CITY OF ANN ARBOR
INVITATION TO BID

2018 Guardrail Rehabilitation Program

ITB No. 4546

Due Date: **Tuesday, August 21, 2018 at or before 2:00 p.m. (Local Time)**

Public Services Area
Engineering Unit

Issued By:

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

TABLE OF CONTENTS

ATTACHMENTS

NOTICE OF PRE-BID CONFERENCE

A pre-bid conference for this project will be held on **August 8, 2018 at 1:30 p.m.** in the **Fourth Floor Conference Room** of the Guy C Larcom Building (City Hall), located at 301 East Huron Street, Ann Arbor, Michigan 48104.

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

INSTRUCTIONS TO BIDDERS

General

Work to be done under this Contract is generally described through the detailed specifications and must be completed fully in accordance with the contract documents. All work to be done under this Contract is located in or near the City of Ann Arbor.

Any Bid which does not conform fully to these instructions may be rejected.

Preparation of Bids

Bids should be prepared providing a straight-forward, concise description of the Bidder's ability to meet the requirements of the ITB. Bids shall be written in ink or typewritten. No erasures are permitted. Mistakes may be crossed out and corrected and must be initialed and dated in ink by the person signing the Bid.

Bids must be submitted on the "Bid Forms" provided with each blank properly filled in. If forms are not fully completed it may disqualify the bid. No alternative bid will be considered unless alternative bids are specifically requested. If alternatives are requested, any deviation from the specification must be fully described, in detail on the "Alternate" section of Bid form.

Each person signing the Bid certifies that he/she is the person in the Bidder's firm/organization responsible for the decision as to the fees being offered in the Bid and has not and will not participated in any action contrary to the terms of this provision.

Questions or Clarifications / Designated City Contacts

All questions regarding this ITB shall be submitted via email. Emailed questions and inquires will be accepted from any and all prospective Bidders in accordance with the terms and conditions of the ITB.

All questions shall be due on or before **Wednesday, August 15, 2018 at 5:00pm** and should be addressed as follows:

Specification/Scope of Work questions emailed to **nhutchinson@a2gov.org**
Bid Process and Compliance questions emailed to **cspencer@a2gov.org**

Any error, omissions or discrepancies in the specification discovered by a prospective contractor and/or service provider shall be brought to the attention of **Nicholas Hutchinson** at **nhutchinson@a2gov.org** after discovery as possible. Further, the contractor and/or service provide shall not be allowed to take advantage of errors, omissions or discrepancies in the specifications.

Addenda

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

Each Bidder must in its Bid, to avoid any miscommunications, acknowledge all addenda which it has received, but the failure of a Bidder to receive, or acknowledge receipt of; any addenda shall not relieve the Bidder of the responsibility for complying with the terms thereof.

The City will not be bound by oral responses to inquiries or written responses other than written addenda.

Bid Submission

All Bids are due and must be delivered to the City of Ann Arbor Procurement Unit on or before **2:00 p.m., Tuesday, August 21, 2018 (Local Time).** Bids submitted late or via oral, telephonic, telegraphic, electronic mail or facsimile **will not** be considered or accepted.

Each Bidder must submit one (1) original Bid and **two (2)** Bid copies in a sealed envelope clearly marked: **ITB No. 4546: 2018 Guardrail Rehabilitation Program**

Bids must be addressed and delivered to:

City of Ann Arbor
Procurement Unit,
c/o Customer Services, 1st Floor
301 East Huron Street
Ann Arbor, MI 48107

All Bids received on or before the Due Date will be publicly opened and recorded immediately. No immediate decisions are rendered.

The following forms provided within this ITB Document must be included in submitted bids.

- **City of Ann Arbor Prevailing Wage Declaration of Compliance**
- **City of Ann Arbor Living Wage Ordinance Declaration of Compliance**
- **Vendor Conflict of Interest Disclosure Form**
- **City of Ann Arbor Non-Discrimination Ordinance Declaration of Compliance**

Bids that fail to provide these completed forms listed above upon bid opening will be rejected as non-responsive and will not be considered for award.

Hand delivered bids will be date/time stamped/signed by the Procurement Unit at the address above in order to be considered. Normal business hours are 9:00 a.m. to 3:00 p.m. Monday through Friday, excluding Holidays. The City will not be liable to any Bidder for any unforeseen circumstances, delivery or postal delays. Postmarking to the Due Date will not substitute for receipt of the Bid. Each Bidder is responsible for submission of their Bid.

Additional time for submission of bids past the stated due date and time will not be granted to a single Bidder; however, additional time may be granted to all Bidders when the City determines in its sole discretion that circumstances warrant it.

Award

The City intends to award a Contract(s) to the lowest responsible Bidder(s). On multi-divisional contracts, separate divisions may be awarded to separate Bidders. The City may also utilize alternatives offered in the Bid Forms, if any, to determine the lowest responsible Bidder on each division, and award multiple divisions to a single Bidder, so that the lowest total cost is achieved for the City. For unit price bids, the Contract will be awarded based upon the unit prices and the lump sum prices stated by the bidder for the work items specified in the bid documents, with consideration given to any alternates selected by the City. If the City determines that the unit price for any item is materially different for the work item bid than either other bidders or the general market, the City, in its sole discretion, in addition to any other right it may have, may reject the bid

as not responsible or non-conforming.

The acceptability of major subcontractors will be considered in determining if a Bidder is responsible. In comparing Bids, the City will give consideration to alternate Bids for items listed in the bid forms. All key staff and subcontractors are subject to the approval by the City.

Official Documents

The City of Ann Arbor officially distributes bid documents from the Procurement Unit or through the Michigan Intergovernmental Trade Network (MITN). Copies of the bid documents obtained from any other source are not Official copies. Addenda and other bid information will only be posted to these official distribution sites. If you obtained City of Ann Arbor Bid documents from other sources, it is recommended that you register on www.MITN.info and obtain an official Bid. Bidders do not need to be shown on the plan holders list provided by MITN to be considered an official plan holder.

Bid Security

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

Withdrawal of Bids

After the time of opening, no Bid may be withdrawn for the period of ninety (90) days

Contract Time

Time is of the essence in the performance of the work under this Contract. The available time for work under this Contract is indicated on page C-1, Article III of the Contract. If these time requirements can not be met, the Bidder must stipulate on Bid Form Section 3 - Time Alternate its schedule for performance of the work. Consideration will be given to time in evaluating bids.

Liquidated Damages

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

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

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

Human Rights Information

All contractors proposing to do business with the City shall satisfy the contract compliance administrative policy adopted by the City Administrator in accordance with the Section 9:158 of the Ann Arbor City Code. Breach of the obligation not to discriminate as outlined in Section 5, beginning at page GC-2 shall be a material breach of the contract. Contractors are required to post a copy of Ann Arbor's Non-Discrimination Ordinance attached at all work locations where its employees provide services under a contract with the City.

Wage Requirements

Section 4, beginning at page GC-1, outlines the requirements for payment of prevailing wages and for payment of a "living wage" to employees providing service to the City under this contract. The successful bidder and its subcontractors must comply with all applicable requirements and provide proof of compliance.

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

For laborers whose wage level are subject to federal, state and/or local prevailing wage law the appropriate Davis-Bacon wage rate classification is identified based upon the work including within this contract. **The wage determination(s) current on the date 10 days before bids are due shall apply to this contract.** The U.S. Department of Labor (DOL) has provided explanations to assist with classification in the following resource link: www.wdol.gov.

For the purposes of this ITB the Construction Type of Highway will apply.

Conflict Of Interest Disclosure

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

Major Subcontractors

The Bidder shall identify on Bid Form Section 4 each major subcontractor it expects to engage for this Contract if the work to be subcontracted is 15% or more of the bid sum or over $50,000, whichever is less. The Bidder also shall identify the work to be subcontracted to each major subcontractor. The Bidder shall not change or replace a subcontractor without approval by the City.

Debarment

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

Disclosures

After bids are opened, all information in a submitter's bid is subjected to disclosure under the provisions of Michigan Public Act No. 442 of 1976, as amended (MCL 15.231 et seq.) known as the "Freedom of Information Act." The Freedom of Information Act also provides for the complete disclosure of contracts and attachments thereto except where specifically exempted.

Bid Protest

All Bid protests must be in writing and filed with the Purchasing Agent within five (5) business days of the award action. The bidder must clearly state the reasons for the protest. If a bidder contacts a City Service Area/Unit and indicates a desire to protest an award, the Service Area/Unit shall refer the bidder to the Purchasing Agent. The Purchasing Agent will provide the bidder with the appropriate instructions for filing the protest. The protest shall be reviewed by the City Administrator or designee whose decision shall be final.

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

Cost Liability

The City of Ann Arbor assumes no responsibility or liability for costs incurred by the Bidder prior to the execution of a contract with the City. By submitting a bid, a bidder agrees to bear all costs incurred or related to the preparation, submission and selection process for the bid.

Reservation of Rights

The City of Ann Arbor reserves the right to accept any bid or alternative bid proposed in whole or in part, to reject any or all bids or alternatives bids in whole or in part and to waive irregularity and/or informalities in any bid and to make the award in any manner deemed in the best interest of the City.

Idlefree Ordinance

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

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

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

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

In addition, generators and other internal combustion engines are covered

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

Environmental Commitment

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

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

INVITATION TO BID

City of Ann Arbor
Guy C. Larcom Municipal Building
Ann Arbor, Michigan 48107

Ladies and Gentlemen:

The undersigned, as Bidder, declares that this Bid is made in good faith, without fraud or collusion with any person or persons bidding on the same Contract; that this Bidder has carefully read and examined the bid documents, including City Nondiscrimination requirements and Declaration of Compliance Form, Living Wage requirements and Declaration of Compliance Form, Prevailing Wage requirements and Declaration of Compliance Form, Vendor Conflict of Interest Form, Notice of Pre-Bid Conference, Instructions to Bidders, Bid, Bid Forms, Contract, Bond Forms, General Conditions, Standard Specifications, Detailed Specifications, all Addenda, and the Plans (if applicable) and understands them. The Bidder declares that it conducted a full investigation at the site and of the work proposed and is fully informed as to the nature of the work and the conditions relating to the work's performance. The Bidder also declares that it has extensive experience in successfully completing projects similar to this one.

The Bidder acknowledges that it has not received or relied upon any representations or warrants of any nature whatsoever from the City of Ann Arbor, its agents or employees, and that this Bid is based solely upon the Bidder's own independent business judgment.

The undersigned proposes to perform all work shown on the plans or described in the bid documents, including any addenda issued, and to furnish all necessary machinery, tools, apparatus, and other means of construction to do all the work, furnish all the materials, and complete the work in strict accordance with all terms of the Contract of which this Bid is one part.

In accordance with these bid documents, and Addenda numbered_____, the undersigned, as Bidder, proposes to perform at the sites in and/or around Ann Arbor, Michigan, all the work included herein for the amounts set forth in the Bid Forms.

The Bidder declares that it has become fully familiar with the liquidated damage clauses for completion times and for compliance with City Code Chapter 112, understands and agrees that the liquidated damages are for the non-quantifiable aspects of non-compliance and do not cover actual damages that may be shown and agrees that if awarded the Contract, all liquidated damage clauses form part of the Contract.

The Bidder declares that it has become fully familiar with the provisions of Chapter 14, Section 1:320 (Prevailing wages) and Chapter 23 (Living Wage) of the Code of the City of Ann Arbor and that it understands and agrees to comply, to the extent applicable to employees providing services to the City under this Contract, with the wage and reporting requirements stated in the City Code provisions cited. Bidder certifies that the statements contained in the City Prevailing Wage and Living Wage Declaration of Compliance Forms are true and correct. Bidder further agrees that the cited provisions of Chapter 14 and Chapter 23 form a part of this Contract.

The Bidder declares that it has become familiar with the City Conflict of Interest Disclosure Form and certifies that the statement contained therein is true and correct.

The Bidder encloses a certified check or Bid Bond in the amount of 5% of the total of the Bid Price. The Bidder agrees both to contract for the work and to furnish the necessary Bonds and insurance documentation within 10 days after being notified of the acceptance of the Bid.

If this Bid is accepted by the City and the Bidder fails to contract and furnish the required Bonds and insurance documentation within 10 days after being notified of the acceptance of this Bid, then the Bidder shall be considered to have abandoned the Contract and the certified check or Bid Bond accompanying this Bid shall become due and payable to the City.

If the Bidder enters into the Contract in accordance with this Bid, or if this Bid is rejected, then the accompanying check or Bid Bond shall be returned to the Bidder.

In submitting this Bid, it is understood that the right is reserved by the City to accept any Bid, to reject any or all Bids, to waive irregularities and/or informalities in any Bid, and to make the award in any manner the City believes to be in its best interest.

SIGNED THIS_____DAY OF_____, 201_.

_____	_____
Bidder's Name	Authorized Signature of Bidder
_____	_____
Official Address	(Print Name of Signer Above)
_____	_____
Telephone Number	Email Address for Award Notice

LEGAL STATUS OF BIDDER

(The Bidder shall fill out the appropriate form and strike out the other three.)

Bidder declares that it is:

* A corporation organized and doing business under the laws of the State of _____, for whom _____, bearing the office title of _____, whose signature is affixed to this Bid, is authorized to execute contracts.

NOTE: If not incorporated in Michigan, please attach the corporation's Certificate of Authority

• A limited liability company doing business under the laws of the State of _____, whom _____ bearing the title of _____

whose signature is affixed to this proposal, is authorized to execute contract on behalf of the LLC.

* A partnership, organized under the laws of the state of _____ and filed in the county of _____, whose members are (list all members and the street and mailing address of each) (attach separate sheet if necessary):

_____

_____

_____

_____

_____

* An individual, whose signature with address, is affixed to this Bid: ___ _____
(initial here)

Authorized Official

_____ **Date**_____**,** 201_

(Print) Name_____Title_____

Company:_____

Address: _____

Contact Phone ( )_____Fax ( ) _____

Email _____

BID FORM

2018 Guardrail Rehabilitation Program
File No. 2018-038
Bid No. 4546

Section 1 – Schedule of Prices
Contractor:

Line No.	Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Total Price
10	1047051	General Conditions, Max. $20,000	LSUM	1.000	$	$
20	1047051	Minor Traffic Devices, Max. $20,000	LSUM	1.000	$	$
30	2040035	Guardrail, Rem	Ft	2231.000	$	$
40	2040050	Pavt, Rem	Syd	138.000	$	$
50	2050010	Embankment, CIP	Cyd	695.000	$	$
60	2080020	Erosion Control, CIP, Inlet Protection, Fabric Drop	Ea	15.000	$	$
70	2090001	Project Cleanup	LSUM	1.000	$	$
80	3070121	Shoulder, Cl II	Ton	147.000	$	$
90	6020050	Conc Pavt, Misc, Nonreinf, 6 inch	Syd	138.000	$	$
100	8070004	Guardrail Type MGS-8	Ft	2158.000	$	$
110	8070025	Guardrail Anch, Bridge, Det T4	Ea	6.000	$	$
120	8070052	Guardrail Departing Terminal, Type MGS	Ea	9.000	$	$
130	8070080	Guardrail Reflector	Ea	117.000	$	$
140	8077050	Guardrail Approach Terminal, Type 2M	Ea	13.000	$	$
150	8077050	Guardrail, Wood Backing, Special	Ft	490.000	$	$
160	8120012	Barricade, Type III, High Intensity, Double Sided, Lighted, Furn	Ea	15.000	$	$
					TOTAL THIS PAGE	$

BID FORM

2018 Guardrail Rehabilitation Program
File No. 2018-038
Bid No. 4546

Section 1 – Schedule of Prices
Contractor:

Line No.	Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Total Price
170	8120013	Barricade, Type III, High Intensity, Double Sided, Lighted, Oper	Ea	15.000	$	$
180	8120140	Lighted Arrow, Type C, Furn	Ea	5.000	$	$
190	8120141	Lighted Arrow, Type C, Oper	Ea	5.000	$	$
200	8120250	Plastic Drum, High Intensity, Furn	Ea	100.000	$	$
210	8120251	Plastic Drum, High Intensity, Oper	Ea	100.000	$	$
220	8120350	Sign, Type B, Temp, Prismatic, Furn	Sft	642.000	$	$
230	8120351	Sign, Type B, Temp, Prismatic, Oper	Sft	642.000	$	$
240	8120370	Traf Regulator Control	LSUM	1.000	$	$
250	8127050	Pedestrian Type II Barricade, Temp	Ea	4.000	$	$
260	8167002	Turf Establishment	Syd	1612.000	$	$
270	8167002	Landscaping, Maintenance and Warranty, 1st Year	LSUM	1.000	$	$

TOTAL THIS PAGE $

TOTAL FROM BF-1 $

TOTAL BASE BID $

BID FORM

Section 2 – Material, Equipment and Environmental Alternates

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

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

If an environmental alternative is bid the City strongly encourages bidders to provide recent examples of product testing and previous successful use for the City to properly evaluate the environmental alternative. Testing data from independent accredited organizations are strongly preferred.

Item Number	Description	Add/Deduct Amount

If the Bidder does not suggest any material or equipment alternate, the Bidder **MUST** complete the following statement:

For the work outlined in this request for bid, the bidder does NOT propose any material or equipment alternate under the Contract.

Signature of Authorized Representative of Bidder_____ Date _____

BID FORM

Section 3 - Time Alternate

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

If the Bidder does not suggest any time alternate, the Bidder **MUST** complete the following statement:

For the work outlined in this request for bid, the bidder does NOT propose any time alternate under the Contract.

Signature of Authorized Representative of Bidder_____Date _____

BID FORM

Section 4 - Major Subcontractors

For purposes of this Contract, a Subcontractor is anyone (other than the Contractor) who performs work (other than or in addition to the furnishing of materials, plans or equipment) at or about the construction site, directly or indirectly for or on behalf of the Contractor (and whether or not in privity of Contract with the Contractor), but shall not include any individual who furnishes merely the individual's own personal labor or services.

Contractor agrees that all subcontracts entered into by the Contractor shall contain similar wage provision to Section 4 of the General Conditions covering subcontractor's employees who perform work on this contract.

For the work outlined in these documents the Bidder expects to engage the following major subcontractors to perform the work identified:

Subcontractor (Name and Address)	Work	Amount

If the Bidder does not expect to engage any major subcontractor, the Bidder **MUST** complete the following statement:

For the work outlined in this request for bid, the bidder does NOT expect to engage any major subcontractor to perform work under the Contract.

Signature of Authorized Representative of Bidder_____Date _____

BID FORM

Section 5 – References

Include a minimum of 3 reference from similar project completed within the past 3 years.

1) _____ _____ _____
Project Name Cost Date Constructed

_____ _____
Contact Name Phone Number

2) _____ _____ _____
Project Name Cost Date Constructed

_____ _____
Contact Name Phone Number

3) _____ _____ _____
Project Name Cost Date Constructed

_____ _____
Contact Name Phone Number

SAMPLE STANDARD CONTRACT

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

CONTRACT

THIS AGREEMENT is made on the_____day of_____, 201_, between the CITY OF ANN ARBOR, a Michigan Municipal Corporation, 301 East Huron Street, Ann Arbor, Michigan 48104 ("City") and_____("Contractor")

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

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

ARTICLE I - Scope of Work

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

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

ARTICLE II - Definitions

Administering Service Area/Unit means **Public Services Area / Engineering Unit**

Project means **2018 Guardrail Rehabilitation Program; ITB No. 4546**

ARTICLE III - Time of Completion

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

(B) The entire work for this Contract shall be completed in accordance with the scheduling requirements outlined the "Detailed Specification for Project Schedule" found later in this document.

(C) Failure to complete all the work within the time specified above, including any extension granted in writing by the Supervising Professional, shall obligate the Contractor to pay the City, as liquidated damages and not as a penalty, the amount(s) specified in the "Detailed Specification for Project Schedule" for each calendar day of delay in the completion of all the work. If any liquidated damages are unpaid by the Contractor, the City shall be entitled to deduct these unpaid liquidated damages from the monies due the Contractor. The liquidated damages are for the non-quantifiable aspects of any of the previously identified events and do not cover actual damages that can be shown or quantified nor are they intended to preclude recovery of actual damages in addition to the recovery of liquidated damages.

(D) The term of this Contract shall be one year, or until satisfactory performance of all services have been performed, whichever occurs later. Subject to the availability of funding, the Contract may be extended for one one-year term, subject to the same terms and conditions, including unit prices, in the original Contract and subject to agreement by the City and the Contractor. Between May 31, 2019 and July 31, 2019, the City may provide a written request for the one year extension to the Contractor, after which the Contractor shall have 30 days to respond in writing that it agrees to the one year extension. Failure to respond may result in the Contract being reissued for bid.

ARTICLE IV - The Contract Sum

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

_____Dollars ($_____)

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

ARTICLE V - Assignment

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

ARTICLE VI - Choice of Law

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

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

ARTICLE VII - Relationship of the Parties

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

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

ARTICLE VIII - Notice

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

ARTICLE IX - Indemnification

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

ARTICLE X - Entire Agreement

This Contract represents the entire understanding between the City and the Contractor and it supersedes all prior representations, negotiations, agreements, or understandings whether written or oral. Neither party has relied on any prior representations in entering into this Contract. No terms or conditions of either party's invoice, purchase order or other administrative document shall modify the terms and conditions of this Contract, regardless of the other party's failure to object to such form. This Contract shall be binding on and shall inure to the benefit of the parties to this Contract and their permitted successors and permitted assigns and nothing in this Contract, express or implied, is intended to or shall confer on any other person or entity any legal or equitable right, benefit, or remedy of any nature whatsoever under or by reason of this Contract. This Contract may be altered, amended or modified only by written amendment signed by the City and the Contractor.

FOR CONTRACTOR

By_____

Its:_____

FOR THE CITY OF ANN ARBOR

By_____
Christopher Taylor, Mayor

By_____
Jacqueline Beaudry, City Clerk

Approved as to substance

By_____

City Administrator

By_____

Services Area Administrator

Approved as to form and content

_____
Stephen K. Postema, City Attorney

PERFORMANCE BOND

(1) _____ of _____ (referred to as "Principal"), and _____, a corporation duly authorized to do business in the State of Michigan (referred to as "Surety"), are bound to the City of Ann Arbor, Michigan (referred to as "City"), for

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

(2) The Principal has entered a written Contract with the City dated _____, 201_, for: _____ and this bond is given for that Contract in compliance with Act No. 213 of the Michigan Public Acts of 1963, as amended, being MCL 129.201 et seq.

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

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

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

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

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

SIGNED AND SEALED this _____ day of _____, 201_.

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

LABOR AND MATERIAL BOND

(1) _____ of _____ _____ (referred to as "Principal"), and _____, a corporation duly authorized to do business in the State of Michigan, (referred to as "Surety"), are bound to the City of Ann Arbor, Michigan (referred to as "City"), for the use and benefit of claimants as defined in Act 213 of Michigan Public Acts of 1963, as amended, being MCL 129.201 et seq., in the amount of $_____, for the payment of which Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by this bond.

(2) The Principal has entered a written Contract with the City, dated _____, 201_, for _____ _____; and this bond is given for that Contract in compliance with Act No. 213 of the Michigan Public Acts of 1963 as amended;

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

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

SIGNED AND SEALED this _____ day of _____, 201_

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

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

Approved as to form:

_____
Stephen K. Postema, City Attorney

Name and address of agent:

_____

_____

_____

GENERAL CONDITIONS

Section 1 - Execution, Correlation and Intent of Documents

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

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

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

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

Section 2 - Order of Completion

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

Section 3 - Familiarity with Work

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

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

Section 4 - Wage Requirements

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

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

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

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

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

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

Section 5 - Non-Discrimination

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

Section 6 - Materials, Appliances, Employees

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

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

Adequate sanitary facilities shall be provided by the Contractor.

Section 7 - Qualifications for Employment

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

Section 8 - Royalties and Patents

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

Section 9 - Permits and Regulations

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

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

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

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

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

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

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

Section 11 - Inspection of Work

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

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

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

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

Section 12 - Superintendence

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

Section 13 - Changes in the Work

The City may make changes to the quantities of work within the general scope of the Contract at any time by a written order and without notice to the sureties. If the changes add to or deduct from the extent of the work, the Contract Sum shall be adjusted accordingly. All the changes shall be executed under the conditions of the original Contract except that any claim for extension of time caused by the change shall be adjusted at the time of ordering the change.

