bar is made out of 12-inch material.

d. **Temporary Raised Pavement Markings**. Select temporary raised pavement markers (TRPMs) from the Qualified Products List and install per the manufacturer's specifications.

Remove TRPMs before applying subsequent layers of HMA or if they are no longer in the proper configuration for the associated pavement markings in use.

13. **Pavement Marking Cover.** Provide and install temporary pavement marking cover, Type R, preformed black tape, to cover existing pavement markings, as shown on the plans or directed by the Engineer. Use black pavement marking cover on HMA pavement and PCC pavement in accordance with manufacturer's specifications. Do not use heat, solvents, or other additional adhesive to install pavement marking cover.

    Prior to installing the pavement marking cover, air blow or brush the pavement surface to remove surface dust and dirt.

    Ensure that the tape completely masks the existing marking.

    Replace pavement marking covers that come loose or that do not meet contract requirements, as directed by the Engineer, and at no additional cost to the Department.

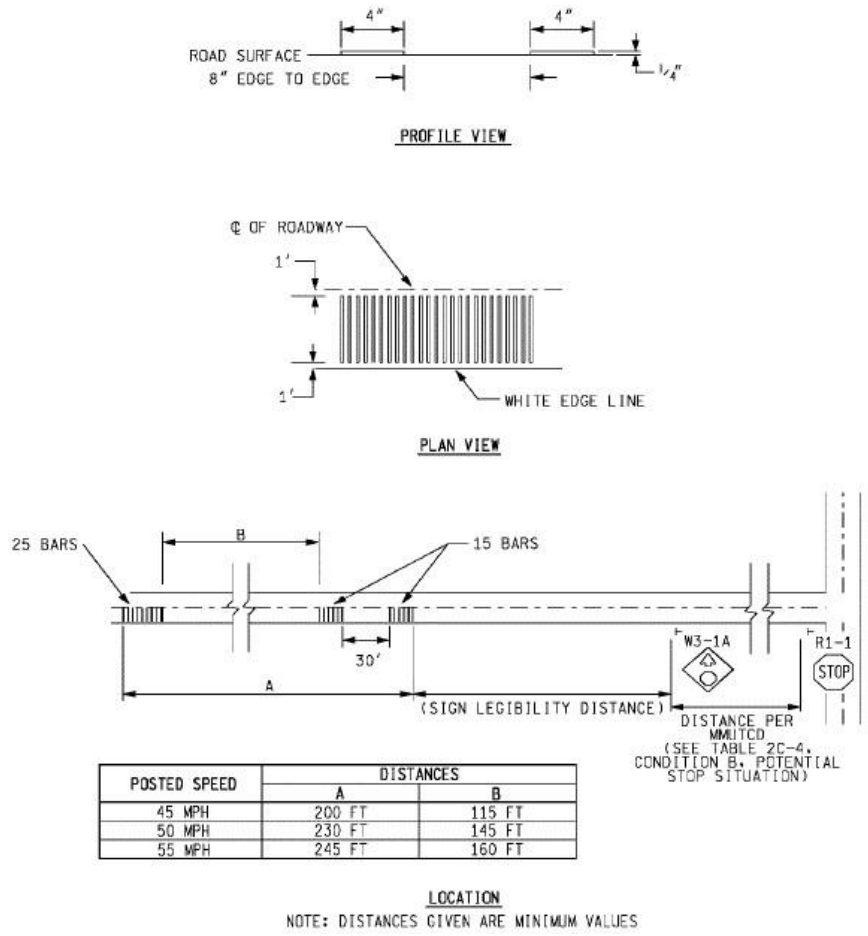
    Apply and tamp the marking cover in accordance with the manufacturer's recommendations.

    The use of pavement marking cover is prohibited between November 1 and April 14 due to temperature and weather limitations as defined by manufacturer's recommendations.

14. **Temporary Rumble Strips (Orange).** Do not apply the rumble strips unless the pavement surface temperature is 40°F and rising, and dry. Do not use artificial heat. Clean all foreign and contaminating material from the surface of the pavement prior to application of the rumble strips.

The Engineer will consider the pavement to be dry if the underside of small sheet of black plastic taped to the pavement has no visible condensation on the underside after 15 minutes.

a. **Temporary Rumble Strips (Orange) in Advance of a Stop Condition**. Place as shown in Figure 812-1.



POSTED SPEED	DISTANCES	
	A	B
45 MPH	200 FT	115 FT
50 MPH	230 FT	145 FT
55 MPH	245 FT	160 FT

Figure 812-1: Temporary Rumble Strips for Use in Advance of a Stop

b. **Temporary Rumble Strips (Orange) in Advance of a Work Zone.** On freeway projects where a lane closure or crossover shift will be in the same location for 14 consecutive days or longer place three sets of nine rumble strips in advance of a lane closure in each direction of the roadway for a total of six sets of nine rumble strips. Ensure that the rumble strips cover the entire width of the roadway from edge of metal to edge of metal. Place the temporary rumble strips as follows:

i. Apply one set of nine rumble strips, each spaced 1.5 feet apart from edge to edge, placed approximately 700 feet upstream of the beginning of the taper;

ii. Apply one set of nine rumble strips, each spaced 5 feet apart from edge to edge, placed approximately 1,400 feet upstream of the beginning of the taper; and

iii. Apply one set of nine rumble strips, each spaced 10 feet apart from edge to edge, placed approximately 2,800 feet upstream of the beginning of the taper.

The completed temporary rumble strip consists of one layer of the 0.25- by 4-inch material.

Apply the primer to the surface of the pavement only if recommended by the manufacturer. Place the pre-adhesive surface of the rumble strip on the primer or directly on the pavement surface, as recommended by the manufacturer. Seat the rumble strips with a minimum of three passes of a 200-pound weighted roller.