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

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

Section 14 - Extension of Time

Extension of time stipulated in the Contract for completion of the work will be made if and as the

Supervising Professional may deem proper under any of the following circumstances:

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

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

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

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

(5) Delay due to an act of Government;

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

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

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

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

Section 15 - Claims for Extra Cost

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

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

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

(2) The term "Cost" shall cover all payroll charges for employees and supervision required under the specific order, together with all worker's compensation, Social Security, pension and retirement allowances and social insurance, or other regular payroll charges on same;

the cost of all material and supplies required of either temporary or permanent character; rental of all power-driven equipment at agreed upon rates, together with cost of fuel and supply charges for the equipment; and any costs incurred by the Contractor as a direct result of executing the order, if approved by the Supervising Professional;

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

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

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

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

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

Section 16 - Progress Payments

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

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

In the case of Contracts which include only the Furnishing and Delivering of Equipment, the payments shall be; 60% of the Contract Sum upon the delivery of all equipment to be furnished, or in the case of delivery of a usable portion of the equipment in advance of the total equipment delivery, 60% of the estimated value of the portion of the equipment may be paid upon its delivery in advance of the time of the remainder of the equipment to be furnished; 30% of the Contract

Sum upon completion of erection of all equipment furnished, but not later than 60 days after the date of delivery of all of the equipment to be furnished; and payment of the final 10% on final completion of erection, testing and acceptance of all the equipment to be furnished; but not later than l80 days after the date of delivery of all of the equipment to be furnished, unless testing has been completed and shows the equipment to be unacceptable.

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

Section 17 - Deductions for Uncorrected Work

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

Section 18 - Correction of Work Before Final Payment

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

If the Contractor does not remove the condemned work and materials within l0 days after written notice, the City may remove them and, if the removed material has value, may store the material at the expense of the Contractor. If the Contractor does not pay the expense of the removal within 10 days thereafter, the City may, upon 10 days written notice, sell the removed materials at auction or private sale and shall pay to the Contractor the net proceeds, after deducting all costs and expenses that should have been borne by the Contractor. If the removed material has no value, the Contractor must pay the City the expenses for disposal within 10 days of invoice for the disposal costs.

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

Section 19 - Acceptance and Final Payment

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

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

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

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

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

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

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

Section 20 - Suspension of Work

The City may at any time suspend the work, or any part by giving 5 days notice to the Contractor in writing. The work shall be resumed by the Contractor within 10 days after the date fixed in the written notice from the City to the Contractor to do so. The City shall reimburse the Contractor for expense incurred by the Contractor in connection with the work under this Contract as a result of the suspension.

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

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

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

If the Contractor is adjudged a bankrupt, or if it makes a general assignment for the benefit of creditors, or if a receiver is appointed on account of its insolvency, or if it persistently or repeatedly refuses or fails except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials, or if it fails to make prompt payments to subcontractors or for material or labor, or persistently disregards laws, ordinances or the instructions of the Supervising Professional, or otherwise is guilty of a substantial violation of any provision of the Contract, then the City, upon the certificate of the Supervising Professional that sufficient cause exists to justify

such action, may, without prejudice to any other right or remedy and after giving the Contractor 3 days written notice, terminate this Contract. The City may then take possession of the premises and of all materials, tools and appliances thereon and without prejudice to any other remedy it may have, make good the deficiencies or finish the work by whatever method it may deem expedient, and deduct the cost from the payment due the Contractor. The Contractor shall not be entitled to receive any further payment until the work is finished. If the expense of finishing the work, including compensation for additional managerial and administrative services exceeds the unpaid balance of the Contract Sum, the Contractor and its surety are liable to the City for any excess cost incurred. The expense incurred by the City, and the damage incurred through the Contractor's default, shall be certified by the Supervising Professional.

Section 22 - Contractor's Right to Terminate Contract

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

Section 23 - City's Right To Do Work

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

Section 24 - Removal of Equipment and Supplies

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

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

Section 25 - Responsibility for Work and Warranties

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

The Contractor shall guarantee the quality of the work for a period of one year. The Contractor shall also unconditionally guarantee the quality of all equipment and materials that are furnished and installed under the contract for a period of one year. At the end of one year after the Contractor's receipt of final payment, the complete work, including equipment and materials

furnished and installed under the contract, shall be inspected by the Contractor and the Supervising Professional. Any defects shall be corrected by the Contractor at its expense as soon as practicable but in all cases within 60 days. Any defects that are identified prior to the end of one year shall also be inspected by the Contractor and the Supervising Professional and shall be corrected by the Contractor at its expense as soon as practicable but in all cases within 60 days. The Contractor shall assign all manufacturer or material supplier warranties to the City prior to final payment. The assignment shall not relieve the Contractor of its obligations under this paragraph to correct defects.

Section 26 - Partial Completion and Acceptance

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

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

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

Section 27 - Payments Withheld Prior to Final Acceptance of Work

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

(1) Defective work not remedied;

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

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

(4) Damage to another Contractor.

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

Section 28 - Contractor's Insurance

(1) The Contractor shall procure and maintain during the life of this Contract, including the guarantee period and during any warranty work, such insurance policies, including those set forth below, as will protect itself and the City from all claims for bodily injuries, death

or property damage which may arise under this Contract; whether the act(s) or omission(s) giving rise to the claim were made by the Contractor or by any subcontractor or anyone employed by them directly or indirectly. In the case of all contracts involving on-site work, the Contractor shall provide to the City, before the commencement of any work under this contract, certificates of insurance and other documentation satisfactory to the City demonstrating it has obtained the policies and endorsements required.on behalf of itself, and when requested, any subcontractor(s). The certificates of insurance endorsements and/or copies of policy language shall document that the Contractor satisfies the following minimum requirements.

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

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

(b) Commercial General Liability Insurance equivalent to, as a minimum, Insurance Services Office form CG 00 01 07 98 or current equivalent. The City of Ann Arbor shall be named as an additional insured. There shall be no added exclusions or limiting endorsements specifically for the following coverages: Products and Completed Operations, Explosion, Collapse and Underground coverage or Pollution. Further there shall be no added exclusions or limiting endorsements which diminish the City's protections as an additional insured under the policy. The following minimum limits of liability are required:

$1,000,000	Each occurrence as respect Bodily Injury Liability or Property Damage Liability, or both combined.
$2,000,000	Per Job General Aggregate
$1,000,000	Personal and Advertising Injury
$2,000,000	Products and Completed Operations Aggregate

(c) Motor Vehicle Liability Insurance, including Michigan No-Fault Coverages, equivalent to, as a minimum, Insurance Services Office form CA 00 01 07 97 or current equivalent. Coverage shall include all owned vehicles, all non-owned vehicles and all hired vehicles. The City of Ann Arbor shall be named as an additional insured. There shall be no added exclusions or limiting endorsements which diminish the City's protections as an additional insured under the policy. Further, the limits of liability shall be $1,000,000 for each occurrence as respects Bodily Injury Liability or Property Damage Liability, or both combined.

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

(2) Insurance required under subsection (1)(b) and (1)(c) above shall be considered primary as respects any other valid or collectible insurance that the City may possess, including any self-insured retentions the City may have; and any other insurance the City does possess shall be considered excess insurance only and shall not be required to contribute with this insurance. Further, the Contractor agrees to waive any right of recovery by its insurer against the City.

(3) Insurance companies and policy forms are subject to approval of the City Attorney, which

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

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

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

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

Section 29 - Surety Bonds

Bonds will be required from the successful bidder as follows:

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

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

Section 30 - Damage Claims

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

Section 31 - Refusal to Obey Instructions

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

Section 32 - Assignment

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

Section 33 - Rights of Various Interests

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

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

Section 34 - Subcontracts

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

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

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

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

Section 35 - Supervising Professional's Status

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

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

Section 36 - Supervising Professional's Decisions

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

Section 37 - Storing Materials and Supplies

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

Section 38 - Lands for Work

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

Section 39 - Cleaning Up

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

Section 40 - Salvage

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

Section 41 - Night, Saturday or Sunday Work

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

No Saturday work may be permitted on the following dates:

September 8th, 2018
September 15th, 2018
September 22nd, 2018
October 6th, 2018
October 13th, 2018
November 3rd, 2018
November 17th, 2018

Section 42 - Sales Taxes

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

Section 43

CONTRACTOR'S DECLARATION

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

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

_____ _____
Contractor Date

By _____
(Signature)

Its _____
(Title of Office)

Past due invoices, if any, are listed below.

Section 44

CONTRACTOR'S AFFIDAVIT

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

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

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

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

_____ _____
Contractor Date

By _____
(Signature)

Its _____
(Title of Office)

Subscribed and sworn to before me, on this_____day of_____, 20___
_____,_____County, Michigan
Notary Public
_____County, MI
My commission expires on:

STANDARD SPECIFICATIONS

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

Standard Specifications are available online:
https://www.a2gov.org/departments/engineering/Pages/Engineering-and-Contractor-Resources.aspx

DETAILED SPECIFICATION
FOR
LOG OF PROJECT

Project Overview

This project includes removal and replacement of new guardrail beams and approach terminals at various locations throughout the City of Ann Arbor as directed by the Engineer and as described herein. In the spring of 2017, the City performed an evaluation of existing guardrail assets throughout the City and found a number of defects which are desired to be corrected as part of this project. These defects include, but are not limited to:

- Breakaway Cable Terminals (BCT's) no longer comply with applicable crash safety standards
- Type A Guardrail being utilized along major roadways
- Damaged end terminals or beam sections
- Damaged or rotted guardrail posts
- Erosion of shoulder around guardrail segments
- Missing reflectors or other hardware

During the 2017 evaluation, 46 of the City's 112 guardrail locations were rated in poor condition. The locations given a poor rating were then prioritized based on a number of factors, including posted speed limit, traffic volume, damaged components, crash history and purpose of the guardrail. For this project, guardrail repairs shall be made in order of priority in accordance with the prioritization list provided later in the Log of Project.

Location of Project and Roadway Characteristics

The project includes multiple location(s) throughout the City of Ann Arbor as indicated in the attached Appendix A – Guardrail Inspection Reports. Guardrail is typically located along the roadside within the City of Ann Arbor Right-of-Way.

Description of Work

This project for the City of Ann Arbor is anticipated to start as soon as possible after the award notification, which is anticipated to be in October of 2018. The project shall be completed in a timely manner as outlined in the Detailed Specification for Project Schedule.

Contract pay items, standard details and construction specifications shall be in accordance with the MDOT 2012 Standard Specifications for Construction and the current MDOT Standard Plans unless stated otherwise in this proposal. Review article 1 of Specification Section 01001 – Supplemental Project Requirements for contract requirements.

Within the limits of the project as described herein, the scope of this work is to be completed as stated in this log and as directed by the Engineer and includes the following:

- Remove and replace guardrail approach and departure terminals
- Remove and replace segments of guardrail
- Include transition lengths to connect MASH approved terminal to existing Type A/B guardrail
- New guardrail anchorage at bridge approaches
- Maintaining traffic

Guardrail Locations:

Asset ID.	Location	Limits	Existing Guardrail	Proposed Scope
GR-017	Fuller Rd	S side of WB approach to bridge over the Huron River	75’ of Type B	78.125’ Guardrail, Type MGS-8; Guardrail Approach Terminal, Type 2M; Guardrail Anch, Bridge, Det T4; 37 syd of Conc Pavt, Misc, Nonreinf, 6 inch
GR-018	Fuller Rd	N side of WB approach to bridge over the Huron River	88’ of Type B	78.125’ Guardrail, Type MGS-8; Guardrail Approach Terminal, Type 2M; Guardrail Anch, Bridge, Det T4; 51 syd of Conc Pavt, Misc, Nonreinf, 6 inch
GR-021	Fuller Rd	N side of EB approach to bridge over the Huron River	75’ of Type B	78.125’ Guardrail, Type MGS-8; Guardrail Approach Terminal, Type 2M; Guardrail Anch, Bridge, Det T4; 50 syd of Conc Pavt, Misc, Nonreinf, 6 inch
GR-071	Fuller Rd	N side of the road, W of intersection with Maiden Ln, E of railroad tracks	75’ of Type B	34.375’ Guardrail, Type MGS-8; Guardrail Approach Terminal, Type 2M
GR-081	Fuller Rd	S side of road, W of Huron Pkwy across the street from Huron High School	332’ of Type B	350’ Guardrail, Type MGS-8; Guardrail Approach Terminal, Type 2M
GR-045	Jackson Rd	S side of road, E of bridge over I-94 Ramp, W of Weber’s Driveway	134’ of Type B (Impacted)	28.125’ Guardrail Type MGS-8; Guardrail Approach Terminal, Type 2M
GR-046	Plymouth Rd	Along S side of road at entrance to the North Campus Research Complex Building	162.5’ of Type B	112.5’ Guardrail Type MGS-8; Guardrail Approach Terminal , Type 2M
GR-120	Plymouth Rd	S side of road, W bridge approach to US-23 overpass	81’ of Type B	190.625’ Guardrail, Type MGS-8; Guardrail Anch, Bridge, Det T4; Guardrail Approach Terminal, Type 2M

Asset ID.	Location	Limits	Existing Guardrail	Proposed Scope
GR-060	E Eisenhower Pkwy	N side of road, WB of intersection with S Industrial Hwy	50’ of Type B	121.875’ Guardrail, Type MGS-8 and Guardrail Approach Terminal, Type 2M
GR-061	E Eisenhower Pkwy	S side of road, WB of intersection with S Industrial Hwy	8’ of Type B	9.375’ Guardrail, Type MGS-8; Guardrail Departing Terminal, Type MGS
GR-062	E Eisenhower Pkwy	N side of road, E of intersection with Boardwalk Dr, W of RR tracks	587’ of Type B	562.5’ Guardrail, Type MGS-8; Guardrail Anch, Bridge, Det T4; Guardrail Approach Terminal, Type 2M
GR-063	E Eisenhower Pkwy	S side of road, E of intersection with Boardwalk Dr, W of RR tracks	50’ of Type B	21.875’ Guardrail, Type MGS-8; Guardrail Approach Terminal, Type 2M
GR-103	Miller Rd	SW side of road, E bridge approach to M-14 overpass	100’ of Type B	71.875’ Guardrail, Type MGS-8; Guardrail Approach Terminal, Type 2M
GR-036	Platt Rd	WB side, S of Huron Pkwy and N of Canterbury Rd	35’ of Type B	Guardrail, Rem; Turf Establishment
GR-037	Platt Rd	WB side, S of Huron Pkwy and N of Canterbury Rd	58’ of Type B	Guardrail, Rem; Turf Establishment
GR-069	Fernwood Ave	E side of road at Creekwood Apts, protecting Swift Drain	40’ of Type B	25’ Guardrail, Type MGS-8; Guardrail Departing Terminal, Type MGS (x2)
GR-125	Scio Church Rd	N side of road, E bridge approach to I-94 overpass	49’ of Type B	53.125’ Guardrail, Type MGS-8; Guardrail Anch, Bridge, Det T4; Guard Approach Terminal, Type 2M
GR-052	Ann Arbor – Saline Road	Along N side of the road, protecting pedestrian bridge N of Northbrook Drive	90’ of Type B	62.5’ Guardrail, Type MGS-8; Guardrail Approach Terminal, Type 2M; Guardrail Departing Terminal, Type MGS
GR-075	Depot St	N side of the road, W of intersection w/ N State St	100’ of Type B	125’ Guardrail, Type MGS-8; Guardrail Approach Terminal, Type 2M; Guardrail Departing Terminal, Type MGS

Maintain traffic in accordance with the Special Provision for Maintaining Traffic. It is the intent of the project that the work will be performed under traffic with at least one lane remaining open at all times.

For lane closure details and specifications, refer to the MDOT Traffic Design Manual: Maintenance Work Zone Traffic Control Guidelines.

Unless otherwise stated in this log, do not extend the proposed work outside the limits of the City of Ann

Arbor Right-of-Way (ROW). Any damage to areas outside the ROW shall be restored as directed by the Engineer with no additional compensation to be paid to the contractor.

Protect existing drainage structures within the project limits from erosion, paid for as: "Erosion Control, Inlet Protection, Fabric Drop" (Ea).

At locations directed by the Engineer, remove any trees that stand in the way of proposed guardrail improvements, paid for as: "Tree, Rem, _ inch to _ inch" (Ea) and "Tree, Rem, _ inch and Larger" (Ea). Limits of tree removals will be determined in the field by the Engineer.

All contract bid items listed in this project will be categorized under their standard MDOT pay item code, unless specifically stated otherwise.

All quantities of work included in the contract have been established based on the Engineer's preliminary field investigation and understanding of existing conditions based on historical information available at the time these documents were assembled. There are guardrail quantities included in the contract estimate for one additional location as-needed in the field, to be approved by the Supervising Professional. All work shown is subject to change based on evaluation of field conditions at the time of construction and shall be provided only as directed by the Engineer.

DETAILED SPECIFICATION FOR PROJECT SCHEDULE

Examination of Plans, Specifications, and Work Site: Bidders shall carefully examine the Bid Form, plans, specifications and the work site until the Bidder is satisfied as to all local conditions affecting the contract and the detailed requirements of construction. The submission of the bid shall be considered prima facie evidence that the Bidder has made such examination and is satisfied as to the conditions to be encountered in performing the work and all requirements of the contract.

The entire work under this Contract shall be completed in accordance with, and subject to, the scheduling requirements as outlined below, and all other requirements of the Contract Documents.

1. By no later than **the Pre-Construction Meeting** the Contractor shall submit a detailed schedule of work, by major item of work, for the Engineer's review and approval. The proposed schedule must fully comply with the scheduling requirements contained in this Detailed Specification. The Contractor will not be issued a notice to proceed until their progress schedule has been approved. The Contractor shall update the approved work schedule each week and present it to the Engineer at the weekly progress meeting.

2. The Contractor will receive two (2) copies of the Contract, for his/her execution, on or before **August 28, 2018**. The Contractor shall properly execute both copies of the Contract and return them, with the required Bonds and Insurance Certificate, to the City by **October 2, 2018**.

3. Contractor may begin construction on the 2018 Guard Rehabilitation Program as early as **October 15, 2018**, but not before receiving the copy of executed contract documents and the Notice to Proceed from the City. Appropriate time extensions shall be granted if the Notice to Proceed is delayed due to the circumstances controlled by the City.

4. Construction must be completed before **May 31, 2019**, unless otherwise approved in writing by the Engineer. The total duration for construction shall not exceed 28 calendar days. The contractor may

be required to mobilize multiple times before the final completion date. Time between mobilizations will not be counted against the 28 calendar days.

5. The Contractor must complete a Punchlist to be generated by the Supervising Professional prior to seasonal suspension of work. All deficiencies on this list must be completed by **May 31, 2019**. Failure to complete all work as specified herein within the times specified herein, including time extensions granted thereto as determined by the Engineer, shall entitle the City to deduct from the payments due the Contractor, **$350.00** in "Liquidated Damages", and not as a penalty, for each and every calendar day beyond the completion date.

6. A detailed schedule of work identifying the major items of work shall be submitted 1 week prior to construction. The contractor will not be issued a notice to proceed until their progress schedule has been approved by the Engineer.

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

All work performed on this project shall be considered 'short-term stationary' work as-defined in the MDOT Maintenance Work Zone Traffic Control Guidelines. As such, all work in any active zones will be completed within 24 hours of start time.

Time is of the essence in the performance of the work of this contract. The Contractor is expected to mobilize sufficient personnel and equipment, and work throughout all authorized hours, as listed in the Detailed Specification for Maintenance of Traffic (included elsewhere in this proposal), in order to complete the project by the final completion date. Costs for the Contractor to organize, coordinate, and schedule all of the work of the project, will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions, Max. $20,000."

If the City elects to terminate this Construction Contract due to non-performance, contract items paid for on a Lump Sum basis will be pro-rated based on percentage equal to the percentage of the contract work completed.

DETAILED SPECIFICATION FOR MAINTENANCE OF TRAFFIC

DESCRIPTION

Traffic shall be maintained in accordance with the City of Ann Arbor Public Services Department Standard Specifications except as specified in Sections 103.05, 810, 812, 919, and 920 of the 2012 Michigan Department of Transportation (MDOT), Standard Specifications for Construction, **the 2011 Michigan Manual of Uniform Traffic Control Devices (MMUTCD)** and as amended herein.

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

MATERIALS

The materials and equipment shall meet the requirements specified in the corresponding sections of the 2012 MDOT Standard Specifications for Construction and the current edition of the Michigan Manual of Uniform Traffic Control Devices (MMUTCD).

Maintenance of Local Traffic

Unless otherwise indicated on the plans, all side roads shall remain open to traffic except during construction operations of short duration and only upon written approval of the Engineer.

Local access shall be maintained at all times for emergency vehicles, refuse pick-up, mail delivery and ingress/egress to private properties. If the refuse receptacles are located within the Contractor's work area, the Contractor shall move the receptacles as needed to allow the refuse to be picked up.

Contractor must accommodate the safe access to the residential buildings and businesses located within construction area.

Driveways shall not be blocked for extended periods of time unless arrangements can be made with the affected property owner(s). When it becomes necessary to temporarily block driveways, the Contractor shall notify the affected property owners in advance to coordinate the work and allow sufficient time for vehicles to vacate from properties. It may be necessary to allow for vehicles to temporarily park in the roadway, or on side streets, at locations that do not interfere with the Contractor's work. During these periods the owners of the respective vehicles must be available to, with proper notice, move their vehicles if it becomes necessary to accommodate the work.

At times when it becomes necessary to temporarily obstruct local traffic during the performance of the work, the Contractor shall maintain work-zone warning and lane-closure signs. These signs shall be placed leading up to the construction work-zone and along incoming street on each/any of the locations undergoing guardrail improvements to direct traffic along the construction. Access shall be maintained through each of these areas for all incoming traffic at all times. The Contractor shall be responsible for adjusting the direction of these signs as changing situations warrant. For situations when the outlet path is disturbed by any work, the contractor shall provide flag control in conformance with Part VI of the MMUTCD, Sections 6F-1 thru 6F-7. A minimum of two flaggers are required. The cost of flag control shall be included in the contract pay item "Minor Traf Devices, Max. $20,000".

A lane-closure permit shall be obtained by the Contractor from the City at least 48 hours in advance of any proposed lane or street closing.

The hours of work on all Local streets are 7:00 a.m. to 8:00 p.m. and 9:00am to 3:00pm on Major streets, Monday through Saturday, or as specified on the lane-closure permit. At other times, work will not be permitted unless authorized by the City Administrator. No Sunday work will be permitted unless the Contractor gives the Supervising Professional at least 48 hours notice of the Contractor's intention to work the upcoming Sunday and only after receiving written approval from that Supervising Professional. No equipment will be allowed in the street before or after these hours. Local streets may only be closed to through traffic (local access only) with written authorization of the Engineer. Work must be completed each day such that all streets are re-opened to through traffic by 8:00 p.m. unless otherwise specified, directed, or authorized in writing by the Engineer. All major changes in traffic control shall be made either between 9:30 a.m. and 3:30 p.m. or between 7:00 p.m. and 6:30 a.m. in order to minimize interference with rush-hour traffic. All traffic controls must be in-place and ready for traffic each day by 6:30 a.m. and 3:30 p.m.

The Contractor shall temporarily cover conflicting traffic and/or parking signs when directed by the Engineer. Included in the bid price for the contract pay item “Minor Traffic Devices, Max. $20,000”.

The work of maintaining and relocating existing warning, regulatory and/or guide signs; and of removing, salvaging and reinstalling existing signs and supports is included in the bid price for the contract pay item “Minor Traffic Devices, Max. $20,000."

Mailboxes and newspaper boxes that are in the way of the construction shall be removed and reset immediately in a temporary location approved by the Engineer. Mail and paper delivery shall not be interrupted during the construction. Upon completion of the construction, all mailboxes and newspaper boxes, including their supports, shall be repositioned in their permanent locations as approved by the Engineer.

Where the work requires the Contractor to maintain traffic using “Traffic Regulator Control”, the Contractor shall perform the work of this Contract by using flag persons and by relocating traffic control devices to prevent traffic from entering the work area until such time that it can be safely maintained without damaging the new construction. For the purposes of this project, flag control will be required in areas where there are only two lanes of 1-way traffic or areas where the Contractor does not have enough room to isolate the work-zone to the shoulder. The Contractor shall provide traffic regulators in sufficient number to maintain traffic as described herein, and provide for safe travel at all times as directed by the Engineer.

DETAILED SPECIFICATION FOR PROTECTION OF UTILITIES

Damages to utilities by the Contractor's operations shall be repaired by the utility owner at the Contractor's expense.
Delays to the work due to utility repairs are the sole responsibility of the Contractor.

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

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

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

Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions, Max. $20,000."

DETAILED SPECIFICATION
FOR
SOIL EROSION CONTROL

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

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

DETAILED SPECIFICATION
FOR
PERMITS

The following permits are required. All permit requirements shall be met and no direct costs are anticipated with the exception of any required bonds.

City of Ann Arbor Right Of Way (ROW) Permit: Submit application through City of Ann Arbor Customer Service for a permit for advanced signs placed in the ROW and guardrail work in the public ROW. It is the responsibility of the Contractor to submit this permit application to the City. Fees will be waived.

DETAILED SPECIFICATION
FOR
MATERIALS AND SUPPLIES CERTIFICATIONS

The following materials and supplies shall meet MDOT standards as having been tested and approved for compliance with the Specifications:

Guardrail, Type MGS-8
Guardrail, Curved, Type MGS-8
Guardrail Anch, Bridge, Det T4
Guardrail Approach Terminal, Type 2M
Guardrail Departing Terminal, Type MGS
Guardrail, Wood Backing
Turf Establishment
Cements, coatings, admixtures and curing materials
Sands and Aggregates
Steel and Fabricated metal
Portland Cement Concrete Mixtures

The Contractor shall submit all certifications to the Engineer for review and approval a minimum of three business days prior to any scheduled delivery, installation, and/or construction of same.
Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions."