If the temporary rumble strips lose their adhesion to the pavement during the life of the project, replace or re-adhere them, as directed by the Engineer. Upon completion of the project, or as directed by the Engineer, entirely remove the temporary rumble strips using a method that does not permanently damage the pavement surface.

Provide temporary rumble strips that are composed of a polymer with pre-applied adhesive, orange, and a tensile strength of 250 psi. Provide primer in accordance with the manufacturer's recommendations.

15. **Temporary Traffic Signals.** At least 14 days before starting construction on temporary traffic signals, contact the utility company and apply for temporary electric service. Provide electric service on the project and arrange for electric service removal when the project is complete.

    Ground equipment with a resistance of no greater than 10 ohms.

    Perform work on signals in accordance with the contract, the requirements of the *National Electrical Safety Code* (NESC), *National Electrical Code* (NEC), and *NEMA Standards Publication TS-5* for items not identified in the contract.

    Use signal lamps with brass bases in accordance with *ITE Standards*.

    Use the type of traffic signal controller shown on the plans. Before using a traffic signal controller other than as shown on the plans, obtain the Engineer's approval. Provide the Engineer-approved, alternate controller at no additional cost to the Department.

    Provide, install, operate, inspect, maintain, disconnect, cover, and remove temporary traffic signals and the required equipment and materials. Provide the electric service equipment and the required wiring between the secondary service terminal that is provided by the utility company and the signal controller.

    Place hoods over or cover signals until they are placed in service.

    Install the required traffic signal timing for operating the temporary traffic signals.

    Adjust traffic signal timing, as directed by the Engineer, to ensure that the temporary traffic signal is operational. If the Engineer requires traffic signal timing changes, the Engineer will provide the locations and a signal-timing permit for implementing the approved timing changes.

Maintain traffic signals installed or modified for construction for the duration of the project to ensure that the signals perform as required. Disconnect and cover the signals when closing the roadway to traffic, as directed by the Engineer. Remove the temporary signals at the end of the contract.

Test equipment in operation as a complete installation. Include sequence of operation, continuity, voltage, and ground resistance readings. Provide the results of these tests to the Engineer before placing the installation into service.

Notify the Engineer before placing traffic signal installations in service.

The Department will not allow the substitution of a portable traffic signal system when temporary traffic signals are required.

16. **Temporary Portable Traffic Signal (PTS) System.** Provide the temporary portable traffic signal (PTS) system as shown on the plans. Each PTS system consists of a minimum of two trailer-mounted, solar-powered PTSs with battery backup.

    Provide, install, program, and activate the signal system at the initial location. Provide hardwire or radio communication. Operate, inspect, maintain, clean, relocate, reactivate, reprogram, and remove the PTS system from the project.

    Check the PTS system for required operation at 12-hour intervals when in use on the project. If PTS system failure occurs, provide traffic regulators to control traffic until the PTS system is operational. If the PTS system fails a second time within 30 calendar days of the first failure, remove the PTS system from the project and provide traffic regulators until the replacement PTS system is installed, activated, and operating as required.

    The Contractor is responsible for repairing or replacing the PTS system.

    PTS trailers must be located on the shoulder, outside the travel lane. After positioning the trailer, rest the tires on the ground with wheel chocks or elevate the trailer, with the bottom of the tires above the ground. Delineate each trailer using three plastic drums or 42-inch channelizing devices.

    When work operations are suspended and traffic lanes are to be opened for less than 72 hours, the temporary signal may remain in place in yellow-flash mode. Remove the temporary signal from the roadway if the temporary signal will be non-functional for longer than 72 hours.

    If existing guardrail prevents a trailer from sitting completely on the shoulder, place the PTS system in accordance with the following:

    a. **Open Lane Approach Side.** On the open lane approach side, if existing guardrail prevents the trailer from sitting completely on the shoulder, complete the following:

        i. Remove one panel of guardrail at the required PTS trailer location, at least 100 feet from the end of the temporary concrete barrier;

        ii. Slide the PTS trailer into the gap so the left tire is on the shoulder and the signal does not encroach into the open lane;

iii. Place a terminal end shoe, in accordance with the *MDOT Standard Plan R-66* series, and of appropriate type based on existing guardrail, on both blunt guardrail ends; and

iv. After removing trailers, restore the guardrail to the original condition in accordance with section 807.

b. **Closed Lane Approach Side.** On the closed lane approach side if existing guardrail prevents the trailer from sitting completely on the shoulder, complete the following:

i. Remove one extra guardrail panel where the temporary concrete barrier runs through the guardrail;

ii. Slide the PTS trailer into the extra opening in front of the temporary concrete barrier where it runs through the guardrail so the left tire is on the shoulder and the signal does not encroach into the open lane;

iii. After removing trailers, restore the guardrail to the original condition in accordance with section 807; and

iv. No extruder ending is required on the closed lane approach side.

17. **Portable Changeable Message Signs.** Portable changeable message signs (PCMSs) include the following two types of devices (each paid for separately):

NTCIP-Compliant Portable Changeable Message Sign. A National Transportation Communications for ITS [Intelligent Transportation Systems] Protocol (NTCIP) compliant PCMS. The NTCIP PCMS will be capable of communication via a cellular network with software provided and installed on a state-owned computer and include an automated PCMS Global Positioning System (GPS) coordinate/ location information as noted below.

Portable Changeable Message Sign. A non-NTCIP-compliant PCMS meets all requirements outlined herein, except those that are noted to apply only to NTCIP-compliant PCMS.

a. **Messaging.** The Department will allow the use of PCMS for advance time notification for future events, including closures and planned maintenance work, or information including detours or alternative routes; incident management; construction zone backups; and similar conditions.