DETAILED SPECIFICATION
FOR
WORKING IN THE RAIN

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

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

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

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

DETAILED SPECIFICATION
FOR
WORKING IN THE DARK

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

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

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

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

DETAILED SPECIFICATION
FOR
QUANTITIES AND UNIT PRICES

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

DETAILED SPECIFICATION
FOR
GENERAL CONSTRUCTION NOTES

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

1. All work shall conform to latest revision of the City Standard Specifications. Pay Items not having a Detailed Specification shall refer to the City Standard Specifications for that item. Copies of the City Standard Specifications are not in these Contract Documents but are included herein by reference and can be viewed on-line at: https://www.a2gov.org/departments/engineering/Pages/Engineering-and-Contractor-Resources.aspx

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

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

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

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

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

DETAILED SPECIFICATION
FOR
CONCRETE PLACEMENT AND PROTECTION

DESCRIPTION

This work shall consist of furnishing all labor, material, and equipment needed to furnish, place, and protect

all concrete material in accordance with the requirements of this Detailed Specification. These requirements shall not apply to concrete bridge decks, unless otherwise noted.

MATERIALS

The Concrete shall meet the requirements of Sections 601 and 701 of the 2012 Michigan Department of Transportation Standard Specifications for Construction.

The Contractor shall propose specific concrete mix designs for the intended project purpose in accordance

with the requirements of this Detailed Specification and other applicable Detailed Specifications and/or project requirements. The Engineer's acceptance of a mix design shall not relieve the Contractor of their responsibility for the manufacture of the concrete mixture(s), its placement, or performance.

CONSTRUCTION

The Contractor shall perform all concrete placement operations in weather that is suitable for the successful placement and curing of the concrete materials. Concrete shall not be placed during periods of active precipitation.

The Contractor shall complete all needed formwork, base and/or sub-base preparation, and any other related items that are deemed necessary for the proper completion of the work. The Contractor shall not commence the placement of concrete until they receive all needed approvals from the Engineer for placement. The Engineer's approval of the Contractor to place concrete shall not relieve the Contractor of their responsibility for the proper placement and protection of the concrete materials or its long-term performance.

During periods when precipitation is threatening, provide durable, plastic sheeting, approved by the Engineer, in sufficient quantity to cover and protect all freshly placed concrete such that precipitation does not come into contact with the concrete. The Contractor shall arrange the placement of the plastic sheeting such that the surface of any freshly placed concrete is not marred by contact with the plastic; any seams in the plastic sheeting shall be water tight. The Contractor shall place adequate supports along and over the freshly placed concrete to prevent contact of the plastic and concrete. The Contractor shall ensure that sufficient dams or barriers are placed along the edges of the freshly placed concrete to prevent erosion of the underlying materials or damage to the edges of the freshly placed concrete. All measures shall be effective.

Any concrete damaged by precipitation shall be removed and replaced at the Contractor's expense. The Engineer shall decide if the concrete has been damaged and the limits of removal and replacement.

Concrete shall only be placed when the rate of surface evaporation at the site is less than 0.20 pounds per square foot per hour, according to Figure 706-1 of the 2012 Michigan Department of Transportation Standard Specifications for Construction. The Contractor shall provide approved equipment for determining the relative humidity and wind velocity at the site.

Water shall not be added to the placed concrete in order to aid finishing. Any water added to the concrete for slump adjustments shall be done by adding water to the mixing unit and thoroughly re-mixing the concrete for 30 revolutions of the mixing unit at mixing speed. Water shall not be added such that the design water-to-cement ratio of the concrete mixture or the design slump of the concrete mix is exceeded.

Concrete curing shall be performed in accordance with Section 602.03.M of the 2012 MDOT Standard Specifications for Construction. Curing operations shall take precedence over texturing operations and

continued concrete placement. All curing compound applied shall provide uniform coverage over the entire surface being protected. The placement of curing compound shall be free of spots, blotches, or uncovered or non-uniformly covered areas. Should any areas be determined to exist by the Engineer, the curing compound shall be immediately re-applied by the Contractor at no additional cost to the project.

WEATHER LIMITATIONS

The Contractor shall take all precautions when placing concrete to protect it from damage due to the elements. Concrete shall not be placed during precipitation events.

Concrete shall be protected from weather and temperature according to the requirements of Section 602.03.T. Concrete shall not be placed when the temperature of the plastic concrete mixture itself is greater than 90° F. In conditions where low temperature protection is required, the Contractor shall cover the concrete with insulated blankets, or other means as approved by the Engineer, to protect the concrete from damage. This will be paid for as part of the contract bid item "General Conditions, Max. $20,000". The concrete shall remain protected until it has reached a compressive strength of at least 1000 psi, or as directed by the Engineer.

MEASUREMENT AND PAYMENT

All costs associated with the conformance to the requirements of this Detailed Specification will not be paid for separately, but shall be considered to be included in the respective items of work

---

DETAILED SPECIFICATION
FOR
CONCRETE DURABILITY

DESCRIPTION

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

MATERIALS

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

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

* Fine and coarse aggregates shall consist of natural aggregates as defined in the 2012 MDOT Standard Specifications Section 902.02.A.1.

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

Alkali-Silica Reactivity

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

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

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

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

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

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

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

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

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

Method 2. Use low alkali cement and maintain the total alkali content from the cementitious at no

more than 3.0 lbs/cyd (Na_2Oeq). The total alkali contribution is calculated by the quantity contained in the Portland cement only.

Requirements for Low Alkali Cement are that the alkali content does not exceed 0.60% expressed as Na_2O equivalent. Equivalent sodium oxide is calculated as: (percent Na_2O + 0.658 x percent K_2O).

For either method 1 or 2, if the Contractor intends to change any component material supplied after the mix design has been approved all concrete work will be suspended with no cost to the project or extensions

of time, unless approved, until evaluation of the new mixtures and testing of the new materials demonstrates that it is resistant to excessive expansion due to ASR.

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

When concrete is placed during cold weather, defined for the purposes of this Detailed Specification to be, air temperatures below 40º F, the use of accelerators, heated aggregates, silica fume and/or additional forms of cold weather protection will be required. Cold weather will not eliminate the requirement for furnishing and placing a concrete mix that is considered resistant to ASR attack.

Prior to cool weather placement, defined for the purposes of this detailed specification to be, air temperatures between 40º and 60º F, the set time of the proposed mix shall be verified under anticipated field conditions. This information shall be used when scheduling pours and saw crews.

Air Entrainment

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

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

For up to the first four loads, the air content measured on-site prior to placement shall be at least 8.0% and no more than 12.0%. To establish the initial AAC on the first day of paving, the air content of the first load shall be tested at the plant. After initial testing at the plant the Contractor shall provide at least two sample sets to determine the actual air loss during placement. A sample set shall consist of two samples of concrete from the same batch, one taken at the point of discharge and the

other from the in-place concrete behind the paver. The air loss from the two sample sets shall be averaged and added to 6.0% to establish the AAC (rounded to the next higher 0.5%). After the testing and adjustment procedure(s) have been completed, the project acceptance air tests shall be taken prior to placement. The Contractor shall provide concrete to the jobsite that has an air content of plus 2.0%, or minus 1.0%, of the AAC.

After the AAC has been established, it shall be verified and/or adjusted through daily checks of the air loss through the paver. The Contractor shall check the air loss through the paver a minimum of two times a day. A Revised AAC shall be required to be established by the Contractor if the average air loss from two consecutive tests deviates by more than 0.5% from the current accepted air loss. The

testing operations performed by the Contractor to establish a revised AAC shall be performed to the satisfaction of the Engineer. The Contractor shall be solely responsible for any delays and/or costs that occur to the project while establishing revised AACs.

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

CONSTRUCTION METHODS

Aggregate Control

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

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

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

Mixing

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

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

Ribbon mixers: After all solid materials are assembled in the mixer; the mixing time shall be a minimum of 30 seconds and a maximum of 2.5 minutes. The mixing time may be decreased if the

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

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

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

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

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

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

Curing

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

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

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

The finished product shall appear as a uniformly painted solid white surface. Areas exhibiting a blotchy or

spotty appearance shall be recoated immediately.

COMPLIANCE WITH STANDARDS

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

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

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

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

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

MEASUREMENT AND PAYMENT

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

DETAILED SPECIFICATION
FOR
ITEM #1047051 - GENERAL CONDITIONS, MAX. $20,000

DESCRIPTION

This item shall include all work described and required by the Plans and Specifications for which no item of work is listed in the Bid Form, including but not limited to:

- Scheduling and organization of all work, subcontractors, suppliers, testing, inspection, surveying, and staking
- Coordination of, and cooperation with, other contractors, agencies, departments, and utilities
- Protection and maintenance of Utilities
- Placing, maintaining, and removing all soil erosion and sedimentation controls
- Maintaining drainage
- Maintaining drives, drive openings, sidewalks, bikepaths, mail deliveries, and solid waste/recycle

pick-ups
- Storing all materials and equipment off lawn areas
- Site clean-up
- Providing low temperature weather protection for concrete pavement
- Coordination efforts to furnish various HMA mixtures as directed by the Engineer
- Coordination efforts to furnish and operate various-size vehicles/equipment as directed by the Engineer
- Furnishing and operating vacuum-type street cleaning equipment
- Furnishing and operating vacuum-type utility structure cleaning equipment
- Furnishing and operating both vibratory plate and pneumatic-type ("pogo-stick") compactors
- Furnishing and operating a backhoe during all work activities
- Furnishing and operating a jackhammer and air compressor during all work activities
- Noise and dust control
- Mobilization(s) and demobilization(s)
- Furnishing submittals and certifications for materials and supplies.
- Disposing of excavated materials and debris
- All miscellaneous and incidental items such as overhead, insurance, and permits.

MEASUREMENT AND PAYMENT

This item of work will be paid for on a pro rata basis at the time of each progress payment. Measurement will be based on the ratio between work completed during the payment period and the total contract amount. When all of the work of this Contract has been completed, the measurement of this item shall be 1.0 Lump Sum.

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

PAY ITEM	PAY UNIT
General Conditions, Max. $20,000	Lump Sum

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

DETAILED SPECIFICATION
FOR
ITEM #1047051 – MINOR TRAFFIC DEVICES, MAX. $20,000

DESCRIPTION

The work of Minor Traffic Devices shall include, but not be limited to:

- The furnishing and operating of miscellaneous signs, warning devices, flag-persons, and cones;
- The operation of additional signs furnished by the City;
- Removing temporary signs, barricades, barrels, message boards and other temporary maintenance of traffic items between location changes
- Furnishing and installing meter bags;
- Coordinating with the City to have meter heads removed and reinstalled;
- Maintaining pedestrian traffic;

- Temporarily covering traffic controls;
- Temporarily covering existing signs as directed;
- Any and all other miscellaneous and/or incidental items which are necessary to properly perform the work.

Where there is metered parking, the Contractor shall either rent and install meter bags, or, with the Engineer's authorization, coordinate with the City Transportation Division to have meter heads removed and reinstalled.

The Contractor shall maintain vehicular and pedestrian traffic during the work by the use of flag-persons, channelizing devices, and signs as necessary, as directed by the Engineer, and in accordance with MMUTCD. Typical applications for maintaining pedestrian traffic in accordance with the MMUTCD are included in this detailed specification.

MEASUREMENT AND PAYMENT

This item of work will be paid for on a pro rata basis at the time of each progress payment. Measurement will be based on the ratio between work completed during the payment period and the total contract amount. When all of the work of this Contract has been completed, the measurement of this item shall be 1.0 Lump Sum.

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

PAY ITEM	PAY UNIT
Minor Traffic Devices, Max $20,000	Lump Sum

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

DETAILED SPECIFICATION
FOR
ITEM #8070004 - GUARDRAIL, TYPE MGS-8
ITEM #8070025. – GUARDRAIL ANCH, BRIDGE, DET T4
ITEM #8070052. – GUARDRAIL DEPARTING TERMINAL TYPE MGS
ITEM #8070080 – GUARDRAIL REFLECTOR
ITEM #8077050 – GUARDRAIL APPROACH TERMINAL, TYPE 2M

DESCRIPTION

All work must be completed in accordance with section 807 of the 2012 Michigan Department of Transportation Standard Specifications for Construction, except as stated in this detailed specification, noted elsewhere in this proposal, and as directed by the Engineer.

MATERIALS

Provide materials in accordance with the following sections of the 2012 MDOT Standard Specifications for Construction:

Sound Earth	205
Guardrail Beam Elements and Hardware	908
Reflectors	908
Steel Posts	908
Wood Posts	912
Guardrail Blocks	912

CONSTRUCTION

The construction of Guardrail, Type MGS-8 (MDOT Standard Plan R-60-J), Guardrail Approach Terminal, Type 2M (MDOT Standard Plan R-62-H), Guardrail, Departing Terminal, Type MGS (MDOT Standard Plan R-66-E) and Guardrail Anch, Bridge, Det T4 (MDOT Standard Plan R-67-G) shall conform to Section 807 of the 2012 MDOT Standard Specifications for Construction, the City of Ann Arbor Standard Specifications, and the plans.

MEASUREMENT AND PAYMENT

The measurement and payment for Guardrail, Type MGS-8, Guardrail Departing Terminal, Type MGS, Guardrail Approach Terminal, Type 2M and Guardrail Anch, Bridge, Det T4 shall be in accordance with Section 807 of the 2012 MDOT Standard Specifications for Construction. The unit prices for this item of work shall include all labor, material, and equipment costs to perform all the work specified in the section 807 of the 2012 MDOT Standard Specifications and as modified by this Detailed Specification.

PAY ITEM	PAY UNIT
Guardrail, Type MGS-8	Foot
Guardrail, Departing Terminal, Type MGS	Each
Guardrail Approach Terminal, Type 2M	Each
Guardrail Anch, Bridge, Det T4	Each
Guardrail Reflector	Each

All work indicated herein shall be included in the unit prices for the above pay items and shall include all labor, materials and equipment required to complete the work.

DETAILED SPECIFICATION
FOR
ITEM #2040035 - GUARDRAIL REM

DESCRIPTION

This work shall be done in accordance with Section 204 of the 2012 Michigan Department of Transportation Standard Specifications for Construction, the City of Ann Arbor Standard Specifications, the plans, and as specified herein.

The work includes removal of the existing guardrail, beam elements, posts, anchorages, including concrete

blocks and sleeves, hardware and other items.

MATERIALS

Materials shall be in accordance with Section 204 of the 2012 Michigan Department of Transportation Standard Specifications for Construction, the City of Ann Arbor Standard Specifications, the plans, and as specified herein.

CONSTRUCTION

Construction shall be in accordance with Section 204 of the 2012 Michigan Department of Transportation Standard Specifications for Construction, the City of Ann Arbor Standard Specifications, the plans, and as specified herein.

MEASUREMENT AND PAYMENT

The completed work as described will be measured and paid for using the following pay item.

Pay Item	Pay Unit
Guardrail, Rem	Foot

Payment for Guardrail, Rem includes equipment, labor and materials to remove and dispose of the existing guardrail and guardrail elements as described herein. The Engineer will measure Guardrail, Rem along the face of the existing guardrail installation.

DETAILED SPECIFICATION
FOR
ITEM #8120012– BARRICADE, TYPE III, HIGH INTENSITY, DOUBLE SIDED, LIGHTED, FURN
ITEM #8120013 – BARRICADE, TYPE III, HIGH INTENSITY, DOUBLE SIDED, LIGHTED, OPER
ITEM #8120140– LIGHTED ARROW, TYPE C, FURN
ITEM #8120141 – LIGHTED ARROW, TYPE C, OPER
ITEM #8120250 – PLASTIC DRUM, HIGH INTENSITY, FURN
ITEM #8120251 – PLASTIC DRUM, HIGH INTENSITY, OPER
ITEM #8120350 – SIGN, TYPE B, TEMP, PRISMATIC, FURN
ITEM #8120351 – SIGN, TYPE B, TEMP, PRISMATIC, OPER

DESCRIPTION

This work shall consist of protecting and maintaining vehicular and pedestrian traffic, in accordance with Sections 103.05, 103.06, 812, and 922, of the 2012 MDOT Standard Specifications for Construction; Part 6 of the Michigan Manual of Uniform Traffic Control Devices, Latest Revised Edition (MMUTCD); and the City Standard Specifications, except as modified herein.

MATERIALS, EQUIPMENT, AND CONSTRUCTION METHODS

General

Materials and equipment shall meet the requirements specified in the above-designated sections of the MDOT Standard Specifications.

The Contractor shall maintain traffic such that no vehicle shall be required to drive into active work areas.

The Contractor shall maintain pedestrian traffic at all times. If the project work zone impedes pedestrian traffic along the sidewalk at any time, the Contractor shall provide a flag person to assist in the safe passage of pedestrians around the active zone. For maintaining normal pedestrian traffic while performing sidewalk and driveway repair, Type I barricades shall be placed by the Contractor, as directed by the Engineer. "Sidewalk Closed" and/or "Cross Here" signs shall be placed, by the Contractor, when directed by the Engineer. All items pertaining to maintaining pedestrian traffic shall be paid for under "Traffic Regulator Control".

All temporary traffic/pedestrian control devices furnished by the Contractor shall remain the property of the Contractor. The City shall not be responsible for stolen or damaged signs, barricades, barricade lights or other traffic maintenance items. The Contractor shall replace missing traffic control devices immediately, at no additional cost to the City.

All existing signs, and signs erected by the City of Ann Arbor on this project shall be preserved, protected, and maintained by the Contractor. Existing City owned signs which are damaged by the Contractor during the work will be repaired by the City at the Contractor's expense.

Parking violation citations issued to the Contractor, subcontractor and material suppliers, including their employees, shall be enforced under appropriate City Code.

The Contractor shall replace missing or damaged traffic control devices, as directed by the Engineer. When traffic control devices have been damaged by, or due to, the negligence of the Contractor, his subcontractors or material suppliers, the traffic control devices shall be replaced at the Contractor's expense.

Plastic Drums; Type III Barricades; Type B Temporary Signs

The Contractor shall furnish and operate these items as directed by the Engineer.

Type III Barricades shall have standard orange-and-white stripes on both sides of the barricade.

Sufficient signs shall be provided by the Contractor to insure the safety of the workers and the general public in accordance with the current MMUTCD.

"Construction Ahead" warning signs shall be placed, as indicated on the Plans, or as directed by the Engineer, prior to the start of work, regardless of the nature, magnitude or duration of the work.

No-Parking Signs and Posts

Prior to the commencement of any construction activity, the Contractor shall place No-Parking signs as directed by the Engineer. The Contractor shall obtain a permit for "Temporary Permission of Reserve Parking Lane for Work Related Purposes" from the City of Ann Arbor Project Management Services Unit. This permit shall be obtained a minimum of 5 days prior to the posting of No-Parking signs.

The City will furnish No-Parking signs to the Contractor at no cost. The Contractor shall furnish the signposts and shall securely bolt the signs to the signposts as directed by the Engineer. The Contractor shall install the signposts at least 2-feet deep into the ground, and there shall be a minimum 6-feet and maximum 7-feet clearance maintained between the bottom of the sign and the ground. The signs shall be placed at 75-foot intervals (or as necessary) to eliminate parking in the construction area.

The installation of No-Parking signs shall be in accordance with the permit. No-Parking signs shall be installed by the Contractor, as directed by the Engineer, **at least 48 hours prior to the proposed start-of-work/enforcement date**.

No-Parking signs shall be returned to the City at the completion of the work. The cost of unreturned signs will be back charged to the Contractor.

No-Parking signs shall be covered by the Contractor, thereby allowing on-street parking, until between 48 and 36 hours prior to the start of the work. No-Parking signs shall be covered by the Contractor whenever there is no work being performed for a period of time longer than 72 hours.

MEASUREMENT AND PAYMENT

General

All temporary traffic/pedestrian control devices furnished by the Contractor shall remain the property of the Contractor. The City shall not be responsible for stolen or damaged signs, barricades, barricade lights or other traffic maintenance items. The Contractor shall replace missing traffic control devices immediately, at no additional cost to the City.

Costs for transporting barricades and other traffic control devices shall be included in the bid prices for the individual items of work.

Barricade Type III - Furnish and Operate

Payment for furnishing and operating lighted Type III barricades shall be for the maximum quantity in-place at any one time during the work of the entire project (all streets).

Temporary Sign - Type B

Payment for Type B signs shall be for the maximum quantity used on each street.

Plastic Drum – Furnish and Operate

There will be a one-time payment for each street for the maximum number of lighted drums in-place (operated) at any one time, as directed by the Engineer.

Lighted Arrow Boards

Measurement for furnishing and operating Lighted Arrow Boards will be for the maximum quantity in-place at any one time during the work of the entire project (all streets).

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

PAY ITEM	PAY UNIT
Plastic Drum, High Intensity, Furn	Each
Plastic Drum, High Intensity, Oper	Each
Barricade Type III, High Intensity, Double Sided, Lighted, Furn	Each
Barricade Type III, High Intensity, Double Sided, Lighted, Oper	Each
Sign, Type B, Temp, Prismatic, Furn	Square Foot
Sign, Type B, Temp, Prismatic, Oper	Square Foot
Lighted Arrow, Type C, Furn	Each
Lighted Arrow, Type C, Oper	Each

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

DETAILED
SPECIFICATION FOR
ITEM # 8167002 –
TURF ESTABLISHMENT

DESCRIPTION

This work shall consist of furnishing and placing 4" of Engineer-approved topsoil, seeding and applying mulch to lawn areas, and placing erosion control matting as indicated on the plans, as detailed in the specifications, or as directed by the Engineer.

The related work of preparing the earth bed, furnishing, and placing the topsoil, furnishing the seed mixtures, furnishing the fertilizer, sowing the seed, furnishing and installing the erosion control matting and watering shall conform to the requirements of this Detailed Specification and Section 816, Turf Establishment, of the Michigan Department of Transportation (MDOT) 2012 Standard Specifications for Construction.

MATERIALS

The materials shall meet the requirements specified in the 2012 MDOT Standard Specifications for Construction except as specified herein:

- Seed shall be fresh, clean, dry, new-crop seed complying with the AOSA's "Rules for Testing Seed", tested for purity and germination tolerances.

Variety Proportion	By Weight	Purity	Germination
Baron Kentucky Bluegrass	25%	90	80
Kentucky Bluegrass 98/80	15%	98	80
Park Kentucky Bluegrass	15%	90	80
Omega III Perennial Ryegrass	20%	98	90
Creeping Red Fescue	25%	95	90

Maximum weed content shall be 0.30%.

- Fertilizers shall be a Class A. The percentages by weight shall be at a minimum 10N-10P-10K or as required and approved by the Engineer.

- The seed, fertilizer, and adhesive (mulch binder) shall be mixed together and applied at one time.

- Water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances.

Erosion Control Blanket:

Straw/jute blanket shall be constructed with a 100% agricultural straw matrix with jute and cotton netting on top and bottom, be 100% biodegradable, and have a typical functional longevity of 12 months. Use 6 inch long biodegradable stakes 24 inch O.C. or as directed by the Engineer. Plastic weaving will not be permitted.

MAINTENANCE AND ACCEPTANCE

It is the responsibility of the Contractor to establish a dense, vigorous, weed free lawn of permanent grasses, free from mounds and depressions prior to final acceptance and payment of this project. Any portion of a seeded area that fails to show a uniform germination shall be re-seeded. Such re-seeding shall be at the Contractor's expense and shall continue until a dense, vigorous and weed free lawn is established.

The Contractor shall maintain all lawn areas until they have been accepted by the Engineer. Lawn maintenance shall begin immediately after the grass seed is in place, and shall continue until final acceptance with the following requirements:

- Lawns shall be protected and maintained by watering, mowing, and reseeding as necessary, until the period of time when the final acceptance and payment is made. The Contractor shall establish a uniform, dense, vigorous, and weed-free stand of the specified grasses. Maintenance includes, but is not limited to; deposition of additional topsoil; re-seeding; watering; fertilizing; mowing, and any other work as required to correct all settlement, erosion, germination, and establishment issues until the date of final acceptance by the Engineer.

- Damage to seeded areas resulting from erosion shall be repaired by the Contractor at the Contractor's expense. Scattered bare spots in seeded areas will not be allowed over three (3) percent of the area nor greater than 6"x 6" in size.

When the above requirements have been fulfilled, the Engineer will accept the lawn.

MEASUREMENT AND PAYMENT

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

PAY ITEM	PAY UNIT
Turf Establishment	Square Yard

"Turf Establishment" will be measured by area in square yards and will be paid for at the contract unit prices which shall be payment in full for all labor, materials, and equipment needed to accomplish this work.