Do not use generic, non-emergency safety messages. If power to the PCMS is lost or in the event of a malfunction, default to one of the following: a screen with an asterisk in each corner, removed from the clear zone, or a default message approved by the Engineer. Ensure that message sequences consist of no greater than two phases with at least a 2-second display time for each message, and the sum of the display time for both phases is a maximum of 8 seconds.

Do not use PCMS for the following:

i. Replacing MMUTCD-required static signing or pavement markings;

ii. Replacing a lighted arrow;

iii. Advance notice of new traffic signals or signs;

iv. Advertising; or

v. Any message that scrolls or moves across the display.

b. **Technical Assistance.** Provide training and support for the PCMS and control software via telephone, e-mail, and on-site technical assistance as needed. Assistance may include, but is not limited to, training, bug fixes, and correction of installation problems.

c. **Warranty.** Warranty that the PCMS will be serviced and fully operational during the life of the related project, as defined in subsection 812.03.C.

d. **Security.** Ensure that the PCMS is secure and complies with the following:

i. Create unique usernames and passwords (not defaults) for access to the PCMS local controls;

ii. Remove all literature (manuals, instructions, etc.) from the PCMS controller enclosure;

iii. Use a padlock, keyed lock, etc., to prevent access to the controller enclosure; and

iv. Provide the Engineer up to 3 keys, or the lock combination, as well as the usernames and passwords.

MDOT may, at any time, inspect PCMS boards that are on site to verify that these security measures are being followed.

e. **Installation on the Roadway.** Delineate a deployed PCMS using three plastic drums or three 42-inch channelizing devices. The devices used for delineation will be paid for separately using the appropriate pay items.

If the PCMS is in use, rest the tires on the ground with wheel chocks or elevate the trailer with the tires off the ground. If a PCMS is not needed, turn it off and remove it from the clear zone in accordance with subsection 812.03.G.5.

All equipment, equipment service, and any appurtenances to the PCMS are the full responsibility of the Contractor.

In addition to the above-listed requirements, an NTCIP-compliant PCMS must also meet the following:

i. **Submittal of Documentation.** When installing an NTCIP-compliant PCMS on a project, submit the following documentation to the Engineer:

(a) Product data for the PCMS and control software. Within 30 days of contract award or 14 days prior to deployment of PCMS, the Contractor must provide to the Engineer or representative a list of PCMS that will be used on the project. Required information includes, but is not limited to, PCMS and GPS equipment make, model number, communication settings, Internet Protocol (IP) addresses, etc. The Engineer will provide an

electronic version of the format and information required for integration. Upon deployment of said devices at any time prior to final acceptance of the project, the Contractor must inform the Engineer in writing of the specific PCMS device that has been placed in the field in active service or pending active service;

(b) An electronic version of the user manuals for the PCMS, GPS equipment, and control software; and

(c) Training materials for the PCMS, GPS equipment, and control software to be distributed during training.

ii. **Training.** Provide a minimum of one classroom-style training session on PCMS operator interface software for NTCIP PCMS and field equipment, including but not limited to, posting and removing messages and diagnosing field equipment malfunctions including messaging and communications errors. All training schedules, syllabi, and materials are to be supplied by the Contractor and approved by the Engineer prior to delivery of training.

iii. **Messaging.** MDOT reserves the right to take full messaging control of any PCMS at any time throughout the duration of the project. Control includes posting any message determined to be appropriate by MDOT using the Contractor-supplied software.

iv. **Technical Assistance.** Provide training and support for the PCMS and control software via telephone, e-mail, and on-site technical assistance as needed. Assistance may include, but is not limited to, additional training, bug fixes, correction of installation problems, and correction of communication errors.

v. **Preconstruction Test Requirements.** Develop a detailed test plan for the PCMS, GPS equipment, and control software, and make revisions as needed until it is approved by the Engineer. This may include, but is not necessarily limited to:

(a) Tests for defects in the PCMS such as leaks, faulty wiring, faulty display modules, faulty batteries, firmware bugs, etc.; and

(b) Tests that demonstrate properly functioning communications between the PCMS, GPS equipment, and control software. The test procedure should demonstrate successful control of the PCMS from the location where the software has been installed.

Conduct all testing in the presence of the Engineer or designated representative. Any problems must be fixed and testing repeated until all elements of the PCMS, GPS equipment, and control software are accepted prior to the start of construction. Payment will not be made prior to a successful accepted test.

E. **Sign Removal (Permanent Signs)**

1. **Department-owned Permanent Signs.** Remove Department-owned permanent signs and supports as necessary to prevent damage. Remove, handle, store, and reinstall the signs in accordance with Department and manufacturer's requirements.

Store the permanent signs outside the work area at a site within the CIA, as directed by the Engineer. Reinstall Department-owned permanent signs and supports within 1 day of completing the work, in accordance with section 810, unless otherwise directed by the Engineer.

Replace signs, supports, or foundations damaged by Contractor operations at no additional cost to the Department.

2. **Permanent Signs Owned by Local Agencies.** Remove locally owned signs and supports before starting work in the area. Remove, handle, and store signs in accordance with the manufacturer's requirements. Store the permanent signs outside the work area within the CIA, as directed by the Engineer. The local agency that owns the sign is responsible for sign and support replacement and related costs.

3. **Logo Signs or Tourist Oriented Directional Signs.** Date stickers on the back of the signs identify Logo Signs and Tourist Oriented Directional Signs. Contact Michigan Logos, Inc., at (888) 645-6476 to arrange for removal, storage, and reinstallation of Logo Signs or Tourist Oriented Directional Signs within the CIA. Provide Michigan Logos, Inc., with at least 14 days notice.

F. **Pavement Marking Removal.** Remove pavement markings that conflict with proposed temporary traffic markings before making any changes in the traffic pattern. Place temporary pavement markings when pavement markings are removed or obscured for more than 24 hours before a change in the traffic pattern. WR Type R tape and/or WR Type NR paint must be placed according to subsection 812.03.D.12 before the close of the work day.

Do not use paint or bituminous bond coat to cover existing and inappropriate pavement markings. The Contractor may use a Type R temporary pavement marking cover per subsection 812.03.D.13 when authorized by the Engineer. Remove pavement markings in a manner that minimizes damage as much as possible to the surface texture of the pavement and by methods approved by the Engineer. Methods and equipment that may provide acceptable results are shot blasting, water blasting, and mechanical devices such as grinders, scarifiers, and wire brushes.

1. **Longitudinal Removal of Greater than 5,000 Feet of Pavement Markings per Stage.** Remove pavement markings using self-propelled truck-mounted removal equipment. The removal truck must be capable of eliminating all airborne dust while operating and of continuously vacuuming up the removal debris. If the debris generated during the removal process is greater than the vacuuming capability of the removal truck, a self-propelled sweeper operating immediately behind the removal truck is required such that all removal debris is immediately cleaned up.

   a. **Asphalt Surfaces.** Use any Engineer-approved type of self-propelled truck-mounted removal equipment except water blasting, provided the equipment is capable of continually vacuuming the removal debris.

   b. **Concrete Surfaces to Be Removed during Construction.** Use any Engineer-approved type of self-propelled truck-mounted removal equipment provided the equipment is capable of continually vacuuming the removal debris.

c. **Concrete Surfaces to Remain in Place.** Use an Engineer-approved self-propelled truck-mounted water blaster to minimize the scarring of the concrete surface. Use equipment capable of continually vacuuming the removal debris as approved by the Engineer.

2. **Longitudinal Removal of Less than 5,000 Feet per Stage of Pavement Markings and Removal of Special Markings**. Obtain the Engineer's approval for one of the following removal methods and minimize damage to the surface texture of the pavement during removal.

   Use one or more of the following removal methods:

   a. Sandblasting using air or water;

   b. Shot blasting;

   c. High-pressure water;

   d. Steam or superheated water; or

   e. Mechanical devices such as grinders, sanders, scrapers, scarifiers, and wire brushes.

   Remove pavement markings such that all removal debris is cleaned up as the operation progresses. Other than for the removal of turning guide lines, the removal equipment must be capable of eliminating the airborne dust while operating and of continuously vacuuming up the removal debris. If the debris generated during the removal process is greater than the vacuuming capability of the removal equipment, all remaining debris must be immediately swept up.

G. **Maintaining Traffic along Project.** Maintain traffic along the project in a safe and orderly manner. Maintain pedestrian mobility within the CIA as required by the contract. If access cannot be accommodated, provide temporary modifications or a clearly marked detour.

1. **Traffic Maintained by Part-Width Intersection Construction.** If part-width construction is required, construct the new pavement on half an intersection at a time. Maintain through traffic on the remaining half intersection and shoulders. The contract may require temporary widening and surfacing of the shoulders.

2. **Access Provisions for Pedestrians and Local Traffic.** Use temporary roadways, culverts, railroad crossings, bridges, and other means approved by the Engineer to provide local traffic access to property adjacent to the project. Obtain the Engineer's approval for temporary culvert material before placement. Provide railroad crossings for local traffic in accordance with subsection 107.20.

   Use pavement gaps or other means approved by the Engineer to maintain two-way traffic across intersections. Provide a clear roadway on the crossroad at least 20 feet wide. The Engineer may vary the pavement gap lengths based on the types of vehicles passing through the intersection.

   The Engineer may allow closing a minor road or street intersection with the approval of the local government agency.

3. **Traffic Maintained on Shoulder.** If the contract requires maintenance of traffic on the shoulder, improve the shoulder as shown on the plans.

   Sweep the shoulder and remove debris prior to placing traffic on the shoulder and throughout the time the shoulder is used to maintain traffic. Properly dispose of collected debris.

   Maintain the shoulder as required and provide labor, material, and equipment to immediately repair and reconstruct the shoulder. Apply surfacing material and dust palliatives as directed by the Engineer.

4. **Shoulders under Construction.** Ensure that shoulder areas adjacent to open traffic lanes are in a safe and usable condition during non-working hours, unless otherwise shown in the plans. Provide the following signs and channelizing devices:

   a. Install one W21-5 “Shoulder Work” sign before the beginning of the unsatisfactory shoulder;

   b. Install the relevant W8-9a “Shoulder Drop-Off,” W8-4 “Soft Shoulder,” or W8-4a “Rough Shoulder” signs before the unsatisfactory shoulder and at no greater than 1-mile intervals along the non-compliant shoulder;

   c. Place plastic drums on the taper, as required by MMUTCD, Part 6, for shoulder closures at the location where the unsatisfactory shoulder begins; and

   d. Place channelizing devices at intervals directed by the Engineer along the length of the affected shoulder without encroaching on the required minimum lane width.

5. **Storage Restrictions for Vehicles, Equipment, and Materials.** Park vehicles and store material in areas that provide minimum exposure to pedestrian and vehicular traffic.

   a. **Working Hours.** During working hours, park workers’ vehicles, idle construction equipment, and stored materials that cannot be removed from the project as follows:

      i. At least 20 feet behind curb faces on roadways with barrier curb; and

      ii. At least 30 feet from the pavement edge on roadways with shoulders or mountable curbs.

   b. **Non-working Hours.** During non-working hours, remove workers’ vehicles and obtain the Engineer’s approval to store idle construction equipment and materials that cannot be removed from the project at least 30 feet from the traffic lanes if topography and right-of-way allow.

   c. **Exceptions.** When the setbacks described in the previous subsections are not possible, furnish and maintain suitable and sufficient signs, lights, barricades, or concrete barriers to delineate parked vehicles, equipment, and stored material, subject to approval by the Engineer.