Topsoil placement shall occur at the locations called for on the plans or, as directed by the Engineer. The unit price for "Turf Establishment" shall include the grading of the area to receive the topsoil, preparing the earth bed, spreading and raking the topsoil to provide a uniform surface free of large clods, lumps, rocks, brush, roots, or other deleterious materials, as determined by the Engineer.

Any damage or soiling to signs, fences, trees, pavements, or structures shall be repaired and/or cleaned by the Contractor at the Contractor's sole expense.

After initial placement of the topsoil and mulch mixture(s), fifty (50) percent of the total quantity placed for each item will be certified for payment. The remaining fifty (50) percent of the total quantities will be held by the Engineer until such time as all lawn areas have been established and accepted by the Engineer.

Final acceptance shall occur no sooner than June 15th of the year after the year in which the lawn areas were initially planted during the previous spring planting season; or, final acceptance will occur no sooner than November 1st of the year after the year in which the lawn areas were initially planted during the previous summer planting season.

In no case shall lawn areas be accepted in the same year in which they were planted.

DETAILED SPECIFICATION
FOR
ITEM #8167002 – LANDSCAPING MAINTENANCE AND WARRENTY, 1ST YEAR

DESCRIPTION

The landscape maintenance and warranty work shall cover all planting work included in the Detailed Specification for "Planting Items." Watering, removing weeds, and completing all necessary tasks to maintain a healthy stand of plants, and Balled and Burlapped (B&B) Trees as shown on the plans and/or as specified herein is also included in these items of work. Complete this work according to the Section 815, 816 & 917 of the Michigan Department of Transportation (MDOT) 2012 Standard Specifications for Construction and as described herein. Extent of work shall include, but not be limited to:

1. Watering
2. Weed Control
3. Mulching
4. Disease and insect control
5. Pruning
6. Fertilizer Application
7. Removal of tree support and tags

MATERIALS

Mulch

Mulch shall be composted, double processed, shredded hardwood bark, free from foreign material and fragments, and shall not contain pieces that are in excess of 2 inches in any dimension. Bark will not be accepted. Colored or dyed mulch will not be accepted.

Pesticides & Herbicides

Materials shall comply with Local, State and Federal regulations.

The Contractor shall post signs with public notice prior to any application of pesticide. The signs shall read: "Notice of Pesticide Application", and will include the following information: the name of the pesticide; the date of application; and the appropriate warning term for the EPA toxicity category. These terms are, for toxicity category I: DANGER-POISON. For category II: WARNING. For category III & IV:

CAUTION. A website containing more information with regard to the chemicals applied will be printed on them.

Herbicide Types:

Herbicide A - Glyphosate, a non-selective herbicide shall be used to eradicate existing vegetation. It shall be used according to the manufacturer's label.

Herbicide B - Sethoxydim, a selective herbicide shall be used to selectively remove invasive grass from prairie planting and wet meadow planting (if not adjacent to water). It shall be used according to the manufacturer's label.

Herbicide C - Rodeo™, a non-selective herbicide shall be used to eradicate existing vegetation in areas adjacent to open water. It shall be used according to the manufacturer's label.

Common IPM (Integrative Pest Management) practices shall be followed. Pesticides and herbicides shall be used as a last resort.
Fertilizer

Materials shall conform to the standards of the Association of Agricultural Chemists and shall comply with State and Federal regulations.

Fertilizer for B&B trees shall be an organic, slow release with a ratio of 3-1-2 or 3-1-1 or approved substitution.

Maintenance fertilizer for lawn shall contain no phosphorus, shall be derived from an organic product and slow release with a ratio of 27-0-12 or approved substitution.

Delivery, Storage and Handling

Packaged materials shall be delivered in original containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and storage.

Submittals

The Contractor shall submit to the Engineer copies of all field reports prepared by the maintenance supervisor identifying the date of each visit and work items completed during each visit. The receipt of the written field report by the Engineer must occur within one week of the actual site visit. Payment for the work of this Detailed Specification shall not be made without the timely receipt of the field reports by the Engineer. The Contractor shall not be allowed to neglect the maintenance, or perform it in a manner that is non-compliant in the opinion of the Engineer, with this Detailed Specification of any planted material in lieu of not being paid for the work.

MAINTENANCE

The Contractor, prior requesting a letter of Provisional Acceptance from the Engineer, shall submit two copies of a maintenance schedule detailing the work items identified under this Detailed Specification. This schedule shall include a 52 week table covering the one-year warranty period, identifying all weekly site visits and the tasks to be performed during each visit. The schedule shall show that no maintenance will occur between the periods of October 15th and April 1st, unless otherwise required by related Detailed Specifications.

Provisional Acceptance: After planting zone/type is finished, the Engineer and Contractor shall perform a

site evaluation to determine if planting is complete. After any additional changes have been performed by the Contractor, the Engineer will issue a written Provisional Acceptance letter, after which the Maintenance and Warranty Periods will commence for one full year.

Maintenance of plantings shall begin immediately after Provisional Acceptance is granted and shall continue as required until final acceptance at the end of the warranty period. Maintenance required prior to Provisional Acceptance shall be included in the contract unit price for each plant. Provisional Acceptance may be granted for different planting zones/types (e.g. B&B trees, Ditch Planting, etc.) within the project based on project schedule constraints.

The Contractor shall submit to the Engineer copies of all field reports prepared by the maintenance supervisor identifying the date of each visit and work items completed during each visit. This will be required prior to each payment.

Maintenance shall include all measures necessary to establish and maintain plants in a vigorous and healthy growing condition.

The Contractor shall inspect the plantings at least once per week during the warranty period and promptly perform needed maintenance. Weekly maintenance shall be conducted for one full year after Provisional Acceptance is granted.
Watering

Water shall come from a source approved by the Engineer.

Monitor all plants during site visits for signs of stress due to lack adequate moisture in the rootzone.

Water as required to keep all plants in optimum condition (1 inch of total water per week, including rainfall) and maintain an optimum supply of moisture within the root zone. Recurring overly dry or wet conditions shall be grounds for rejection of plant material. Watering of all deciduous plants and trees shall be performed using the probe method and by the use of water reservoir bags. Each balled and burlapped tree shall receive its own individual water reservoir bag. Water shall not be applied with a force that will displace mulch or cause soil erosion, and shall not be applied so quickly that the mulch and plants cannot absorb it. Apply water in such a manner that it is allowed to penetrate down into root zone of plant.

Any supplemental watering visits necessary will be paid for in accordance with Section 815.04C.3, and must be approved by the Engineer prior to visit.

Weeding/Cultivating

Frequency shall be every visit.

Methods: Weeds shall be removed by hand and include removing the entire root mass of the weed. Before application of any herbicide the Contractor shall receive approval of the Engineer. A selective herbicide shall be applied according to manufacturer's directions.

Herbicides shall only be used when and where necessary as approved by the Engineer. Manufacturer's directions and precautions must be followed rigorously. Excess herbicides shall be properly removed from the site.

The posting of signs as a public notification of herbicide application will be required 24 hours before and maintained for 48 hours following application.

Weed Control: All Planting Areas

Weeding of all planting areas shall occur with each maintenance visit and in no instance shall they be allowed to propagate such that invasive weed species (Sweet Clover, Burdock, Wild Carrot, Purple Knapweed, Canada Thistle, Queen Anne's Lace, Purple Loosestrife, Phragmites, Bindweed, Crab Grass, Lamb's Quarters, non-native honeysuckle, buckthorn, autumn olive, Norway maple, bindweed, barnyard grass, etc.) may set their seed. Additional weeding activities may need to be performed as determined by Engineer.

Herbicide applications for aggressive weeds shall conform to the following guidelines:

1. Invasive forbs such as purple knapweed, purple loosestrife, garlic mustard, Queen Anne's Lace, Canada thistle, bindweed, lambs quarters, phragmites or other invasive forbs shall be spot controlled on an on-going basis beginning in June with Herbicide A through the end of the second growing season and/or before the plants set seed.
2. Invasive grasses such as crabgrass, smooth brome, reed canary, barnyard or other invasive grass shall be spot controlled beginning in May on an on-going basis with Herbicide B through the end of the second growing season and/or before the plants set seed.
3. Invasive woody plants such as non-native honeysuckle, buckthorn, autumn olive, Norway maple, shall be spot controlled beginning in June on an on-going basis with Herbicide A through the end of the second growing season and/or before the plants set seed.
4. Planting Areas adjacent to open water that contain invasive weeds shall be spot controlled beginning in June with Herbicide C until the end of the first full growing season and/or before the plants set seed.

Mulching

Monitoring: All mulch beds shall be reviewed in June and September for each Maintenance and Warranty Period. Any beds that do not meet the following conditions shall be replenished:

1. Depth shall be three (3) inches throughout the mulch saucer for individual trees.
2. Depth shall be two (2) inches throughout the bioswale areas.
3. Do not allow mulch to be deeper than four (4) inches for individual trees.
4. Keep mulch away from root collar of trees.

Disease and Insect Control

Monitoring for diseases and insects shall be the responsibility of the Contractor. The Contractor shall monitor all plants at all times for disease and insect problems.

Treatment shall take place in accordance with common IPM practices.

Pesticides shall only be used when and where necessary as approved by the Engineer. Manufacturer's directions and precautions must be followed rigorously. Excess pesticides shall be properly removed from the site.

The posting of signs as a public notification of pesticide application will be required 24 hours before and maintained for 48 hours following application.

Pruning

Prune all dead wood at first live lateral bud in accordance with standard horticulture practices using sharp instruments cleaned frequently. Pruning shall enhance plant development and ornamental qualities. Do not prune terminal leader or branch tips. A plant's natural form shall not be compromised by any pruning activities.

Additional pruning may be required at the request of the Engineer in order to decrease public liability factors.

Remove all standing dead material from perennials and grasses at earliest Spring maintenance visit.

Remove immediately after pruning all dead, broken and diseased growth and other pruning debris from the site and dispose of in an environmentally sensitive manner.

Plant material that is "topped" by the Contractor shall be replaced at the Contractor's expense.

Maintenance Fertilizer Application

Application shall be according to manufacturer's directions.

Woody Plants

1. Maintenance Fertilizer application for woody plants shall occur in November of the Second Maintenance and Guarantee Period
2. Topdress at a rate of 1 pound of nitrogen per 1,000 square feet.

Lawn

1. Maintenance Fertilizer application for lawn shall occur during the period of May through October as needed to establish and maintain healthy, vigorous, turf during the First and Second Maintenance and Warranty Periods. For Spring seeding, commencement of maintenance fertilizer shall begin during the first growing season. For Fall seeding, commencement of maintenance fertilizer shall begin the subsequent spring.
2. Fertilize by spreading fertilizer at a rate of one (1.0) pounds of nitrogen per 1,000 square feet.

Removal of Tree Support and Tags

Repair all damaged guys and stakes during the First Maintenance Period.

Remove all stakes, guys, labels and support material at the end of the First Maintenance Period and remove from site.

Final Acceptance will be granted when the above requirements have been met, but in no case sooner than 2 full years after the initial installation of plant material.

Should the Contractor fail to meet the requirements for Final Acceptance, maintenance and warranty work shall continue, without additional compensation, until such time as Final Acceptance can be granted.

Warranty

The Contractor shall warrant all plants to be true to botanical name and specified size.

After receiving a Notice of Provisional Acceptance, the Contractor shall maintain all plantings as specified,

and warrant against unsatisfactory growth and improper maintenance for a period of two years.

The Contractor shall not be responsible for defects resulting from City of Ann Arbor negligence, damage by others or unusual phenomena, including predation, lightning, storms, freezing rains, winds over 60 miles per hour, or fires or vandalism that are beyond the Contractor's control.

Replacements

During the warranty period, the Contractor shall replace at his/her sole expense plant materials that are dead or that are, in the opinion of the Engineer, in an unhealthy or unsightly condition. Rejected plant materials shall be removed from the site and legally disposed of by the Contractor at his/her sole expense. The Contractor shall be aware that plants may need to be replaced more than once during the warranty period should the plants be deemed to be in an unhealthy or unsightly condition by the Engineer. The Contractor shall provide the necessary resources in the unit price bid for the work to cover the cost of any needed replacements.

All plant replacement work shall be in accordance with Section 815 of the 2012 MDOT Standard Specifications for Construction and this project's Detailed Specifications.

Plants shall be replaced no later than the next succeeding planting season. Areas damaged by replacement operations shall be fully restored by the Contractor at his/her sole expense.

Final Acceptance Inspection

The final inspection of all planting work, or phase of planting work, will be made by the Engineer and the Contractor just before the final warranty period expires. All plant replacements shall be completed and the site shall be cleaned-up, prior to the inspection.

The final acceptance inspection of plantings or material planted during recognized planting seasons will be made during September for fall planting and by June for spring planting.

Planted areas which do not meet the contract requirements, shall be replanted to the original project specifications and within acceptable planting dates as directed by the Engineer.

MEASUREMENT AND PAYMENT

The completed work as measured will be paid for at the Contract Unit Price for the following contract items (pay items):

PAY ITEM	PAY UNIT
Landscape Maintenance and Warranty, 1st Year	Lump Sum

The lump sum contract price shall include all materials, labor, and equipment required to maintain plant materials in a healthy, thriving, condition; remove weeds throughout the warranty period; and, meet all other performance requirements outlined in this Detailed Specification.

Payment for maintenance during the warranty period shall be based on the lump sum contract amount divided by the number of maintenance visits identified in the maintenance schedule supplied by the Contractor prior to issuance of provisional acceptance. Payments will only be made for maintenance performed and verified through field reports submitted by the Contractor with each pay request. Also included in these items of work are restoration of any area damaged by the Contractor during their maintenance or during replacement planting operations.

CITY OF ANN ARBOR

NOTICE TO BIDDERS – PROJECT MOBILIZATION SPECIFICATION

HRC July 18, 2018

The Contractor is hereby notified that this project will include locations on major and minor roads throughout the City that will not allow closures for a period of longer than 24 hours after start of work. Due to the nature of this project, all mobilization required to move between each location will be included as one cost in the bid price of the Contract Item "General Conditions, Max. $20,000". The cost involved in moving all traffic control devices between each location will be included as one cost in the bid price of the Contract Item "Minor Traffic Devices, Max. $20,000".

CITY OF ANN ARBOR

DETAILED SPECIFICATION
FOR
GUARDRAIL, WOOD BACKING

HRC: ERS 32 of 83 July 20, 2018

a. Description. This work consists of constructing a wood barrier rail along the backside of proposed guardrail segments that run alongside City pathways that receive pedestrian traffic. This work includes furnishing all labor, equipment, and materials required for construction as specified herein.

b. Materials. Provide materials in accordance with section 807 of the Standard Specifications for Construction.

c. Construction. All construction methods must be in accordance with the standard specifications. Replace any existing wood backing material on guardrail that has been approved to remain and construct new wood backing on all proposed guardrail segments as specified in the project documents. Removal of existing wood backing is included in the pay item "Guardrail, Rem – Ft".

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

Pay Item	**Pay Unit**
Guardrail, Wood Backing	Foot

Guardrail, Wood Backing includes the cost of wooden beam elements, miscellaneous hardware and spacer blocks necessary to construct the span.

APPENDIX

- Guardrail Reference Documents, Inspection Reports & Location Map

- MDOT Guardrail Specifications

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

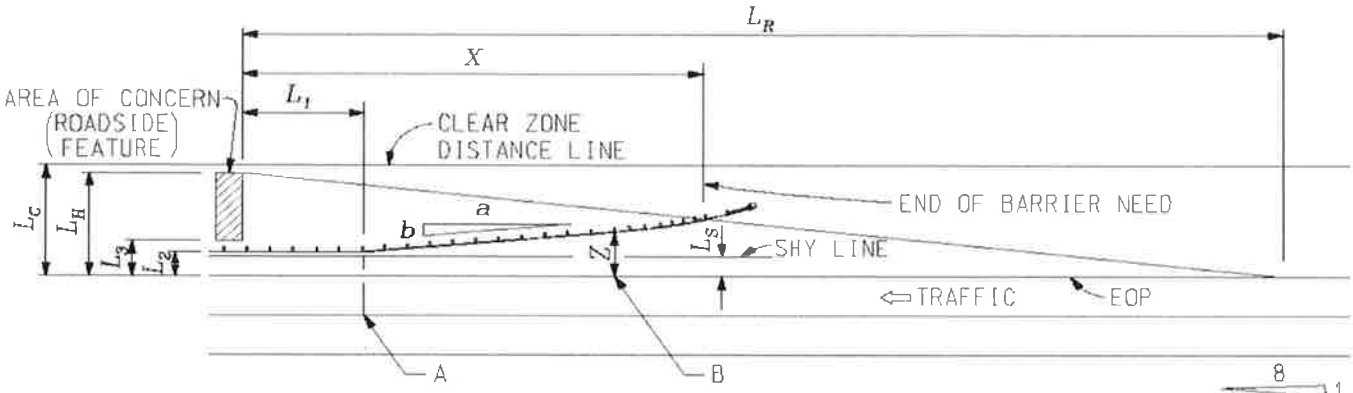
ROUTE **Fuller Road** CONTROL SECTION: _____ JOB # **20160521**

DESIGNED BY **BKD** DATE **5/10/2018** CHECKED BY: EB DATE _____

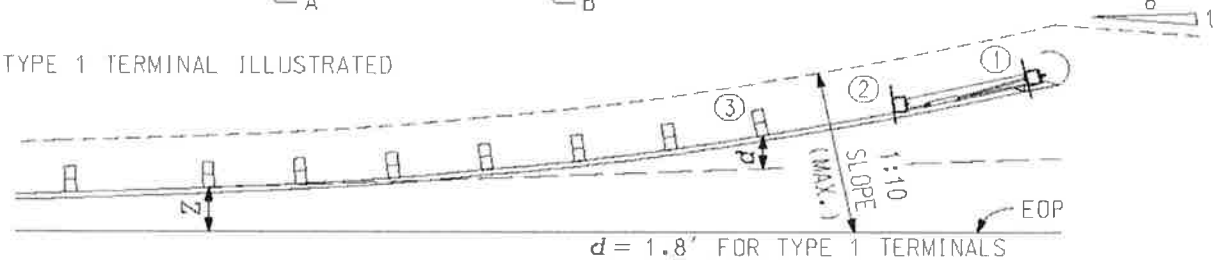
APPROX. STATION OR M.P. RIGHT SIDE DESCRIPTION: **WB Approach to Huron River Bridg**

GUARDRAIL RUN # **017**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT



NOTE: TYPE 1 TERMINAL ILLUSTRATED



$d = 1.8'$ FOR TYPE 1 TERMINALS
$d = 0$ FOR TYPE 2 TERMINALS

$$X = \frac{L_H + (\frac{b}{a})(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right) \frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)(\frac{b}{a}) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED..... X = 130.00

RUNOUT LENGTH (7.01.19)..... L_R = 160.00

GUARDRAIL TAPER RATE (R-59-SERIES)..... $^b/_a$ = _____

E.O.P. TO FACE OF BARRIER (DESIGNED)..... L_2 = 3.00

CLEAR ZONE (7.01.11)..... L_C = SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED)..... L_3 = 3.00

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE..... d = _____

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED)..... L_H = 16.00

LATERAL OFFSET AT END OF FLARE..... Z = 3.00

DESIGN ADT

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S = 5 SHY LINE (7.01.18)

Curve Radius R= N/A '

If guardrail on outside of curve.

Curve Correction Factor Kcz= ___

STATION AT A N/A

STATION AT B _____

NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

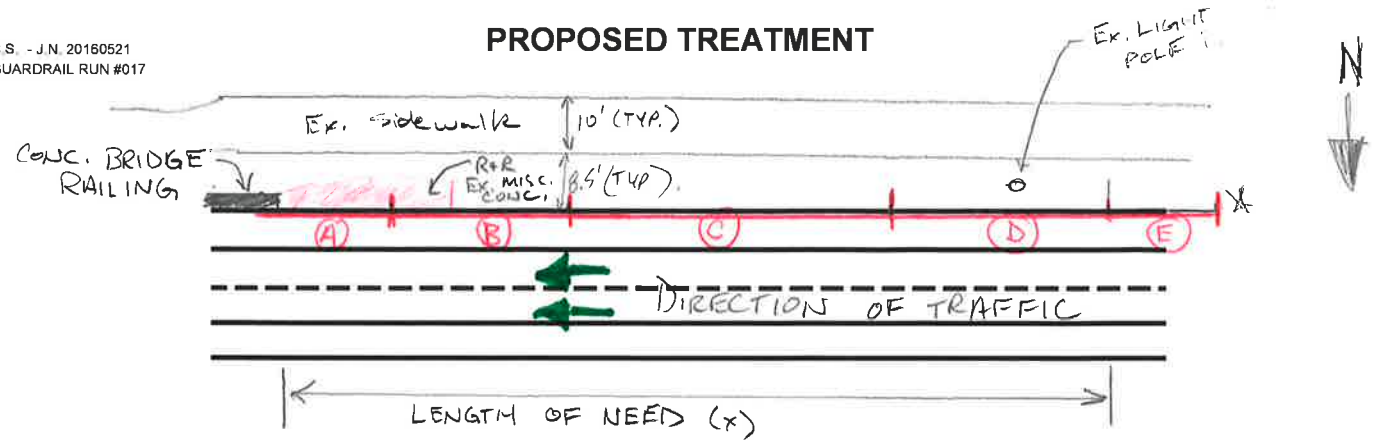
$L_H <= L_C$

LENGTH OF NEED IN ADDITION TO CALCULATED X _____

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #017

PROPOSED TREATMENT



CALCULATIONS OR NOTES

LR = 160 ft (7.01.19)
Calculated X = 130 ft
(D) Approach Terminal = -34.29 ft (Soft Stop) ← Deduction From X (Total Approach Terminal = 50'-9½")
(A) Guardrail Anchorage, Bridge, Det T-4 = -16.87 ft ↳ Part not included in X is 16.5' (E)
(B) Transition from Guardrail Anchorage, Bridge Det T-4 to Guardrail, Type MGS-8 = -28.125 ft
Calculated X Remaining = 130 - 34.29 - 16.87 - 28.125 = 50.715

Guardrail Required
50.715 ÷ 12.5 = 4.05 → USE 4 Each
(C) Additional Guardrail, Type MGS-8 = 4 x 12.5 = 50 ft
Transition is included in item for MGS-8, therefor total Guardrail, Type MGS-8 = 50 + 28.125 = 78.125 ft (C) + (B)

* R&R Ex. Misc. Conc. ⇒ Area = 335 sq. ft = 37 syd
** Remove all ex. guardrail. Quantity includes posts, Bridge Anchorage & Ex. Approach BCT
Inspect ex. Bridge Anchorage in Field and save if in good condition.

PAY ITEMS

** 75 FT Guardrail, Rem

78.125 FT * GUARDRAIL, TYPE MGS-8 (C+B)
6.25 BEAM ELEMENTS

1 EACH GUARDRAIL ANCHORAGE, BRIDGE, DET T-4 (A)

* ~~N/A~~ 130 FT ~~BRIDGE RAILING, THRIE BEAM RETROFIT~~ GUARDRAIL WOOD BACKING, SPECIAL
DO NOT PLACE WOOD BACKING AT APPROACH TERMINAL

1 EACH GUARDRAIL APPROACH TERMINAL, TYPE 2M (D+E)

N/A EACH GUARDRAIL DEPARTING TERMINAL, TYPE ___

3 EACH GUARDRAIL REFLECTOR

N/A CYD EMBANKMENT, LM

* 37 syd Pavt, Rem

* 37 syd Conc Pavt, Misc, Nonreinf, 6inch

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL, TYPE 2M PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

X Total Length of all GR ≈ 146'

Ann Arbor Guardrail Inspections

Inspection Report for:
ASSETID: GR-017

FAIR

General Information:

Asset ID: GR-017	Edge Condition: CURB/GUTTER
Street Name: Fuller Rd	Guardrail Purpose: STRUCTURE - BRIDGE/CULVERT
Road Attribute: ASPHALT	Posted Speed: 30 - 40 MPH
	Number of Lanes: 2

Guardrail Information:

Overall Condition: FAIR	Guardrail Beam Condition: FAIR
Guardrail Type: TYPE B	Guardrail Curved: NO
Length: 75 Feet	

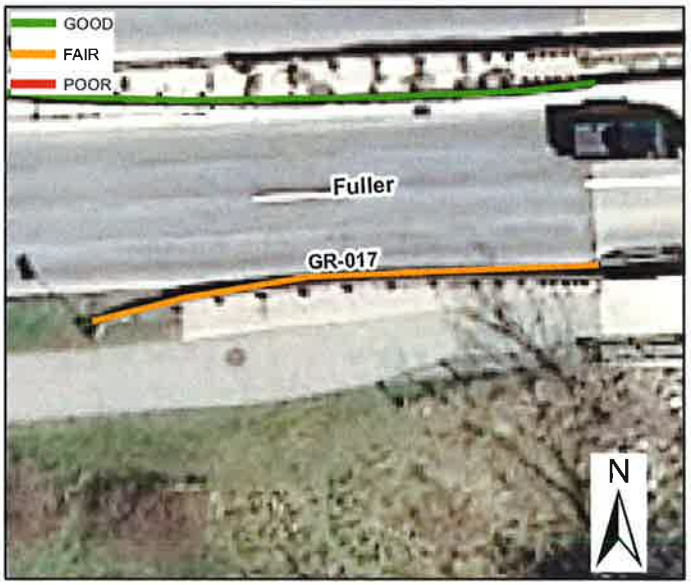
Miscellaneous:

Approach Terminal Type: TYPE 1 - SRT	Approach Terminal Condition: GOOD
Departure Terminal Type: BRIDGE CONNECTION	Departure Terminal Condition: GOOD
Post Type: BOTH	Post and Block Condition: FAIR
Bridge Anchor Type: DETAIL T-3	Bridge Anchor Condition: GOOD

Photo1:

Photo2:

Photo3: (if taken)



Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-017

General Information:

Asset ID: GR-017

Defect: None

Observation 1: SOS

Observation 2: EOS

Defect 1: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

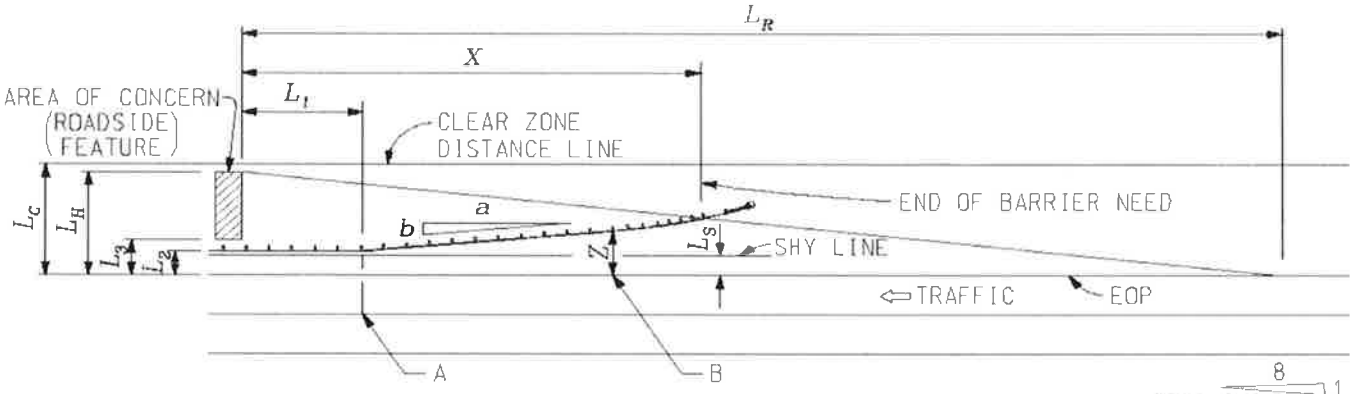
ROUTE **Fuller Road** CONTROL SECTION: _____ JOB # **20160521**

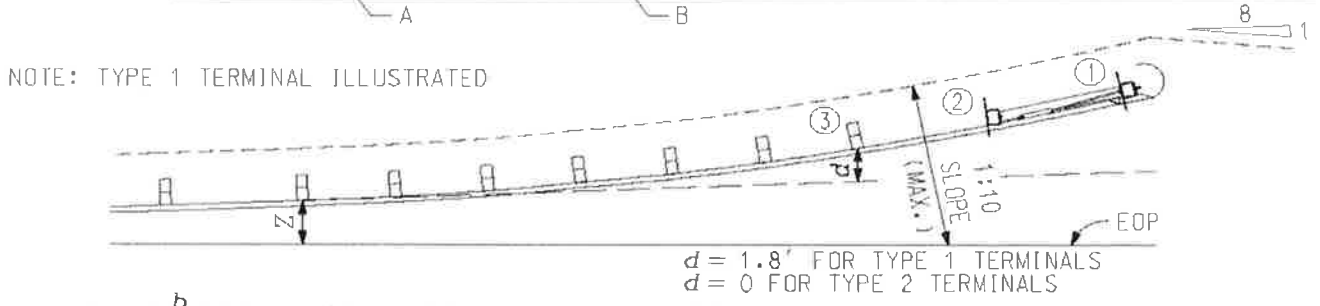
DESIGNED BY **BKD** DATE **5/10/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. **Left Side** DESCRIPTION: **EB Approach to Huron River Bridge**

GUARDRAIL RUN # **018**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





$d = 1.8'$ FOR TYPE 1 TERMINALS
$d = 0$ FOR TYPE 2 TERMINALS

$$X = \frac{L_H + \left(\frac{b}{a}\right)(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right)\frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)\left(\frac{b}{a}\right) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED.....X = 130.00

RUNOUT LENGTH (7.01.19).....L_R = 160.00

GUARDRAIL TAPER RATE (R-59-SERIES).....$^b/_a$ = _____

E.O.P. TO FACE OF BARRIER (DESIGNED).....L_2 = 3.00

CLEAR ZONE (7.01.11).....L_C = SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED).....L_3 = 3.00

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE.....d = _____

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED).....L_H = 16.00

LATERAL OFFSET AT END OF FLARE.....Z = 3.00

DESIGN ADT

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S = 5 SHY LINE (7.01.18)

Curve Radius R= N/A '

If guardrail on outside of curve

Curve Correction Factor Kcz= ___

STATION AT A N/A

STATION AT B _____

LENGTH OF NEED IN ADDITION TO CALCULATED X _____

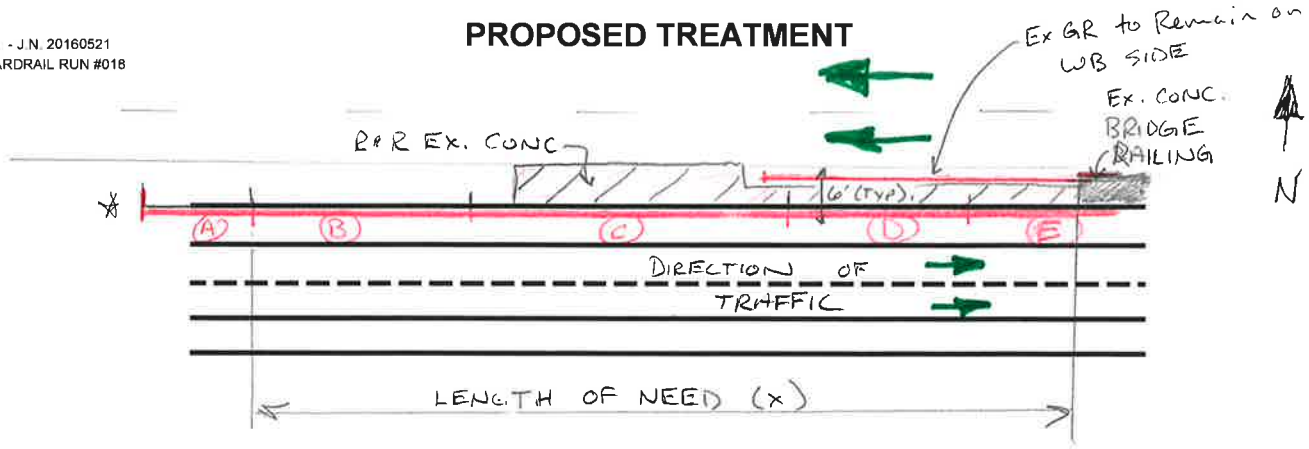
NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

$L_H <= L_C$

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #018

PROPOSED TREATMENT



CALCULATIONS OR NOTES

LR = 160 ft (7.01.19)
Calculated X = 130 ft
Approach Terminal = -34.29 ft (Soft Stop)
Deduction From X (Total Approach Terminal = 50'-9½")
↳ Part not included in x = 16.5'
Guardrail Anchorage, Bridge, Det T-4 = -16.87 ft
Transition from Guardrail Anchorage, Bridge Det T-4 to Guardrail, Type MGS-8 = -28.125 ft
Calculated X Remaining = 130 - 34.29 - 16.87 - 28.125 = 50.715

Guardrail Required
50.715 ÷ 12.5 = 4.05 → USE 4 Each
Additional Guardrail, Type MGS-8 = 4 x 12.5 = 50 ft
Transition is included in item for MGS-8, therefor total Guardrail, Type MGS-8 = 50 + 28.125 = 78.125 ft

PAY ITEMS

Guardrail, Rem = 88 FT
Pavt, Rem = 460 sft = 51 Syd
Pavt, Misc ~~Conc~~ CONC, Nonreinf, 6 inch = 51 Syd

~~PAY ITEMS~~

78.125	FT	*	GUARDRAIL, TYPE MGS-8 (C+D) 6.25 BEAM ELEMENTS
1	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-4 (E)
* ~~N/A~~ 130	FT		GUARDRAIL, WOOD BACKING, SPECIAL ~~BRIDGE RAILING, THRIE BEAM RETROFIT~~ DO NOT PLACE WOOD BACKING AT APPROACH TERMINAL
1	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 2M (A+B)
N/A	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE ___
3	EACH		GUARDRAIL REFLECTOR
N/A	CYD		EMBANKMENT, LM

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL, TYPE 2M PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

* Total Length of all GR = 146'

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-018

GOOD

General Information:

Asset ID: GR-018
Street Name: Fuller Rd
Road Attribute: ASPHALT

Edge Condition: CURB/GUTTER
Guardrail Purpose: STRUCTURE - BRIDGE/CULVERT
Posted Speed: 30 - 40 MPH
Number of Lanes: 2

Guardrail Information:

Overall Condition: GOOD
Guardrail Type: TYPE B
Length: 88 Feet

Guardrail Beam Condition: FAIR
Guardrail Curved: NO

Miscellaneous:

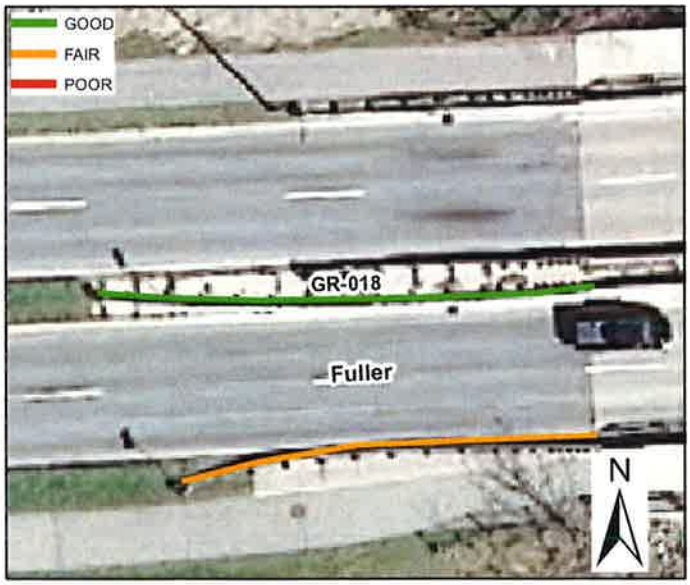
Approach Terminal Type: TYPE 1 - SRT
Departure Terminal Type: BRIDGE CONNECTION
Post Type: BOTH
Bridge Anchor Type: DETAIL T-3

Approach Terminal Condition: GOOD
Departure Terminal Condition: GOOD
Post and Block Condition: FAIR
Bridge Anchor Condition: GOOD

Photo1:

Photo2:

Photo3: (if taken)



Ann Arbor Guardrail Inspections

Inspection Report for:
ASSETID: GR-018

General Information:

Asset ID: GR-018

Defect: None

Observation 1: SOS

Observation 2: EOS

Defect 1: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

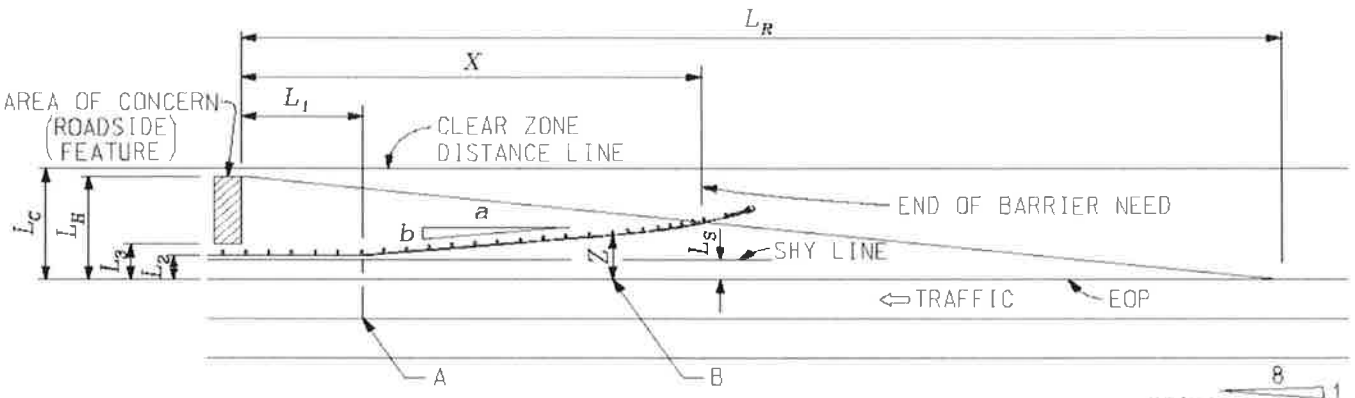
ROUTE **Fuller Road** CONTROL SECTION: _____ JOB # **20160521**

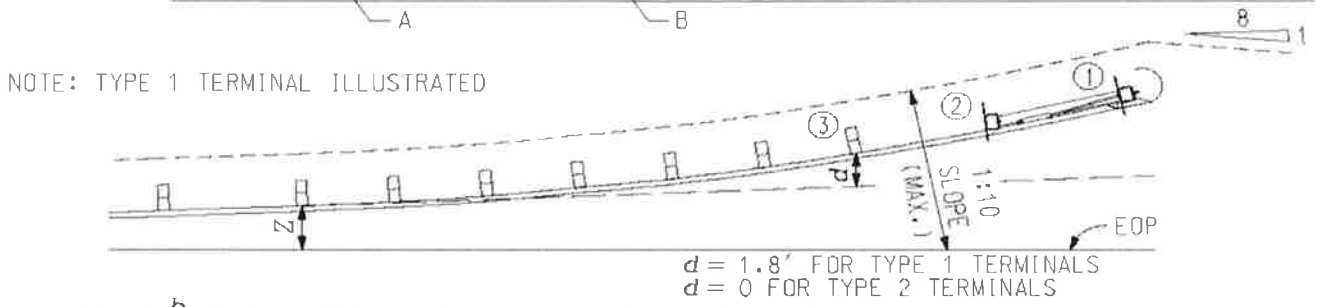
DESIGNED BY **BKD** DATE **5/11/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. **Right Side** DESCRIPTION: **WB Approach to Huron River Bridg**

GUARDRAIL RUN # **021**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





$d = 1.8'$ FOR TYPE 1 TERMINALS
$d = 0$ FOR TYPE 2 TERMINALS

$$X = \frac{L_H + \left(\frac{b}{a}\right)(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}} \qquad X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right)\frac{L_H}{L_R}} \qquad Z = (X - L_1 - 25)\left(\frac{b}{a}\right) + L_2$$

$Z = L_2$ (For Type 2 Terminals)

LENGTH OF NEED..... X = 130.00

RUNOUT LENGTH (7.01.19)..... L_R = 160.00

GUARDRAIL TAPER RATE (R-59-SERIES)..... $^b/_a$ =

E.O.P. TO FACE OF BARRIER (DESIGNED)..... L_2 = 3.00

CLEAR ZONE (7.01.11)..... L_C = SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED)..... L_3 = 3.00

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE..... d =

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED)..... L_H = 16.00

LATERAL OFFSET AT END OF FLARE..... Z = 3.00

DESIGN ADT

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S = 5 SHY LINE (7.01.18)

Curve Radius R= N/A

If guardrail on outside of curve.

Curve Correction Factor Kcz= ____

STATION AT A N/A

STATION AT B _____

LENGTH OF NEED IN ADDITION TO CALCULATED X _____

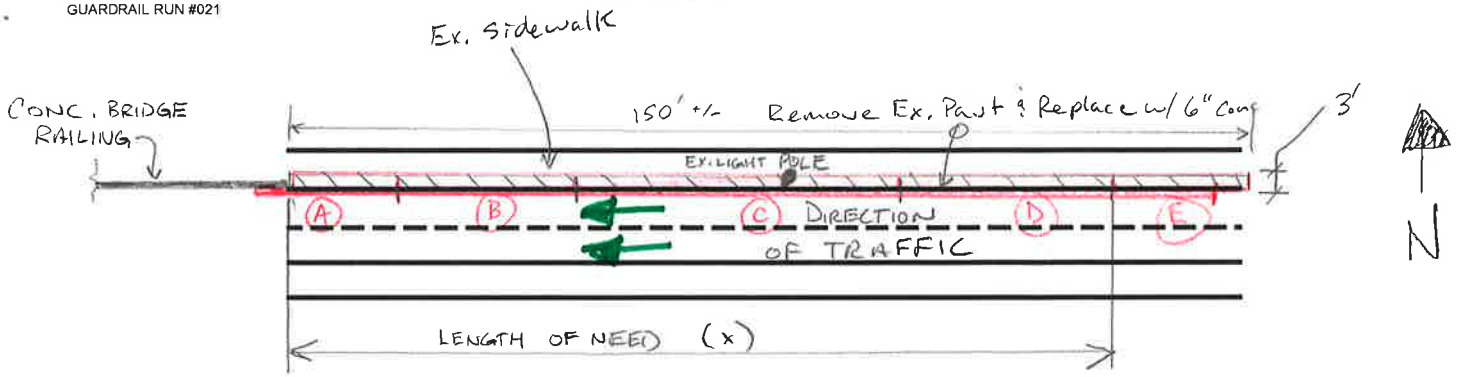
NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

$L_H <= L_C$

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #021

PROPOSED TREATMENT



CALCULATIONS OR NOTES

LR = 160 ft (7.01.19)
Calculated X = 130 ft
(E) Approach Terminal = -34.29 ft (Soft Stop) ← Deduction From X (Total Approach Terminal = 50'-9½")
↳ Part not included in X is 16.5'
(A) Guardrail Anchorage, Bridge, Det T-4 = -16.87 ft
(B) Transition from Guardrail Anchorage, Bridge Det T-4 to Guardrail, Type MGS-8 = -28.125 ft
Calculated X Remaining = 130 - 34.29 - 16.87 - 28.125 = 50.715

Guardrail Required
50.715 ÷ 12.5 = 4.05 → USE 4 Each
(C) Additional Guardrail, Type MGS-8 = 4 x 12.5 = 50 ft
Transition is included in item for MGS-8, therefor total Guardrail, Type MGS-8 = 50 + 28.125 = 78.125 ft
Pavt R&R = 150' x 3' = 450 SFT = 50 SYD (C)+(B)
↳ Ex. Sidewalk appears to by HMA. Saw cut for clean removal and replace with 6" Conc. around guardrail.

PAY ITEMS

~~75~~ 76	FT	*	GUARDRAIL, REM
78.125	FT	*	GUARDRAIL, TYPE MGS-8 (B+C)
1	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-4 (A)
*130	FT		GUARDRAIL, WOOD BACKING, SPECIAL
			DO NOT PLACE WOOD BACKING AT APPROACH TERMINAL
1	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 2M (D+E)
N/A	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE ___
3	EACH		GUARDRAIL REFLECTOR
50	SYD		PAVT, REM
50	SYD		CONC PAVT, MISC, NONREINF, 6 INCH

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL, TYPE 2M PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-021

FAIR

General Information:

Asset ID: GR-021
Street Name: Fuller Rd
Road Attribute: ASPHALT

Edge Condition: CURB/GUTTER
Guardrail Purpose: STRUCTURE - BRIDGE/CULVERT
Posted Speed: 30 - 40 MPH
Number of Lanes: 2

Guardrail Information:

Overall Condition: FAIR
Guardrail Type: TYPE B
Length: 76 Feet

Guardrail Beam Condition: FAIR
Guardrail Curved: NO

Miscellaneous:

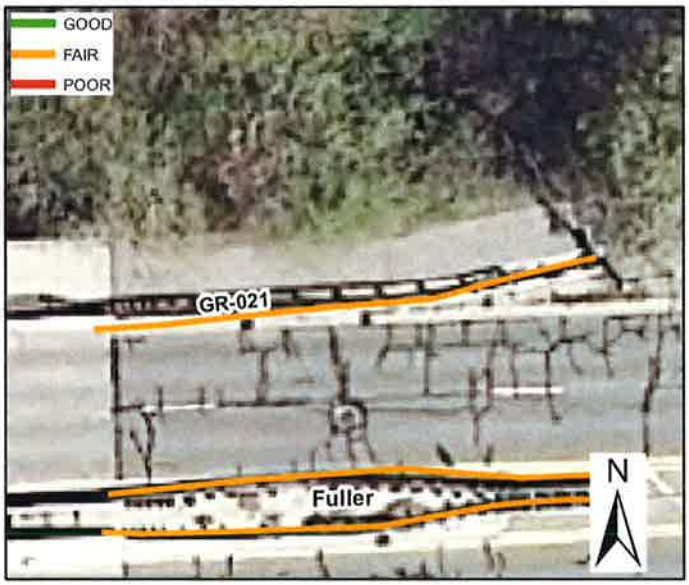
Approach Terminal Type: TYPE 1 - SRT
Departure Terminal Type: BRIDGE CONNECTION
Post Type: BOTH
Bridge Anchor Type: DETAIL T-3

Approach Terminal Condition: GOOD
Departure Terminal Condition: GOOD
Post and Block Condition: FAIR
Bridge Anchor Condition: GOOD

Photo1:

Photo2:

Photo3: (if taken)



Ann Arbor Guardrail Inspections

Inspection Report for:
ASSETID: GR-021

General Information:

Asset ID: GR-021	Defect: None

Observation 1: SOS

Observation 2: EOS

Defect 1: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

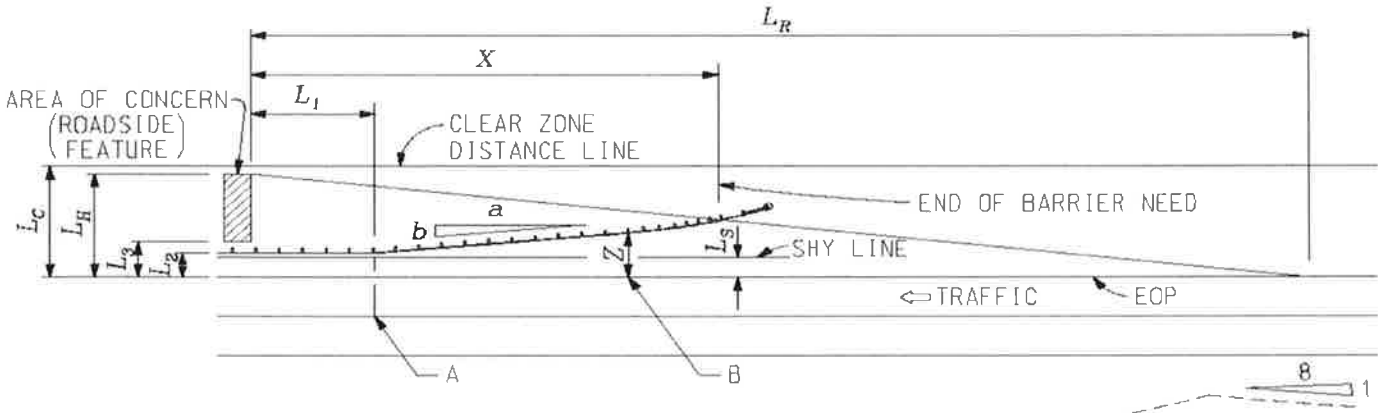
ROUTE **Platt Rd** CONTROL SECTION: _____ JOB # **20160521**

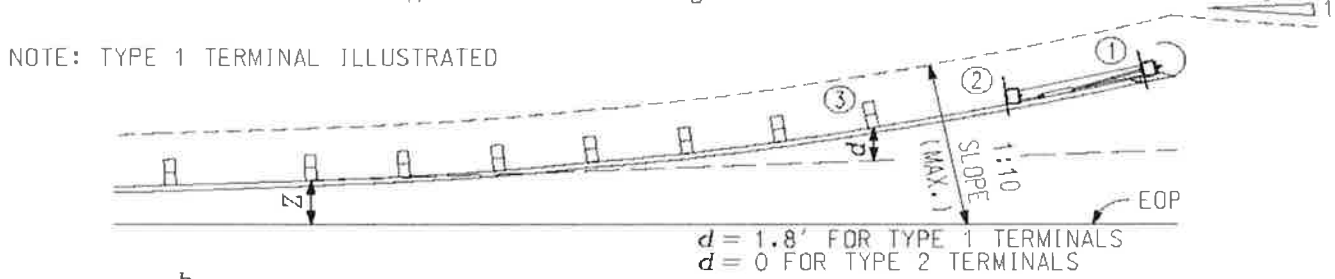
DESIGNED BY **ERS** DATE **5/10/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. _____ DESCRIPTION: **W. side, S. of Huron Pkwy**

GUARDRAIL RUN # **036**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





$d = 1.8'$ FOR TYPE 1 TERMINALS
$d = 0$ FOR TYPE 2 TERMINALS

$$X = \frac{L_H + \left(\frac{b}{a}\right)(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right)\frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)\left(\frac{b}{a}\right) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED.....X = _____

RUNOUT LENGTH (7.01.19).....L_R= 160.00

GUARDRAIL TAPER RATE (R-59-SERIES).....$^b/_a$ = _____

E.O.P. TO FACE OF BARRIER (DESIGNED).....L_2= _____

CLEAR ZONE (7.01.11).....L_C= SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED).....L_3= _____

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE.....d = _____

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED).....L_H= _____

LATERAL OFFSET AT END OF FLARE.....Z = _____

DESIGN ADT

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S= 5 SHY LINE (7.01.18)

Curve Radius R= N/A '

If guardrail on outside of curve.