      The Department will not make additional payment for devices used to delineate stored equipment and material.

6. **Maintaining Lights.** Do not mix different light styles or designs on a project.

   Position and maintain Type A, Type C, and Type D lights to ensure visibility on a clear night from a distance of 3,000 feet. Ensure the visibility of Type B, high-intensity lights on a sunny day from a distance of 1,000 feet when the sun is not directly on or behind the light. Replace the power source if lights do not meet the visibility requirements. Provide and maintain Type C and Type D light-emitting diode (LED) lights that at least meet the requirements in the MMUTCD and maintain the intensity requirement of 2 candelas in the field.

   Ensure that lights work at the time of initial installation and at stage changes during the project. During the project, ensure that at least 95% of the total number of active lights work. Ensure that no more than three adjacent lights are non-operational at any time.

   Change power sources when directed by the Engineer. Replace damaged or non-functioning lights at no additional cost to the Department.

7. **Cleaning Traffic Control Devices.** Clean barrier reflectors, plastic drums, 42-inch channelizing devices, tubular markers, delineators, signs, barricades, and attached lights in operation on the project to ensure that they meet required luminosity. Adjust cleaning frequency based on the exposure of the traffic control devices to unfavorable environmental conditions and the accumulated dirt on the devices.

8. **Traffic Regulators.** Provide traffic regulators for each direction of approaching traffic on primary and intermediate roads if the movement of traffic is restricted to alternating one-way traffic through the construction area. The Engineer may require intermediate traffic regulators at access points throughout the work zone.

   Equip traffic regulators with the following:

   a. High-visibility safety apparel as specified in the MMUTCD;

   b. “Stop/Slow” or “Stop/Stop” sign paddles; and

   c. A two-way handheld radio system and a standby backup system if traffic regulators are not visible to each other.

   Notify and advise traffic regulators of information required to maintain traffic. Illuminate traffic regulator stations at night per subsection 812.03.H.

   Provide traffic regulators and other traffic control devices, as approved by the Engineer, to move materials and equipment that may interfere with traffic. The Department will not make additional payment for providing traffic regulators and other traffic control devices necessary only for the Contractor’s convenience.

   Ensure that persons designated to regulate traffic receive annual training on proper traffic regulating procedures. At a minimum, this training must consist of viewing the video “How to Safely Regulate

   Traffic in Michigan” and reading the current MDOT handbook, *Traffic Regulators Instruction Manual*. Maintain documentation on the persons who have been trained and the dates of the training and provide to the Engineer upon request.

9. **Traffic Regulating Operations.** Ensure that traffic-regulating operations do not exceed 2 miles or stop traffic for more than 10 minutes at a time unless otherwise directed by the Engineer.

H. **Lighting for Night Work.** Furnish, install, operate, maintain, and replace, as needed, fixed, portable, or equipment-mounted lighting systems that provide lighting to ensure worker and inspector safety on and around the worksite. Provide lighting that allows workers and inspectors to clearly conduct all operations and inspections during hours of darkness. Lighting systems provided by the Contractor must meet the requirements set forth in MIOSHA Rule 408.40133 Illumination, MIOSHA Rule 408.42223(7) Traffic Control, section 706, and the contract.

Provide and position the lamps to meet the following lighting requirements: Provide a minimum illumination intensity of 10 foot-candles (108 lux) on a jobsite where construction work is being performed. Maintain a minimum of 5 foot-candles (54 lux) throughout the entire area of operation where workers may pass through on foot or are present but are not performing construction work. Vehicle or equipment headlights are not considered an approved light source.

Lighting levels will be measured with an illuminance meter. Readings from smartphones are not acceptable. Readings will be taken where the work is being performed in a horizontal plane 3 feet above the pavement or ground surface. When necessary, provide additional lights to overlap the footprints of the lights so the lighting requirements are continuous, and do not fall below the minimum lighting requirements throughout the work area.

Submit a work area lighting plan to the Engineer for review and approval a minimum of 14 calendar days prior to the start of work. The Engineer will have 7 calendar days to review the plan for approval or provide comments for plan revisions required to obtain approval. At a minimum, the plan must include the proposed lighting locations for construction equipment, vehicle and pedestrian paths, identification of a person or persons of authority (including contact information) on the project site responsible to execute the plan requirements, and measures that will be taken to ensure compliance with the plan. All costs and any additional time required to obtain an approved work area lighting plan will not be cause for delay or impact claims.

Design and operate the lighting system to avoid glare that interferes with traffic, workers, or inspection personnel. Aim flood, spot, or stadium type luminaires downward at the work and rotated outward no greater than 30 degrees from nadir (straight down). Position balloon lights at least 12 feet above the roadway.

Design the lighting system to light the work area without spilling over to adjoining property. Modify the lighting system, if directed by the Engineer, by rearranging the lights or adding hardware to shield the lights when the lighting system is disturbing adjoining properties.

Provide a power source that adequately powers the lamps to their full capacity. Provide all lighting equipment in good operating condition and in accordance with applicable safety and design codes.

Provide backup lighting to replace lights and equipment during nighttime operations. Store the backup equipment on the project site and have it available for use at all times during the nighttime operations. The backup systems must meet the same criteria as the primary system.

Drive through and observe the lighted area from all traveled directions, including crossroads after initial lighting set up to determine the adequacy of placement and potential for glare. Adjust lighting alignment if necessary. Ensure that the alignment of the lighting does not interfere with or impede traffic on open roadways.