Curve Correction Factor Kcz= 1.3

STATION AT A N/A

STATION AT B _____

LENGTH OF NEED IN ADDITION TO CALCULATED X _____

NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

$L_H <= L_C$

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #036

PROPOSED TREATMENT

CALCULATIONS OR NOTES

After performing a UD-10 evaluation of the intersection of Platt Rd. and S. Huron Pkwy it was determined that there was no crash history to support the continued existance of guardrail at this location. The pay items "Guardrail, Rem (ft)" and "Turf Establishment (syd)" will be used to return the ROW to its original state.

PAY ITEMS

_____	FT	*	GUARDRAIL, TYPE MGS-8
			#DIV/0!
_____	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-4
N/A	FT		BRIDGE RAILING, THRIE BEAM RETROFIT
_____	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 1B
2	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE MGS
_____	EACH		GUARDRAIL REFLECTOR
N/A	CYD		EMBANKMENT, LM
N/A	EACH		GUARDRAIL TERMINAL END SHOE (WHEN SPECIFIED)

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL TYPE 1B PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5' ROUND TO NEXT HIGHEST RAIL LENGTH.

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-036

POOR

General Information:

Asset ID: GR-036	Edge Condition: CURB/GUTTER
Street Name: Platt Rd	Guardrail Purpose: OTHER
Road Attribute: ASPHALT	Posted Speed: 30 - 40 MPH
	Number of Lanes: 5

Guardrail Information:

Overall Condition: POOR	Guardrail Beam Condition: GOOD
Guardrail Type: TYPE B	Guardrail Curved: NO
Length: 35 Feet	

Miscellaneous:

Approach Terminal Type: OTHER	Approach Terminal Condition: POOR
Departure Terminal Type: OTHER	Departure Terminal Condition: FAIR
Post Type: WOOD	Post and Block Condition: GOOD
Bridge Anchor Type: N/A	Bridge Anchor Condition: N/A

Photo1:

Photo2:

Photo3: (if taken)

Ann Arbor Guardrail Inspections

Inspection Report for:
ASSETID: GR-036

General Information:

Asset ID: GR-036

Defect: None

Observation 1: SOS

Observation 2: EOS

Defect 1: None

Defect 2: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

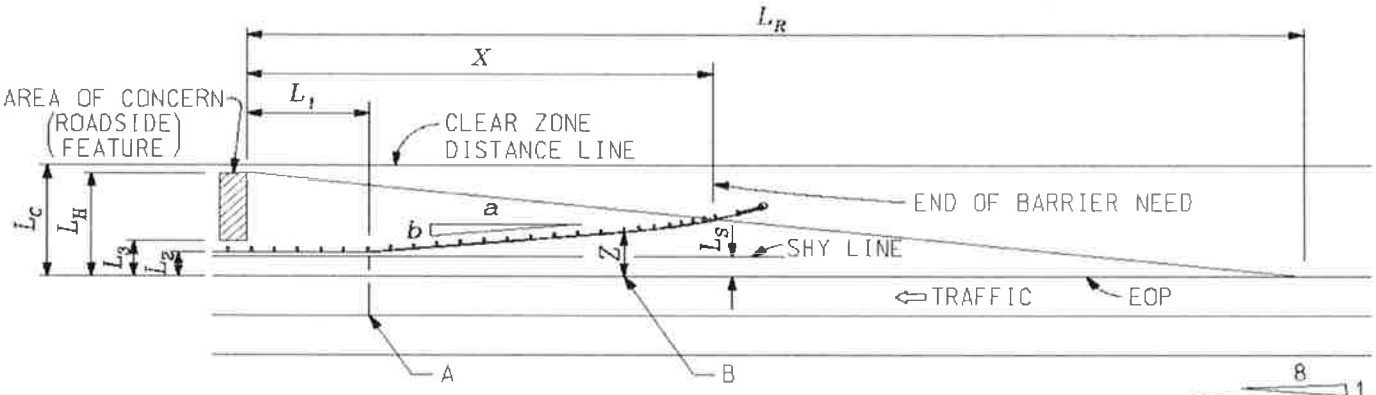
ROUTE **Platt Rd** CONTROL SECTION: _____ JOB # **20160521**

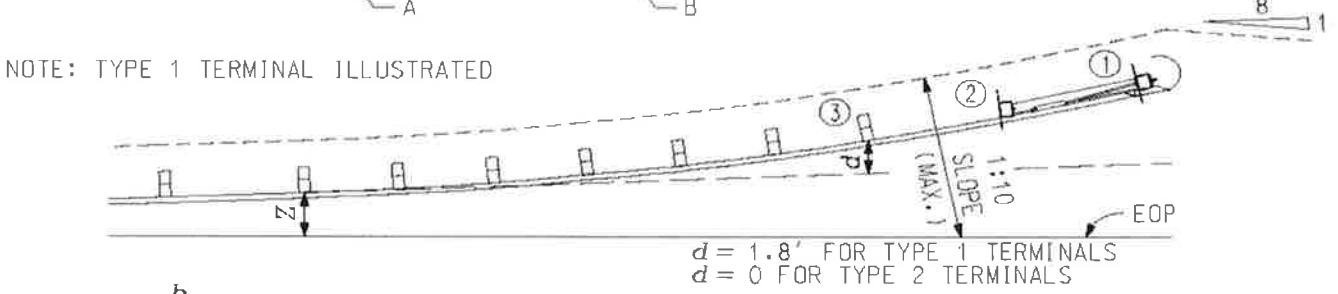
DESIGNED BY **ERS** DATE **5/10/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. _____ DESCRIPTION: **W. side, S. of Huron Pkwy**

GUARDRAIL RUN # **037**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





$$X = \frac{L_H + (\frac{b}{a})(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right) \frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)(\frac{b}{a}) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED..... X = _____

RUNOUT LENGTH (7.01.19)..... L_R = 160.00

GUARDRAIL TAPER RATE (R-59-SERIES)..... $^b/_a$ = _____

E.O.P. TO FACE OF BARRIER (DESIGNED)..... L_2 = _____

CLEAR ZONE (7.01.11)..... L_C = SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED)..... L_3 = _____

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE..... d = _____

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED)..... L_H = _____

LATERAL OFFSET AT END OF FLARE..... Z = _____

DESIGN ADT

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S = 5 SHY LINE (7.01.18)

Curve Radius R= N/A '

If guardrail on outside of curve.

Curve Correction Factor Kcz= ___

STATION AT A N/A

STATION AT B _____

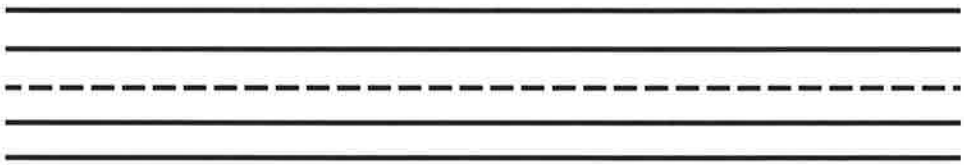
LENGTH OF NEED IN ADDITION TO CALCULATED X _____

NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

$L_H <= L_C$

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

PROPOSED TREATMENT



CALCULATIONS OR NOTES

After performing a UD-10 evaluation of the intersection of Platt Rd. and S. Huron Pkwy it was determined that there was no crash history to support the continued existance of guardrail at this location. The pay items "Guardrail, Rem (ft)" and "Turf Establishment (syd)" will be used to return the ROW to its original state.

PAY ITEMS

_____	FT	*	GUARDRAIL, TYPE MGS-8
			#DIV/0!
_____	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-4
N/A	FT		BRIDGE RAILING, THRIE BEAM RETROFIT
_____	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 1B
2	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE MGS
_____	EACH		GUARDRAIL REFLECTOR
N/A	CYD		EMBANKMENT, LM
N/A	EACH		GUARDRAIL TERMINAL END SHOE (WHEN SPECIFIED)

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL TYPE 1B PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5' ROUND TO NEXT HIGHEST RAIL LENGTH.

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-037

POOR

General Information:

Asset ID: GR-037	Edge Condition: CURB/GUTTER
Street Name: Platt Rd	Guardrail Purpose: STRUCTURE
Road Attribute: ASPHALT	Posted Speed: 30 - 40 MPH
	Number of Lanes: 5

Guardrail Information:

Overall Condition: POOR	Guardrail Beam Condition: FAIR
Guardrail Type: TYPE B	Guardrail Curved: NO
Length: 59 Feet	

Miscellaneous:

Approach Terminal Type: OTHER	Approach Terminal Condition: POOR
Departure Terminal Type: OTHER	Departure Terminal Condition: POOR
Post Type: WOOD	Post and Block Condition: GOOD
Bridge Anchor Type: N/A	Bridge Anchor Condition: N/A

Photo1:

Photo2:

Photo3: (if taken)

Ann Arbor Guardrail Inspections

Inspection Report for:
ASSETID: GR-037

General Information:

Asset ID: GR-037

Defect: Beam damage

Observation 1: SOS

Observation 2: EOS

Defect 1: Beam damage

Defect 2: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

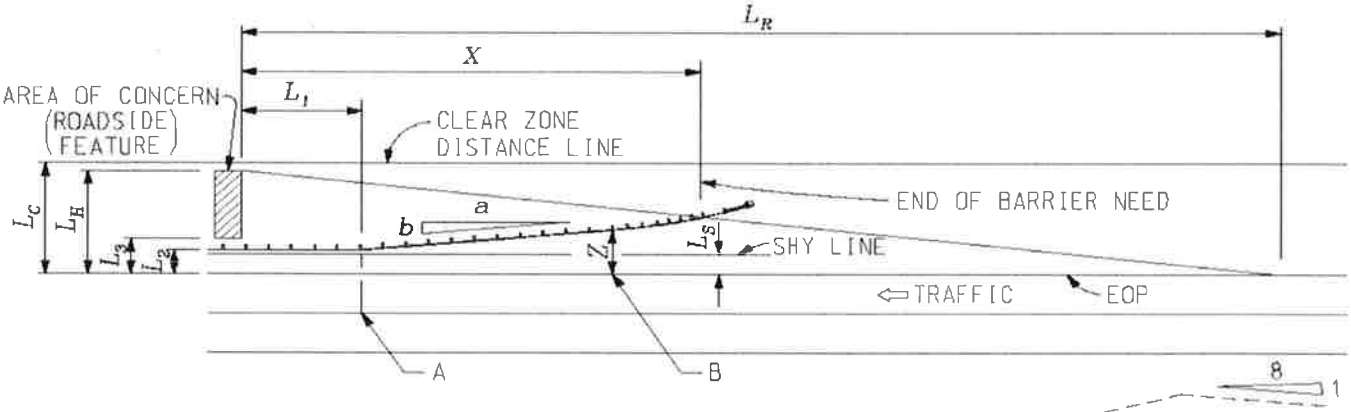
ROUTE **Jackson Ave.** CONTROL SECTION: _____ JOB # **20160521**

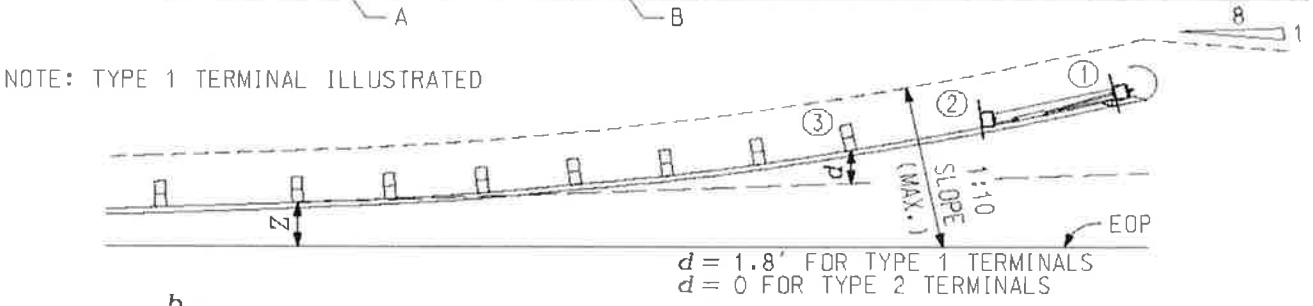
DESIGNED BY **BKD** DATE **7/17/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. _____ DESCRIPTION: **South side of Jackson, east of bridge over I-94 Ramp, west of Weber's Driveway**

GUARDRAIL RUN # **045**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





$d = 1.8'$ FOR TYPE 1 TERMINALS
$d = 0$ FOR TYPE 2 TERMINALS

$$X = \frac{L_H + \left(\frac{b}{a}\right)(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right)\frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)\left(\frac{b}{a}\right) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED	X = 21.11	DESIGN ADT	9,400
RUNOUT LENGTH (7.01.19)	L_R = 190.00	DESIGN SPEED	45 mph
GUARDRAIL TAPER RATE (R-59-SERIES)	$^b/_a$ =	FILL	SLOPE 1:5 - 1:4
E.O.P. TO FACE OF BARRIER (DESIGNED)	L_2 = 16.00		
CLEAR ZONE (7.01.11)	L_C = 24 - 28	L_1 = 25	(25' MIN.)
E.O.P. TO ROADSIDE FEATURE (MEASURED)	L_3 = 16.00	L_S = 6	SHY LINE (7.01.18)
EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE	d =	Curve Radius R=	N/A
LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED)	L_H = 18.00	If guardrail on outside of curve.	
LATERAL OFFSET AT END OF FLARE	Z =	Curve Correction Factor Kcz=	
		STATION AT A	N/A
		STATION AT B	
		LENGTH OF NEED IN ADDITION TO CALCULATED X	

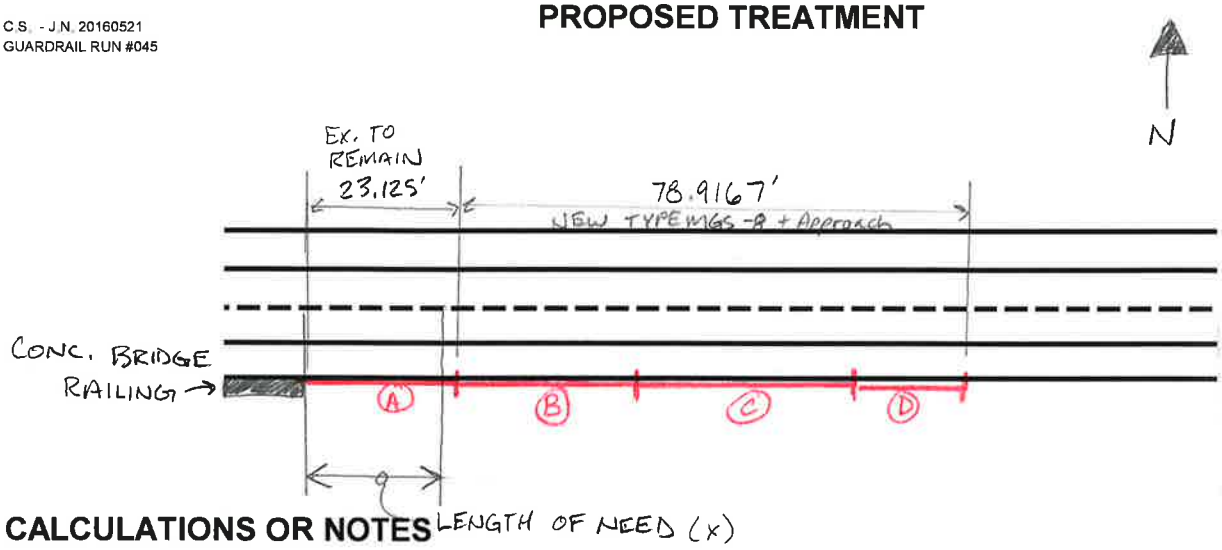
NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

$L_H <= L_C$

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #045

PROPOSED TREATMENT



CALCULATIONS OR NOTES

LR = 190 ft ((7.01.19)
Calculated X = 22 ft
(a) Approach Terminal = -34.29 ft (Soft Stop) → Total Approach Terminal = 50'-9½" → Part D (16.5') Not included as part of X.
(B) Transition from Guardrail, Type B to Guardrail, Type MGS-8 = -28.125 ft
Calculated X Remaining = 22-34.29-28.125 = -41.305 ft

Guardrail Notes
No Additional Beam Elements Required
(A) Existing Guardrail Anchorage to Bridge (Det T-2) to remain = 23.125 Ft (Remove Transition Section)
Transition is included in item for MGS-8, therefore total Guardrail, Type MGS-8 = 0 + 28.125 = 28.125 ft

PAY ITEMS

28.13	FT	*	GUARDRAIL, TYPE MGS-8 2.25 BEAM ELEMENTS
	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-2
	FT		BRIDGE RAILING, THRIE BEAM RETROFIT
1	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 2M
	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE MGS
2	EACH		GUARDRAIL REFLECTOR
N/A	CYD		EMBANKMENT, LM
N/A	EACH		GUARDRAIL TERMINAL END SHOE (WHEN SPECIFIED)

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL, TYPE 2M PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-045

POOR

General Information:

Asset ID: GR-045
Street Name: Jackson Rd
Road Attribute: ASPHALT

Edge Condition: GRAVEL SHOULDER
Guardrail Purpose: STRUCTURE - BRIDGE/CULVERT
Posted Speed: 45 - 50 MPH
Number of Lanes: 2

Guardrail Information:

Overall Condition: POOR
Guardrail Type: TYPE B
Length: 134 Feet

Guardrail Beam Condition: FAIR
Guardrail Curved: NO

Miscellaneous:

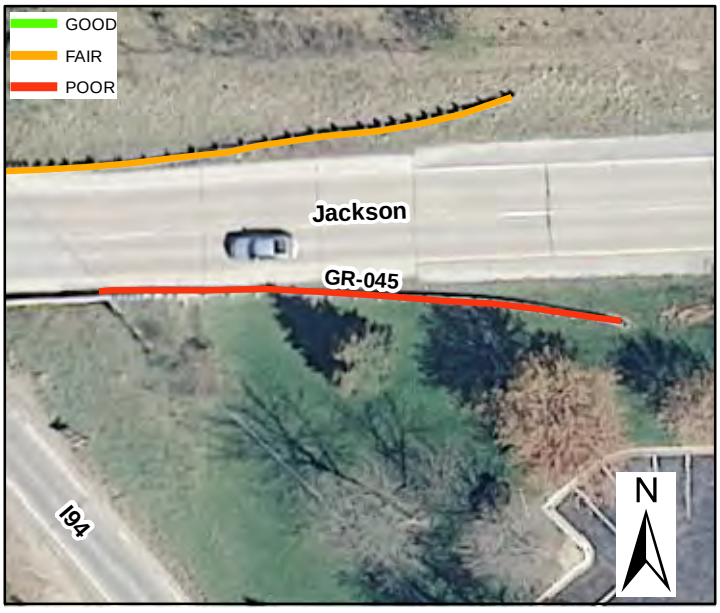
Approach Terminal Type: TYPE 1 - SRT
Departure Terminal Type: BRIDGE CONNECTION
Post Type: BOTH
Bridge Anchor Type: DETAIL T-2

Approach Terminal Condition: GOOD
Departure Terminal Condition: GOOD
Post and Block Condition: FAIR
Bridge Anchor Condition: GOOD

Photo1:

Photo2:

Photo3: (if taken)



HRC HUBBELL, ROTH & CLARK, INC CONSULTING ENGINEERS SINCE 1915

Ann Arbor Guardrail Inspections

Inspection Report for:
ASSETID: GR-045

General Information:

Asset ID: GR-045

Defect: Damage

Observation 1: SOS

Observation 2: EOS

Defect 1: Damage


Jackson Rd - WB Bridge Approach over I-94
Guardrail ID: 045
Photo Taken: 07/06/2018

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

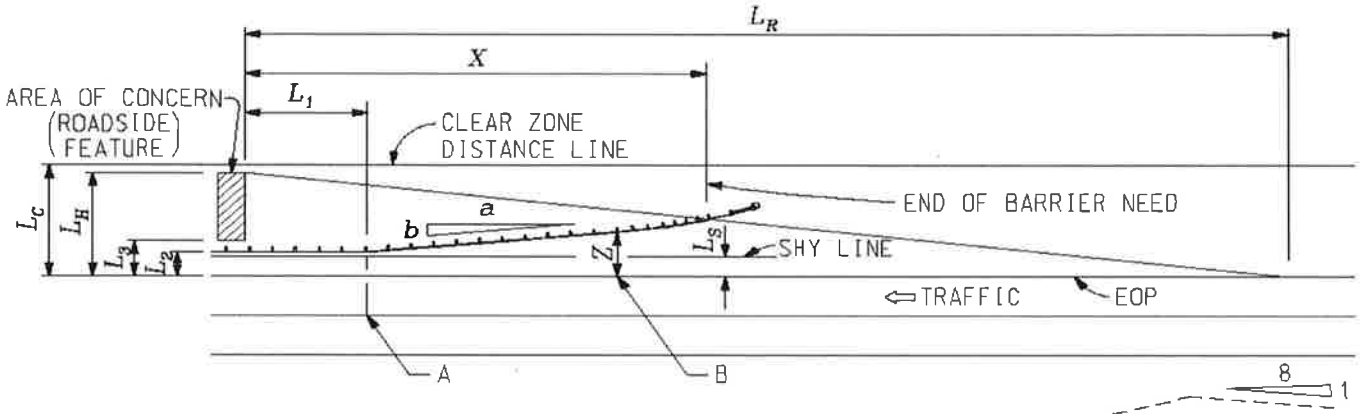
ROUTE **Plymouth Rd.** CONTROL SECTION: _____ JOB # **20160521**

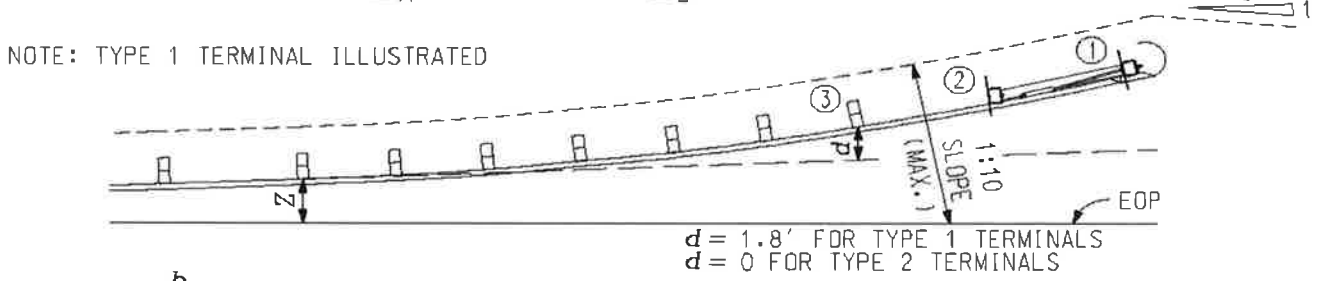
DESIGNED BY **ALM** DATE **5/10/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. _____ DESCRIPTION: **S. side of road at entrance to the Research Complex Bld.**

GUARDRAIL RUN # **046**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





d = 1.8' FOR TYPE 1 TERMINALS
d = 0 FOR TYPE 2 TERMINALS

$$X = \frac{L_H + (\frac{b}{a})(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right) \frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)(\frac{b}{a}) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED.....X = _____

RUNOUT LENGTH (7.01.19).....L_R= 230.00

GUARDRAIL TAPER RATE (R-59-SERIES).....$^b/_a$ = _____

E.O.P. TO FACE OF BARRIER (DESIGNED).....L_2= 3.00

CLEAR ZONE (7.01.11).....L_C= #N/A

E.O.P. TO ROADSIDE FEATURE (MEASURED).....L_3= 6.00

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE.....d = _____

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED).....L_H= 14.00

LATERAL OFFSET AT END OF FLARE.....Z = 3.00

NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

$L_H <= L_C$

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

DESIGN ADT 10000 +

DESIGN SPEED 45 mph

FILL SLOPE 1:5 - 1:4

L_1 = 25 (25' MIN.)

L_S= 6 SHY LINE (7.01.18)

Curve Radius R= N/A '

If guardrail on outside of curve.

Curve Correction Factor Kcz= _____

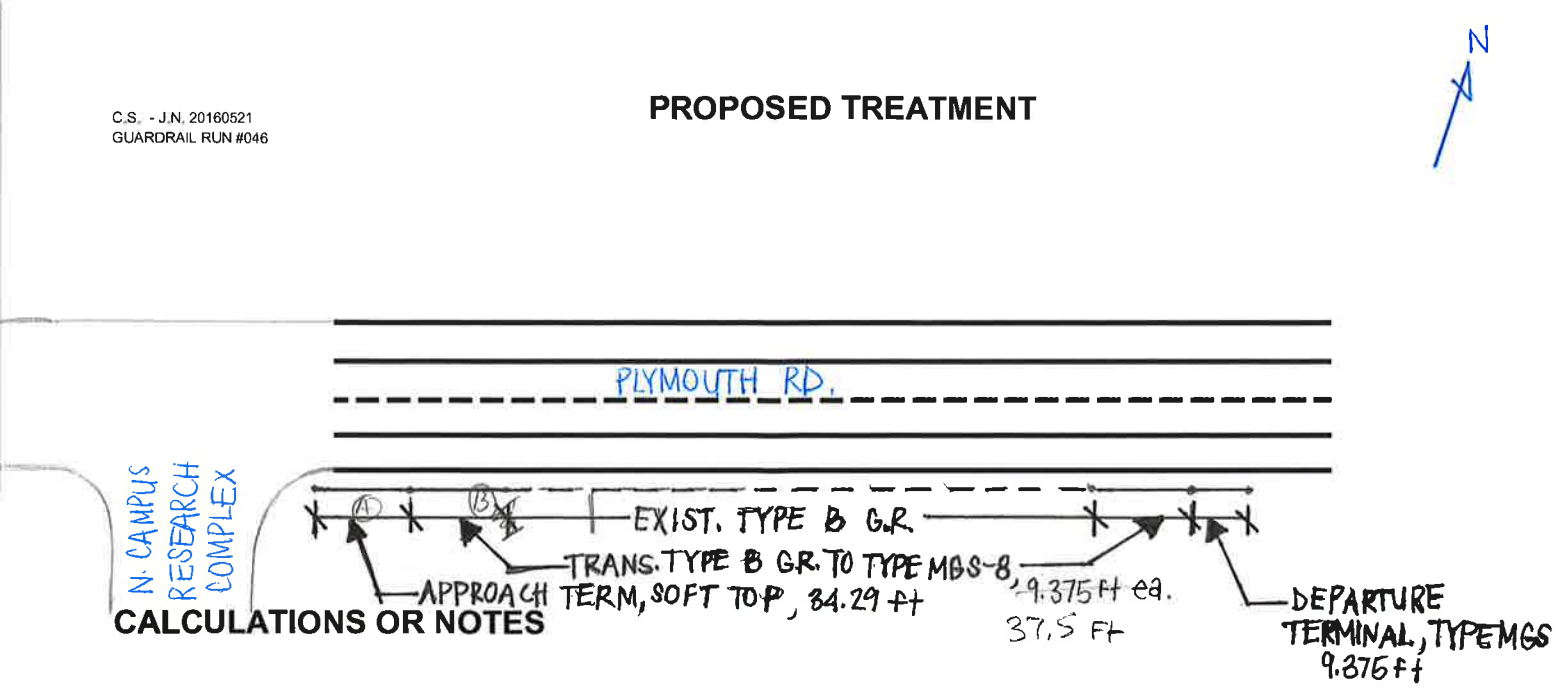
STATION AT A N/A

STATION AT B _____

LENGTH OF NEED IN ADDITION TO CALCULATED X = 100.00 ft

C.S. - J.N. 20160521
GUARDRAIL RUN #046

PROPOSED TREATMENT



CALCULATIONS OR NOTES

Calculated X = 100 ft (update existing terminals)
Approach Terminal = -34.29 ft (Soft Stop)
Transition from Guardrail, Type B to Guardrail, Type MGS-8 = -18.75 ft (for approach and departure terminal)
Departure Terminal = -9.375 ft
Calculated X Remaining = 100 - 34.29 - 18.75 - 9.375 = 37.585
Guardrail Required
37.585 ÷ 12.5 = 3.006 → USE 4 Each
Guardrail, Type MGS-8 = 4 x 12.5 = 50 ft

Transition is included in item for MGS-8, therefore total Guardrail, Type MGS-8 =

Typ. B dept.
Change Ht.

Proposed (A+B) = 71.79 FT → Remove Ex = 75'

162.5 = Guardrail, Rem

112.5'

PAY ITEMS

~~59.38~~	FT	* GUARDRAIL, TYPE MGS-8 (4.75 BEAM ELEMENTS)	
	EACH	GUARDRAIL ANCHORAGE, BRIDGE, DET	T-2
	FT	BRIDGE RAILING, THRIE BEAM RETROFIT	
1	EACH	GUARDRAIL APPROACH TERMINAL, TYPE	2M
0 ~~1~~	EACH	GUARDRAIL DEPARTING TERMINAL, TYPE	MGS
8 ~~6~~	EACH	GUARDRAIL REFLECTOR	
N/A	CYD	EMBANKMENT, LM	
N/A	EACH	GUARDRAIL TERMINAL END SHOE (WHEN SPECIFIED)	

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL, TYPE 2M PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

210 SYD = Restoration

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-046

POOR

General Information:

Asset ID: GR-046
Street Name: Plymouth Rd
Road Attribute: ASPHALT
Edge Condition: CURB/GUTTER
Guardrail Purpose: EMBANKMENT
Posted Speed: 45 - 50 MPH
Number of Lanes: 5

Guardrail Information:

Overall Condition: POOR
Guardrail Type: TYPE B
Length: 338 Feet
Guardrail Beam Condition: GOOD
Guardrail Curved: NO

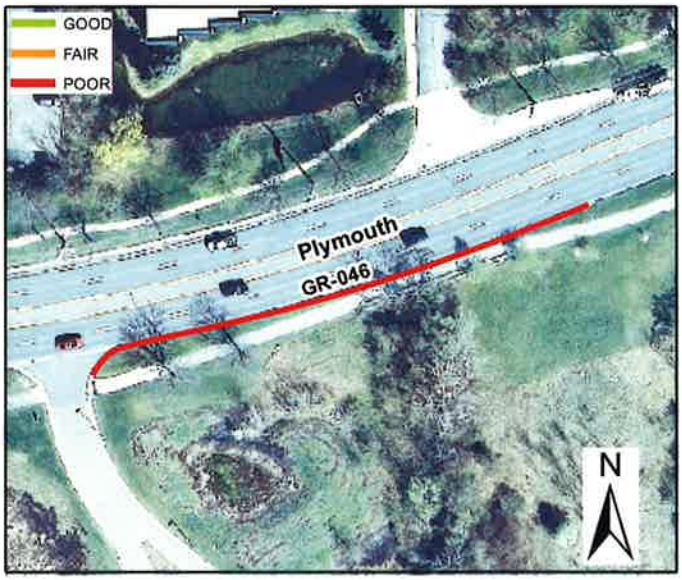
Miscellaneous:

Approach Terminal Type: OTHER
Departure Terminal Type: DEPARTING TERMINAL
Post Type: BOTH
Bridge Anchor Type: N/A
Approach Terminal Condition: POOR
Departure Terminal Condition: FAIR
Post and Block Condition: FAIR
Bridge Anchor Condition: N/A

Photo1:

Photo2:

Photo3: (if taken)



Ann Arbor Guardrail Inspections

Inspection Report for:
ASSETID: GR-046

General Information:

Asset ID: GR-046

Defect: None

Observation 1: SOS

Observation 2: EOS

Defect 1: None

Defect 2: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

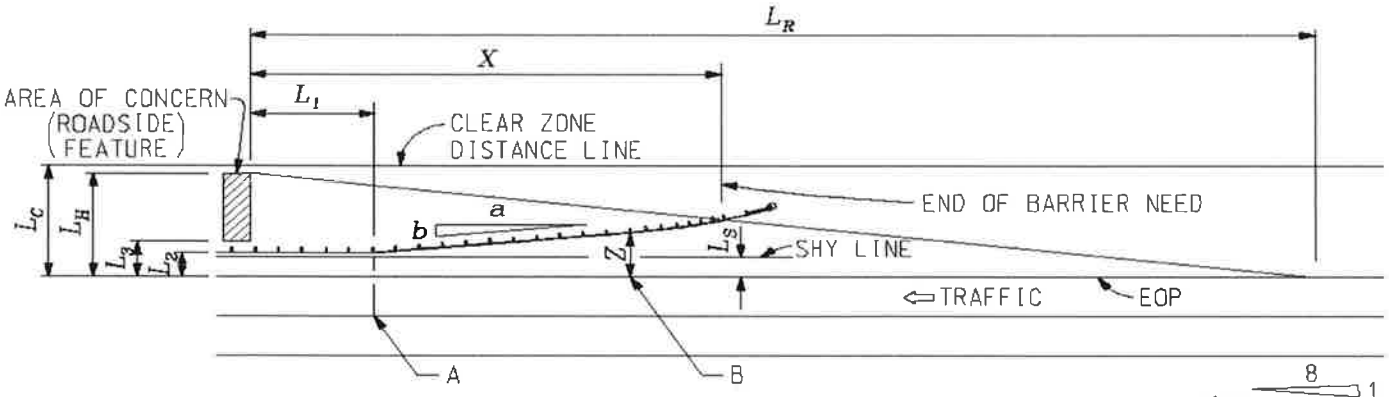
ROUTE **Ann Arbor-Saline Rd** CONTROL SECTION: _____ JOB # **20160521**

DESIGNED BY **ALM** DATE **5/10/2018** CHECKED BY: _____ DATE _____

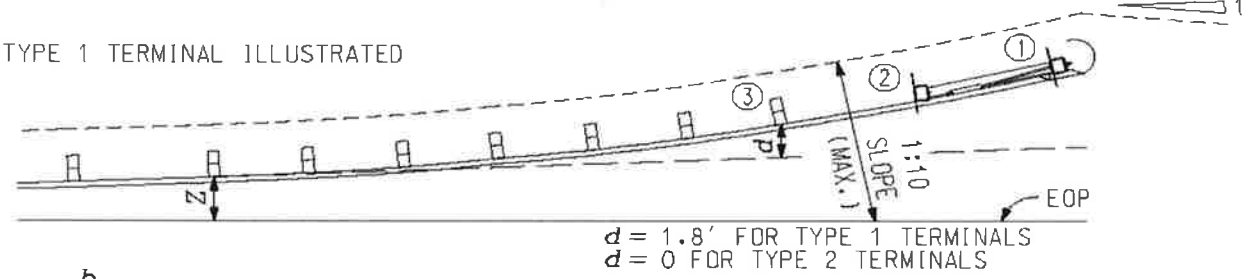
APPROX. STATION OR M.P. _____ DESCRIPTION: **N side protecting ped. Bridge N of Northbrook Dr**

GUARDRAIL RUN # **052**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT



NOTE: TYPE 1 TERMINAL ILLUSTRATED



$d = 1.8'$ FOR TYPE 1 TERMINALS
$d = 0$ FOR TYPE 2 TERMINALS

$$X = \frac{L_H + \left(\frac{b}{a}\right)(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right)\frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)\left(\frac{b}{a}\right) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED.....X = 68.00

RUNOUT LENGTH (7.01.19).....L_R= 230.00

GUARDRAIL TAPER RATE (R-59-SERIES).....$^b/_a$ = _____

E.O.P. TO FACE OF BARRIER (DESIGNED).....L_2= 3.00

CLEAR ZONE (7.01.11)..... L_C= SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED).....L_3= 13.00

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE.....d = _____

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED).....L_H= 25.00

LATERAL OFFSET AT END OF FLARE.....Z = 13.00

DESIGN ADT 10000 +

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S= 6 SHY LINE (7.01.18)

Curve Radius R= N/A '

If guardrail on outside of curve.

Curve Correction Factor Kcz= ___

STATION AT A N/A

STATION AT B _____

NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

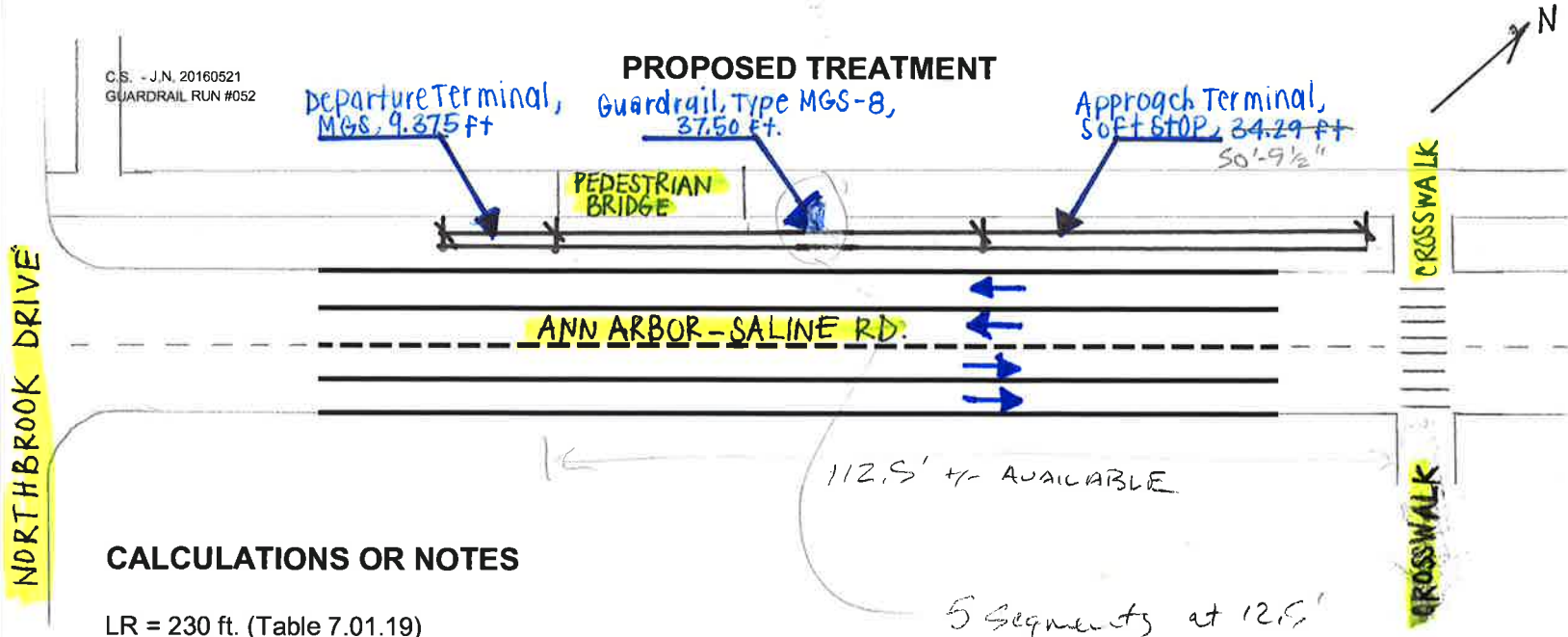
$L_H <= L_C$

LENGTH OF NEED IN ADDITION TO CALCULATED X = 50.00 ft

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #052

PROPOSED TREATMENT



CALCULATIONS OR NOTES

LR = 230 ft. (Table 7.01.19)
Calculated X = 70 ft (due to existing cross walk)
Approach Terminal = -34.29 ft (Soft Stop)
Departure Terminal = -9.375 ft
Calculated X Remaining = 70 - 34.29 - 9.375 = 26.335
Guardrail Required
26.335 ÷ 12.5 = 2.106 → USE 3 Each
Guardrail, Type MGS-8 = 3 x 12.5 = 37.5 ft

5 Segments at 12.5'
= 62.5'

**** May need to include longer posts for part of this GR section****

89 FT · Guardrail, Rem

PAY ITEMS

62.5 ~~37.50~~	FT	*	GUARDRAIL, TYPE MGS-8 (3 BEAM ELEMENTS)
	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-2
N/A	FT		BRIDGE RAILING, THRIE BEAM RETROFIT
1	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 2M
1	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE MGS
5	EACH		GUARDRAIL REFLECTOR
N/A	CYD		EMBANKMENT, LM
N/A	EACH		GUARDRAIL TERMINAL END SHOE (WHEN SPECIFIED)
100	SYD		Restoration

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL, TYPE 2M PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-052

POOR

General Information:

Asset ID: GR-052
Street Name: Ann Arbor-Saline Rd
Road Attribute: ASPHALT
Edge Condition: CURB/GUTTER
Guardrail Purpose: STRUCTURE - BRIDGE/CULVERT
Posted Speed: 45 - 50 MPH
Number of Lanes: 5

Guardrail Information:

Overall Condition: POOR
Guardrail Type: TYPE B
Length: 89 Feet
Guardrail Beam Condition: FAIR
Guardrail Curved: NO

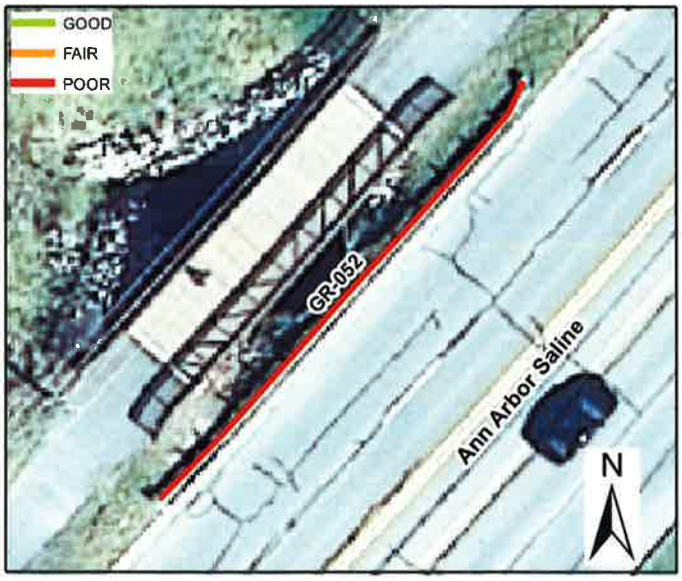
Miscellaneous:

Approach Terminal Type: TYPE 1 - SRT
Departure Terminal Type: DEPARTING TERMINAL (NOT SRT)
Post Type: WOOD
Bridge Anchor Type: N/A
Approach Terminal Condition: POOR
Departure Terminal Condition: FAIR
Post and Block Condition: FAIR
Bridge Anchor Condition: N/A

Photo1:

Photo2:

Photo3: (if taken)



Ann Arbor Guardrail Inspections

Inspection Report for:
ASSETID: GR-052

General Information:

Asset ID: GR-052

Defect: None

Observation 1: SOS

Observation 2: EOS

Defect 1: None

Defect 2: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

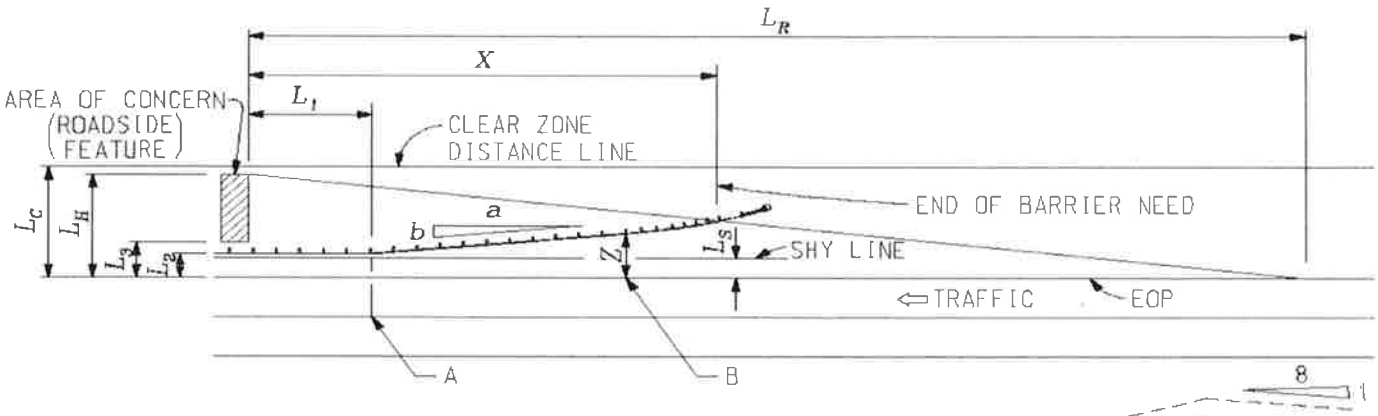
ROUTE **E Eisenhower Pkwy** CONTROL SECTION: _____ JOB # **20160521**

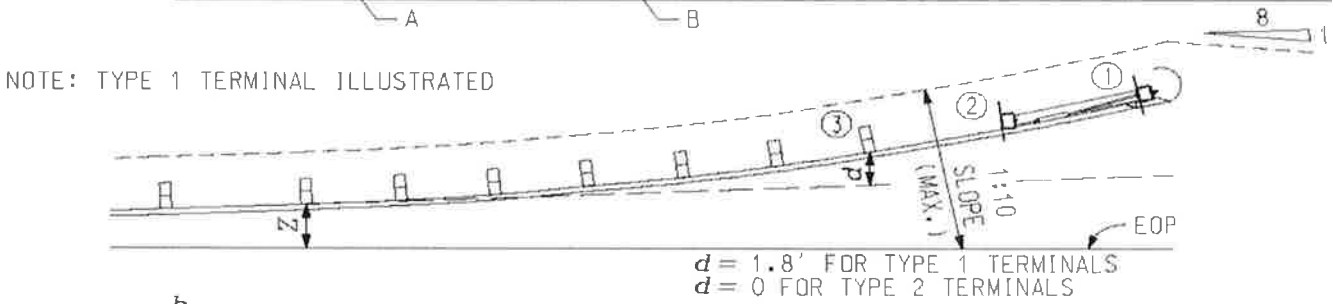
DESIGNED BY **ERS** DATE **5/10/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. _____ DESCRIPTION: **W. of S. Industrial Hwy, N. Side**

GUARDRAIL RUN # **060**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





$d = 1.8'$ FOR TYPE 1 TERMINALS
$d = 0$ FOR TYPE 2 TERMINALS

$$X = \frac{L_H + (\frac{b}{a})(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right) \frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)(\frac{b}{a}) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED..... X = 40.00

RUNOUT LENGTH (7.01.19)..... L_R = 160.00

GUARDRAIL TAPER RATE (R-59-SERIES)..... $^b/_a$ = _____

E.O.P. TO FACE OF BARRIER (DESIGNED)..... L_2 = 12.00

CLEAR ZONE (7.01.11)..... L_C = SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED)..... L_3 = 12.00

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE..... d = _____

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED)..... L_H = 16.00

LATERAL OFFSET AT END OF FLARE..... Z = 12.00

DESIGN ADT

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S = 5 SHY LINE (7.01.18)

Curve Radius R= N/A '

If guardrail on outside of curve.