At any time during the course of the nighttime work, should the lighting not meet the requirements, the work must be halted until adequate lighting is provided. This suspension of work will be at no additional cost to the Department, and the Contractor cannot receive an extension of time to complete the work.

Use balloon lighting for nighttime traffic regulating operations. Position the balloon lighting for traffic regulators so the light illuminates the front of the traffic regulator without casting a shadow on the front of the regulator, the light or equipment does not impair the regulator's vision, and the equipment does not impede the regulator's escape path. Position the lighting so the light does not wash out the lighted arrow at the regulator's station and does not obscure the lighted arrow. Position lighting so it does not create glare or shine directly in the eyes of oncoming drivers. Illuminate the traffic regulator's station with a minimum illumination intensity of 10 foot-candles (108 lux). Lighting devices used to illuminate nighttime traffic regulator operation that have failed or have been damaged must be replaced immediately.

Mount the light fixtures on the construction equipment in a mobile operation in such a way that the view of the equipment operator is not obstructed and a secure connection to the equipment is ensured with minimum vibration.

Provide each paver with the minimum illumination requirements so the operator and paving crew can clearly see the material going into the hopper and the auger area and for alignment. Provide a continuous power source to ensure that the lighting is in operation at all times during work. The light should be adjustable up and down and rotatable horizontally. The area behind the paver must be lighted so the work and operations can be seen clearly and inspected properly.

Equip each roller with four headlights with two facing in each direction of travel. Turn headlights off when facing oncoming traffic and use them only when moving equipment from one location to another.

Provide a continuous power source on each roller with a light tower. The light tower must be a minimum of 4 feet higher than the roller.

When light equipment is not in use, maintain as detailed in section 812.03.G.5.

I. **Chip Seal Surface Treatment and HMA Construction.** Maintain traffic during the placement of chip seals and HMA.

1. **General.** Complete rolling and allow the surface to cool before allowing traffic on chip seal treated and HMA surfaces. If shoulders cannot be used for two-way traffic, arrange for alternating one-way traffic around the roadway section being surfaced.

   If conditions allow, and the Engineer approves, route traffic away from sections of roadway being surfaced. Provide and maintain temporary routes in a condition approved by the Engineer and at no additional cost to the Department.

2. **Chip Seal Surface Treatment.** Unless closing the road to traffic, treat half of the road width at a time. Do not allow traffic on the treated section of roadway for at least 30 minutes after completion of cover material application and rolling.

3. **Aggregate Surface and HMA.** To handle traffic during aggregate surface and HMA applications, divide the project into sections. The Engineer will determine the length of these sections. Keep traffic off the work area of each section during surface preparation, bond coat application, HMA placement, and rolling. Complete each section and open it to traffic before closing the next section. Provide local traffic access to property along the project.

4. **Protection of New HMA Pavements.** Keep traffic off new HMA pavement by installing cones or drums on the tangent in addition to the traffic control devices specified in the plans or MMUTCD. Place additional cones or drums at crossroads and commercial driveways to direct the traffic to open travel lanes.

   After completing compaction, if the air temperature is below 70°F, open the pavement to traffic. If the air temperature is from 70°F to 80°F, keep traffic off the pavement for an additional hour. If the air temperature is greater than 80°F, keep traffic off the pavement for 2 hours.

5. **Staggered Lane Endings with Vertical Longitudinal Joints.** To avoid uneven longitudinal joints, surface lanes within one load of the same ending point at the end of the day's operation. The center lanes of two-way pavements with an odd number of lanes are excluded from this requirement.

   Before starting HMA paving operations, furnish the required signs for emergency signing in case staggered lane endings, causing uneven longitudinal joints, must remain open to traffic overnight.

   If uneven longitudinal joints cannot be avoided and remain open overnight, maintain traffic in accordance with the following:

   a. If the points of ending of adjacent lanes are at least 250 feet apart, install temporary signs as required; and

   b. If the points of ending of adjacent lanes are less than 250 feet apart, install plastic drums as called for in the contract at 30-foot intervals along the length of each side of the affected pavement, and place W21-4 "Road Work Ahead" signs ahead of the pavement area.

6. **Tapered Overlapping Longitudinal Joints.** Unless delayed by inclement weather or otherwise approved by the Engineer, do not expose the tapered overlapping longitudinal joints to traffic for longer than 24 hours after placement. If using a

tapered joint, place W8-9b “Uneven Lanes” signs before, and at no greater than 1-mile intervals along the length of, the joint before allowing traffic on the paved lane.

Place at least two W8-9b “Uneven Lanes” signs in each direction. Leave these signs in place until the adjacent lane is constructed to the same elevation. See subsection 501.03.2.c for allowable tapered overlapping joint details.

J. **Conspicuity Tape for Vehicles and Equipment in Work Zones.** Equip all vehicles and equipment in the work zone, and all vehicles delivering materials or equipment to the project, with red and white conspicuity tape.

Apply one 2-inch wide horizontal stripe of red and white conspicuity tape along at least 50% of each side of and across the full width of the rear of the vehicle or equipment.

Delineate lighted arrow trailers and portable changeable message signs with 2-inch-wide red and white conspicuity tape on each of the four sides where tape application is practical.

812.04. Measurement and Payment

Pay Item	Pay Unit
812-1 Project Safety & Maintenance of Traffic	LSUM

Section 816. Turf Establishment

816.01. Description

816.1. This work consists of conducting soil tests, preparing the soil, and placing sod or seed and mulch to permanently stabilize disturbed areas as shown on the plans. Establish turf in accordance with this section, the MDOT SESC Manual, and as directed by the Engineer. The following terms apply to this section.

Mulch Anchor. A glue type material sprayed over mulch to hold it in place.

Broadleaf Weed. Weeds described by the Engineer as target weeds controlled by spraying. Broadleaf weeds include, but are not limited to, dandelion, clovers, thistles, and ragweed,

Compost. A mature and stabilized, humus-like material derived from the aerobic decomposition of yard clippings, leaves, and brush with a diameter less than 4 inches.

Dormant Seeding. Seeding placed in late November and December when plant growth ends for the season. Seeds are placed on unfrozen ground and mulched to lie dormant over winter and germinate the following spring.

Friable. Easily crumbled or pulverized soil.

Friable Condition. Soil in a "friable condition" is a crumbled, pulverized, worked-up, loosened, or cultivated soil, free of lumps and clods detrimental to seeding and sodding operations.

Humus. A brown or black material formed by the decomposition of vegetable or animal matter. The organic portion of soil, essential to fertility.

Hydroseeding. Spraying seed combined with water onto the prepared seed bed.

Muck. Organic matter consisting of decomposed plant material accumulated under conditions of excessive moisture. If organic remains are not identifiable as plant form, it is considered muck.

Mulch. Material placed over seeding to improve germination by conserving moisture, moderating the soil temperature, and protecting the seed and soil from water and wind erosion.

Peat. Organic matter consisting of undecomposed or slightly decomposed plant material accumulated under conditions of excessive moisture. If organic remains are identifiable as plant form, it is considered peat.

Target Weed. Weeds that the Engineer identifies for removal by spraying or other methods.

816.02. Materials

Materials shall meet Section 917 of the MDOT Standard Specifications for Construction, 2020 Edition, unless otherwise specified on the plans.

816.03. Construction

Construction methods shall comply with Section 816.03 of MDOT Standard Specifications for Construction, 2020 Edition, unless otherwise specified on the plans.

816.04. Measurement and Payment

816.04.1 Method of Measurement

A. The quantity of seeding, mulching, and topsoiling to be paid for shall be the number of units acre measured on the ground surface, completed and accepted.

816.04.1 Basis of Payment

A. Payment shall be made at the contract unit price per acre or fraction thereof, which price and payment shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item. No separate payment shall be made for site preparation, fertilizer, watering, or cultivating.

Pay Item	**Pay Unit**
816-1 Misc. Hydroseed, Mixture Turf with Fertilizer, Wood Fiber Mulch, Topsoil	ACRE

Section 824. Construction Surveying and Staking

824.01. Description

This work consists of Contractor staking on the project and developing grades and field notes from data shown on the plans. Provide these grades to the Engineer after calculation and at least 48 hours before beginning related work or as requested by the Engineer.

All work performed under this section must be performed by ***the contractor***. If the Contractor does not have in-house staff to perform Contractor staking, the Contractor must sub-consult with a consultant prequalified in the MDOT category "Surveying: Construction Staking." If the Contractor is using its staff to perform Contractor staking, the Engineer may request the resume of that person, which must include ability, experience, and education. If the Department is not performing the Engineer staking, it must be done by a consultant with the MDOT prequalification category "Surveying: Construction Staking."

824.02. Materials

Provide stakes, planed on both sides, of the following minimum dimensions and type:

A. Grade stakes: 1 inch by 2 inches by 36 inches, light colored hardwood;
B. Slope stakes: 1 inch by 3 inches by 24 inches, light colored hardwood; and
C. Pavement stakes: 1 inch by 3 inches by 36 inches, light colored hardwood.

824.03. Construction

A. **Engineer Staking.** ***Not Used.***

B. **Contractor Staking.** The Contractor must complete all staking and layout in accordance with the following:

1. The Contractor will loop and set any additional vertical control needed for the project;

2. Supply stakes, survey equipment, personnel, and other devices to check, mark, preserve, and maintain points, lines, and grades;

3. Perform the work in such a manner as to allow the proper verification of all related work and pay items by the Engineer; and

4. Perform staking in such a manner as to allow the Engineer to exercise its authority in accordance with subsection 104.01.

Two work days before moving benchmarks or control points, the Contractor must notify the Engineer. After completion, the Contractor will provide the Engineer with a list of points, including calculations and descriptions of the new locations.

C. **Control Points.** Verify horizontal control points, including curvature points, tangent deflections, and spiral controls for reestablishment of line and distance to within 0.02 foot. Verify the measured distance between control points checks with a precision of 1 in 20,000 for road work and 1 in 20,000 for bridge work. Maintain project control throughout the duration of the project, each visible from the other.

D. **Benchmarks.** Run a level circuit through the entire project to check plan benchmarks and establish new vertical control. The allowable error of closure must not exceed 0.05 foot times the square root of the distance leveled in miles. During grading, check into benchmarks within the above-mentioned tolerance. Advise the Engineer of benchmarks that are out-of-tolerance while performing checks. Maintain at least two benchmarks at each structure during construction.

E. **Slope Stakes, Subgrade Stakes, Undercut Stakes, Clearing Stakes.** If Automated Machine Guidance (AMG) is not used, provide slope stakes, subgrade stakes, undercut stakes, and clearing stakes at 50-foot intervals or as agreed to by the Engineer, and at break points due to subgrade transitions, including superelevation transitions and ramp transitions. The Engineer may request subgrade stakes for subgrade inspection after topsoil stripping and before beginning subsequent grading operations. The Engineer will mark and determine individual tree removal.

F. **Pavement Stakes**. After placing and rough grading the subbase, provide pavement stakes as follows:

1. Place stakes at 50-foot intervals on tangent sections and on curves with radii of at least 1,150 feet;
2. Place stakes at 25-foot intervals on curves with radii of less than 1,150 feet; and
3. Place yield stakes at 200-foot intervals, including stakes to determine wedging limits for HMA pavement.

Use pavement grade stakes for finish grading of the subbase, base course, and pavement. Check stakes for grade, realign, and tack before beginning paving operations. This includes taking cross sections at tie-ins and at other critical areas.

G. **Drainage Stakes.** Provide grade and location stakes for culverts, sanitary sewers, storm sewers, subsurface drains, drainage structures, sanitary structures, and outlets to ensure positive drainage. Secure the Engineer’s approval for adjustments in location and grade for drainage items.

Before installing underdrains, submit a plan for underdrain outlets to the Engineer for approval, including the following information:

1. Distance between outlets;
2. Low point of vertical curves; and;
3. Comparison between clay grade, underdrain grade, outlet grade, and ditch grade at each outlet location.

H. **Miscellaneous Staking**. Provide staking for the following:

1. Pump stations;
2. Curb and gutter;
3. Sidewalk;
4. Water mains;
5. Retaining walls;
6. Siphons;
7. Sound walls;
8. Barrier walls;
9. Junction chambers;
10. Guardrail;
11. Sign structures;
12. Signs;
13. Traffic signal poles;
14. Structure under clearance;
15. Crossovers;
16. Restoration items;
17. Erosion control items; and
18. Other staking required to construct the project.

I. **Muck Stakes.** ***Not Used.***

J. **Temporary and Permanent Signs.** Place post-driven temporary and permanent sign stakes based on provided traffic typicals or as shown on the plans. This does not include temporary signs needed for maintaining traffic purposes. Notify the Engineer after completing temporary and permanent staking and before installing signs.

K. **Bridge Approaches.** ***Not Used.***

L. **Bridge Substructure.** ***Not Used.***

M. **Bridge Superstructure.** ***Not Used.***

N. **Bridge Overlays.** ***Not Used.***

O. **Site Adjustments.** Review the plans. Develop grades and notes after performing checks on the project. If deviations from the plans occur, immediately notify the Engineer. The Engineer will determine the actual solution and provide timely direction.

P. **Final Measurement.** Provide detailed measurements, sketches, and computations of final measurement for earthwork, undercuts, muck excavation, swamp backfill, sand subbase, and topsoil stripping.

Q. **Construction Survey and Staking Measurements.** Provide construction surveying and staking to the tolerances specified in Table 824-1.

R. **Preserving Stakes.** Preserve completed staking as required for Engineer inspection of construction work. Maintain the dimensions, grades, and elevations of the work after the Engineer's inspection and approval of the layout.

Table 824-1:

Construction Survey and Staking Tolerances

Type	Horizontal	Vertical
Bench loops	1,000 feet (maximum); 100 feet (minimum) between benchmarks	0.05 foot * SQRT of distance leveled in miles
Right-of-way stakes	0.04 foot	—
Clearing stakes	0.10 foot	—
Slope, subgrade, utility tunnel, and miscellaneous stakes	0.10 foot	0.03 foot
Pavement and drainage stakes	0.04 foot	0.01 foot
Bridge stakes	0.01 foot	0.01 foot
Cross sections	25 feet left and right; 50 feet along centerline[(a)]	0.10 foot on ground shots; 0.01 foot on others

(a) Distances shown are minimum allowable distances between cross section stakes left and right of centerline and along centerline.

The Contractor must make a reasonable effort to preserve stakes set by the Engineer and/or Contractor. The Contractor is responsible for replacing stakes and benchmarks lost or destroyed by Contractor operations at no additional cost to the Department. If Contractor staking is not used on the project, the cost to replace the stakes and benchmarks lost or destroyed will be reimbursed to the Department at the same rate as Staking Plan Errors and Extras listed in subsection 824.04. The Engineer must verify replacement stakes or benchmarks.

Locate, preserve, and witness government monuments within the project in accordance with section 821.

The Department will not pay for work dependent on lost or destroyed stakes until the Contractor replaces the stakes. The Department will not allow claims for damages caused by the Contractor's replacement of required stakes or benchmarks.

S. **Plan Errors.** Immediately notify the Engineer of a plan error. Document and submit to the Engineer the efforts and the steps to correct a plan discrepancy. The Engineer will determine the solution and decide whether the Contractor or the Department will provide staking for corrective action.

T. **Extra Work**. ***Not Used.***

U. **Staking Changes**. The Engineer will approve staking changes within 2 working days. The Department will not allow claims for damages or extensions of time during the resolution and approval period for staking changes unless the Contractor shows that the changes adversely affect the critical operation and fall outside the approved Contractor Quality Control Plan.

Before making Contractor-initiated staking changes, including staking changes resulting from plan error, provide documentation for the Engineer's approval. Documentation for staking changes includes notes, calculations, and drawings.

During staking, perform checks to establish locations and grades to fit the existing conditions as agreed to by the Engineer. Correct errors from Contractor operations at no additional cost to the Department.

V. **Staking Documentation**. The Department may inspect field notes and calculation documents at any time. Sign, check, date, and provide staking documentation and field notes as requested by the Engineer. Original field notes and grade calculation documents will become the Department's property upon completion of the work.

Provide original and final plotted cross sections and final volume calculations in a format approved by the Engineer for earthwork, undercuts, muck excavation, swamp backfill, sand subbase, and topsoil stripping. Determine final quantities by plan sheet.

Provide the Engineer a final as-constructed set of plans in accordance with the current Department procedures, documenting vertical and horizontal alignment changes, drainage and subsurface changes, and other changes. Verify that plans represent the same scale shown on the plans.

W. **Contractor Staking Quality Control.** ***Not Required.***

824.04. Payment

Pay Item	**Pay Unit**
824-1 Contractor Survey and Stakeout	Lump Sum

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