Curve Correction Factor Kcz= ____

STATION AT A N/A

STATION AT B _____

NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

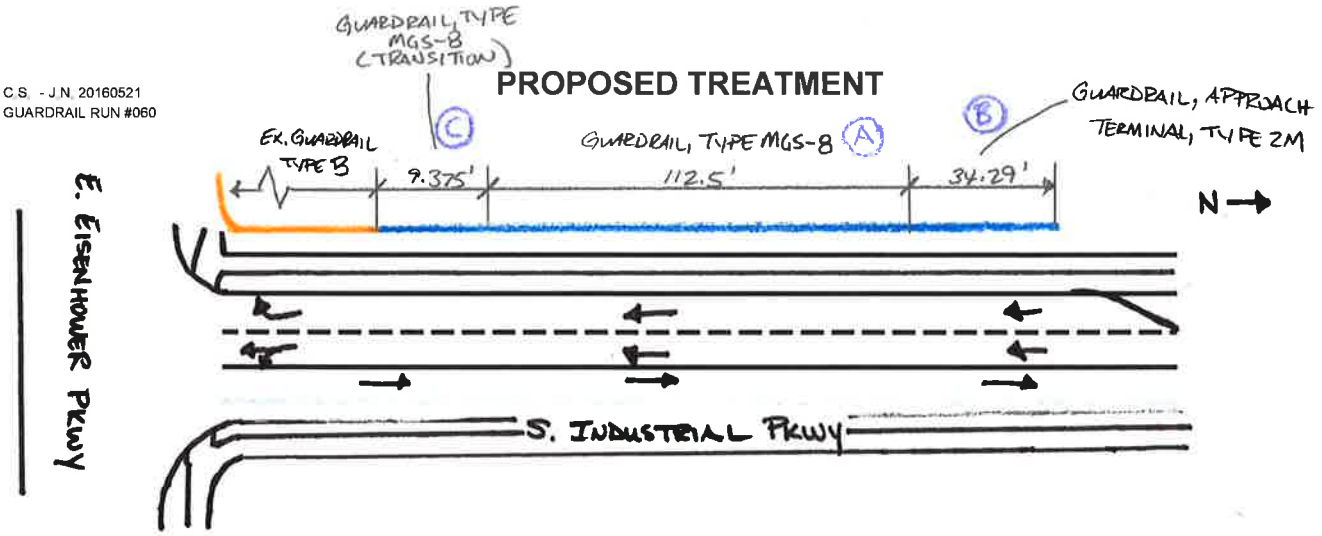
$L_H <= L_C$

LENGTH OF NEED IN ADDITION TO CALCULATED X = 112.50 ft

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #060

PROPOSED TREATMENT



CALCULATIONS OR NOTES

LR = 160 ft (7.01.19)
Calculated X = 152.5 ft
(B) Approach Terminal = -34.29 ft (Soft Stop)
(C) Transition from Guardrail, Type B to Guardrail, Type MGS-8 = -9.375 ft
Calculated X Remaining = 152.5 - 34.29 - 9.375 = 108.84
Guardrail Required
108.84 ÷ 12.5 = 8.71 → USE 9 Each
(A) Guardrail, Type MGS-8 = 9 x 12.5 = 112.5 ft

(A) Transition is included in item for MGS-8, therefore total Guardrail, Type MGS-8 = 112.5 + 9.375 = 121.875 ft
+ (C)

PAY ITEMS

(C) + (A) 121.88	FT	*	GUARDRAIL, TYPE MGS-8 9.75 BEAM ELEMENTS
_____	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-2
N/A	FT		BRIDGE RAILING, THRIE BEAM RETROFIT
(B) 1	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 2M
_____	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE ___
8	EACH		GUARDRAIL REFLECTOR
N/A	CYD		EMBANKMENT, LM
N/A	EACH		GUARDRAIL TERMINAL END SHOE (WHEN SPECIFIED)

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH ###### NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

TURF EST. CSYD = 152.5 x 5 = 762.5/27 = 85 SYD

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-060

POOR

General Information:

Asset ID: GR-060
Street Name: E Eisenhower Pkwy
Road Attribute: ASPHALT

Edge Condition: CURB/GUTTER
Guardrail Purpose: STRUCTURE - BRIDGE/CULVERT
Posted Speed: 30 - 40 MPH
Number of Lanes: 5

Guardrail Information:

Overall Condition: POOR
Guardrail Type: TYPE B
Length: 667 Feet

Guardrail Beam Condition: GOOD
Guardrail Curved: YES

Miscellaneous:

Approach Terminal Type: OTHER
Departure Terminal Type: BRIDGE CONNECTION
Post Type: WOOD
Bridge Anchor Type: DETAIL T-3

Approach Terminal Condition: POOR
Departure Terminal Condition: GOOD
Post and Block Condition: FAIR
Bridge Anchor Condition: GOOD

Photo1:

Photo2:

Photo3: (if taken)

Ann Arbor Guardrail Inspections

Inspection Report for:
ASSETID: GR-060

General Information:

Asset ID: GR-060

Defect: None

Observation 1: SOS

Observation 2: EOS

Defect 1: None

Defect 2: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

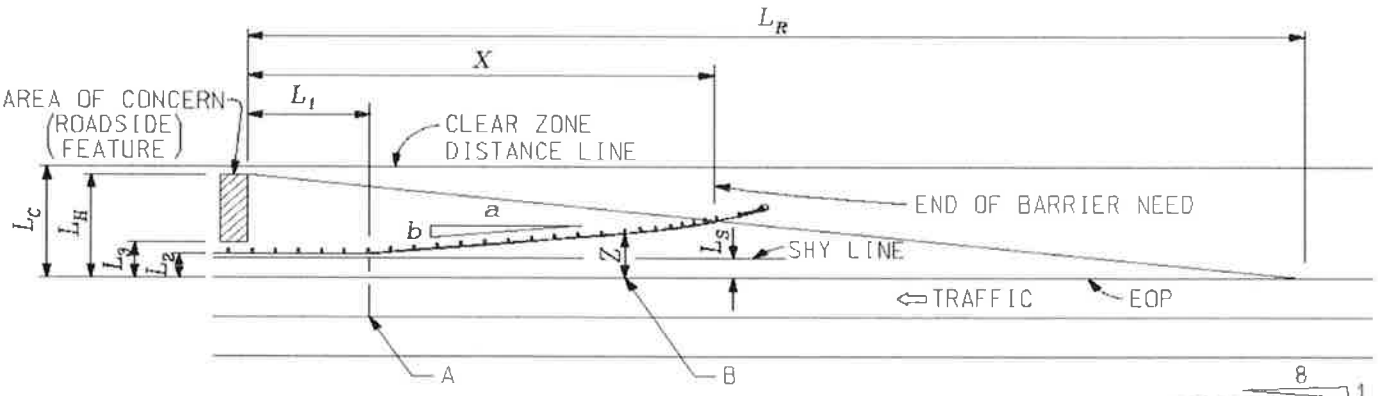
ROUTE **E Eisenhower Pkwy** CONTROL SECTION: _____ JOB # **20160521**

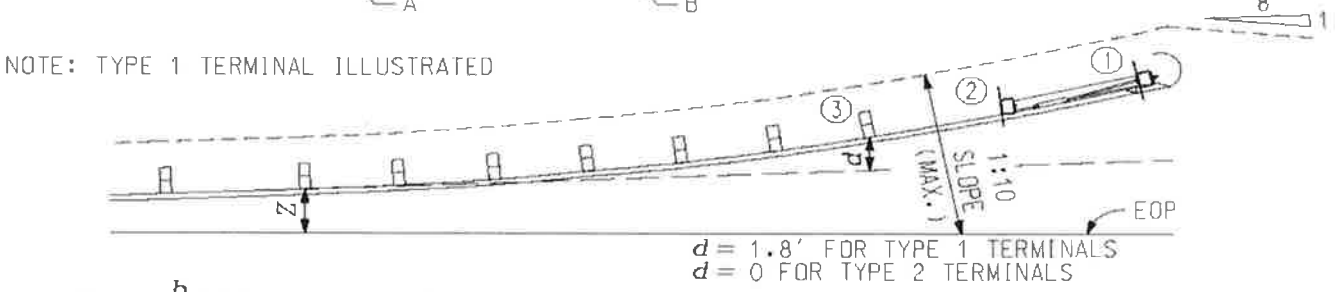
DESIGNED BY **ERS** DATE **5/10/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. _____ DESCRIPTION: **W. of S. Industrial Hwy, S. Side**

GUARDRAIL RUN # **061**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





d = 1.8' FOR TYPE 1 TERMINALS
d = 0 FOR TYPE 2 TERMINALS

$$X = \frac{L_H + \left(\frac{b}{a}\right)(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right)\frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)\left(\frac{b}{a}\right) + L_2$$

$$Z = L_2 \quad \text{(For Type 2 Terminals)}$$

LENGTH OF NEED.....X = _____

RUNOUT LENGTH (7.01.19).....L_R= _____

GUARDRAIL TAPER RATE (R-59-SERIES).....$^b/_a$ = _____

E.O.P. TO FACE OF BARRIER (DESIGNED).....L_2= _____

CLEAR ZONE (7.01.11)..... L_C= SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED).....L_3= _____

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE.....d = _____

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED).....L_H= _____

LATERAL OFFSET AT END OF FLARE.....Z = _____

DESIGN ADT

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S= 5 SHY LINE (7.01.18)

Curve Radius R= N/A '

If guardrail on outside of curve.

Curve Correction Factor Kcz= ___

STATION AT A N/A

STATION AT B _____

LENGTH OF NEED IN ADDITION TO CALCULATED X _____

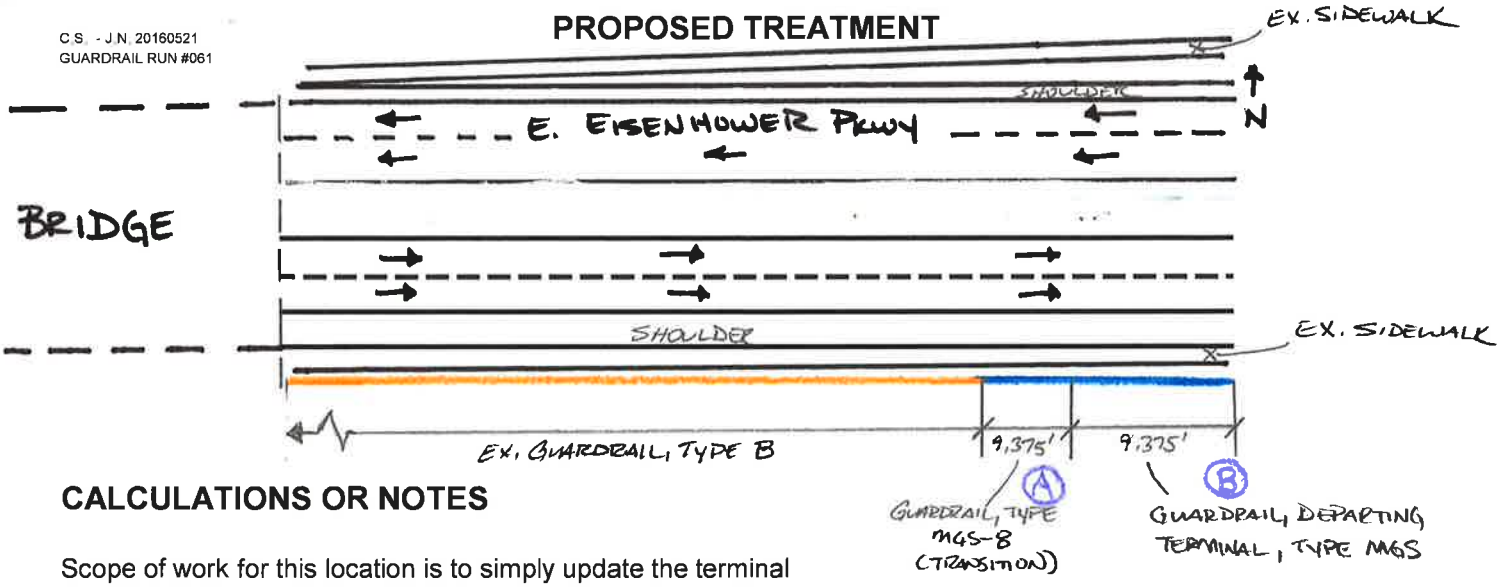
NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

$L_H <= L_C$

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #061

PROPOSED TREATMENT



CALCULATIONS OR NOTES

Scope of work for this location is to simply update the terminal
Use 9'-4.5" Guardrail, Type MGS-8 to transition between Guardrail, Approach Terminal, Type 2M to Guardrail, Type B

(A) Transition is included in item for MGS-8, therefore total Guardrail, Type MGS-8 = 9.375 ft

PAY ITEMS

(A) 9.38	FT	*	GUARDRAIL, TYPE MGS-8 0.75 BEAM ELEMENTS
	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-2
N/A	FT		BRIDGE RAILING, THRIE BEAM RETROFIT
(1) 1	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 2M
(B) 1	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE MGS
4	EACH		GUARDRAIL REFLECTOR
N/A	CYD		EMBANKMENT, LM
N/A	EACH		GUARDRAIL TERMINAL END SHOE (WHEN SPECIFIED)

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH ###### NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

TURF EST. = (20' x 5')/9 = 12 SYD

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-061

POOR

General Information:

Asset ID: GR-061	Edge Condition: CURB/GUTTER
Street Name: E Eisenhower Pkwy	Guardrail Purpose: STRUCTURE - BRIDGE/CULVERT
Road Attribute: ASPHALT	Posted Speed: 30 - 40 MPH
	Number of Lanes: 5

Guardrail Information:

Overall Condition: POOR	Guardrail Beam Condition: FAIR
Guardrail Type: TYPE B	Guardrail Curved: NO
Length: 306 Feet	

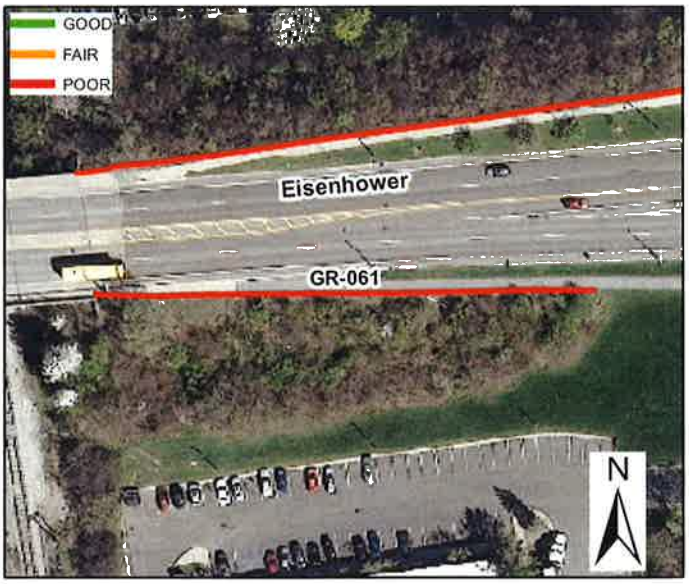
Miscellaneous:

Approach Terminal Type: BRIDGE CONNECTION	Approach Terminal Condition: GOOD
Departure Terminal Type: OTHER	Departure Terminal Condition: POOR
Post Type: BOTH	Post and Block Condition: FAIR
Bridge Anchor Type: DETAIL T-3	Bridge Anchor Condition: GOOD

Photo1:

Photo2:

Photo3: (if taken)



HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-061

General Information:

Asset ID: GR-061

Defect: Guardrail damage

Observation 1: SOS

Observation 2: EOS

Defect 1: Guardrail damage

Defect 2: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

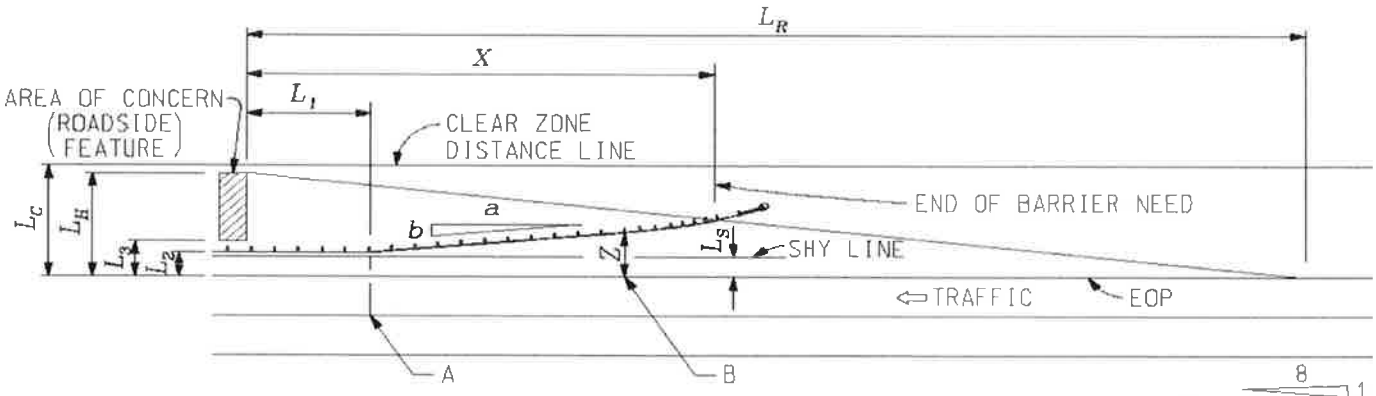
ROUTE **E Eisenhower Pkwy** CONTROL SECTION: _____ JOB # **20160521**

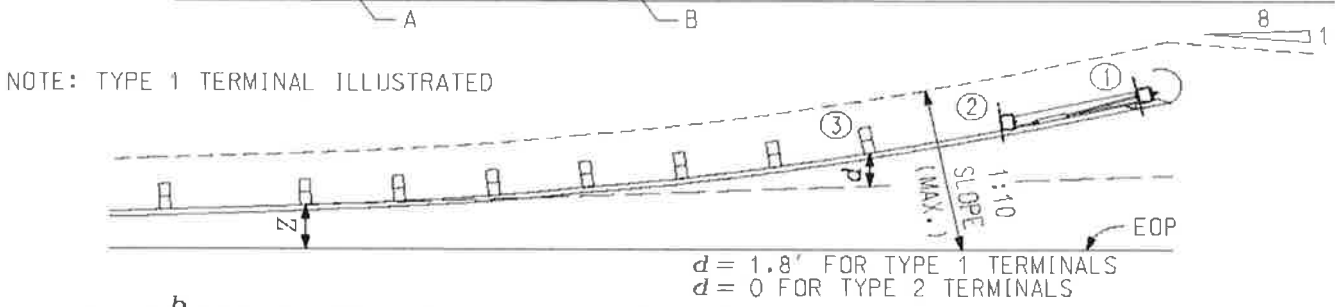
DESIGNED BY **ERS** DATE **5/10/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. _____ DESCRIPTION: **E. of Boardwalk Dr, N. Side**

GUARDRAIL RUN # **062**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





$d = 1.8'$ FOR TYPE 1 TERMINALS
$d = 0$ FOR TYPE 2 TERMINALS

$$X = \frac{L_H + \left(\frac{b}{a}\right)(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right)\frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)\left(\frac{b}{a}\right) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED..... X = 139.43

RUNOUT LENGTH (7.01.19)..... L_R = 160.00

GUARDRAIL TAPER RATE (R-59-SERIES)..... $^b/_a$ =

E.O.P. TO FACE OF BARRIER (DESIGNED)..... L_2 = 9.00

CLEAR ZONE (7.01.11)..... L_C = SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED)..... L_3 = 9.00

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE..... d =

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED)..... L_H = 70.00

LATERAL OFFSET AT END OF FLARE..... Z = 9.00

DESIGN ADT

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S = 5 SHY LINE (7.01.18)

Curve Radius R= N/A

If guardrail on outside of curve.

Curve Correction Factor Kcz= ___

STATION AT A N/A

STATION AT B _____

NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

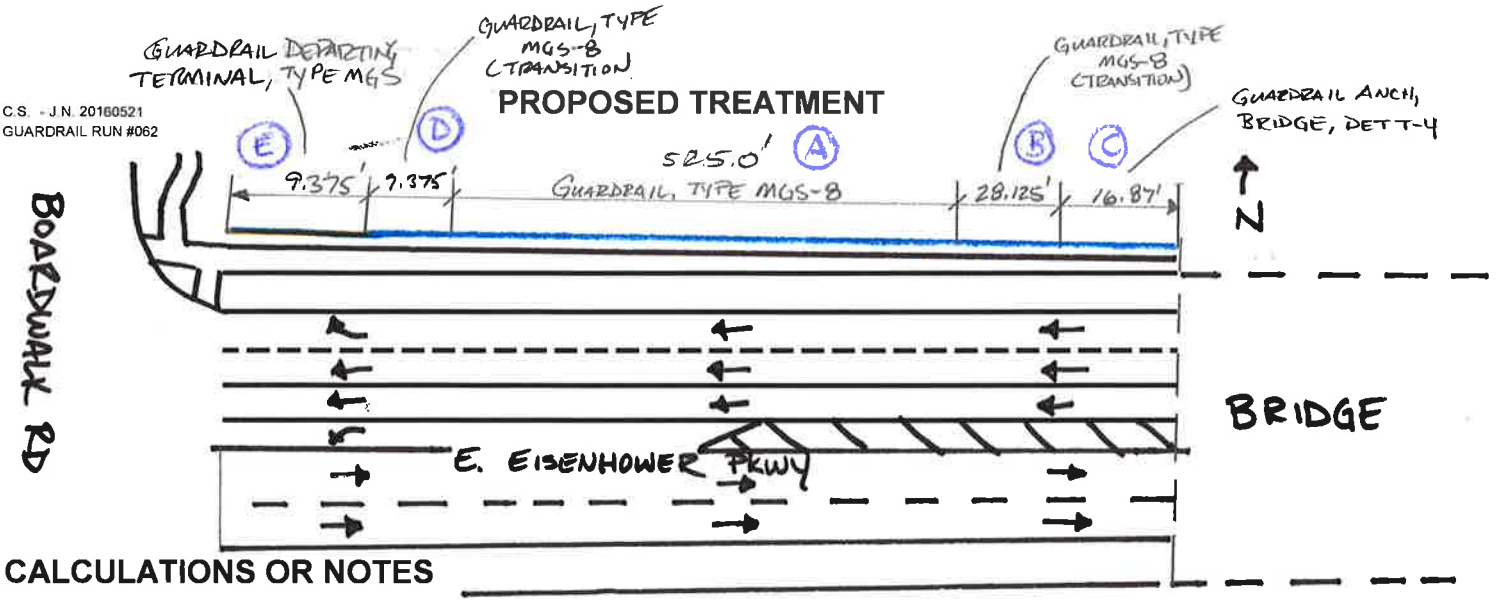
$L_H <= L_C$

LENGTH OF NEED IN ADDITION TO CALCULATED X = 460.57 ft

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #062

PROPOSED TREATMENT



CALCULATIONS OR NOTES

LR = 160 ft (7.01.19)
Calculated X = 139.43 ft + 460.57 ft = 600 ft (Determined additional length was necessary to block off embankment)
(E) ~~Guardrail, Approach Terminal, Type 1B — 25 ft (existing terminal to stay)~~ GUARDRAIL, DEPART. TERMIN., TYPE MGS (-9.375ft)
(C) Guardrail Anchorage, Bridge, Det T-4 = -16.87 ft
(B) Transition from Guardrail Anchorage, Bridge Det T-4 to Guardrail, Type MGS-8 = -28.125 ft
(D) Transition from Guardrail, Type MGS-8 to Guardrail, Type B = -9.375 ft
Calculated X Remaining = 600 - 25 - 16.87 - 28.125 - 9.375 = 520.63
Guardrail Required
520.63 ÷ 12.5 = 41.65 → USE 42 Each
Guardrail, Type MGS-8 = 42 x 12.5 = 525 ft

(A) Transitions are included in item for MGS-8, therefore total Guardrail, Type MGS-8 = 525 + 28.125 + 9.375 = 562.5 ft
+(B) +(D)

PAY ITEMS

+(B) +(D)
525

(A) ~~562.50~~	FT	*	GUARDRAIL, TYPE MGS-8 45 BEAM ELEMENTS
1	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-4
N/A	FT		BRIDGE RAILING, THRIE BEAM RETROFIT
(F)	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 1B
(E) 1	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE MGS
26	EACH		GUARDRAIL REFLECTOR
N/A	CYD		EMBANKMENT, LM
N/A	EACH		GUARDRAIL TERMINAL END SHOE (WHEN SPECIFIED)

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL TYPE 1B PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

TURF: (600'x5')/9 = 335SYD
EMBANKMENT: (600'x3'x5')/27 = 335 CYD

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-062

POOR

General Information:

Asset ID: GR-062
Street Name: E Eisenhower Pkwy
Road Attribute: ASPHALT

Edge Condition: CURB/GUTTER
Guardrail Purpose: STRUCTURE - BRIDGE/CULVERT
Posted Speed: 30 - 40 MPH
Number of Lanes: 5

Guardrail Information:

Overall Condition: POOR
Guardrail Type: TYPE B
Length: 587 Feet

Guardrail Beam Condition: POOR
Guardrail Curved: NO

Miscellaneous:

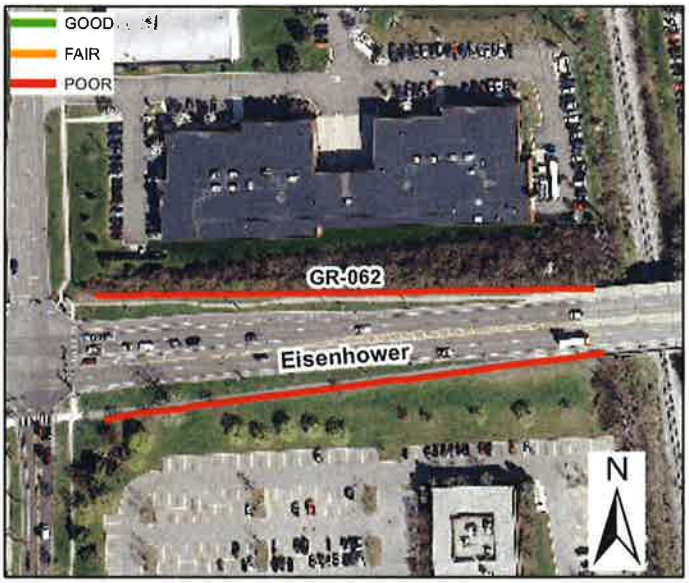
Approach Terminal Type: BRIDGE CONNECTION
Departure Terminal Type: OTHER
Post Type: BOTH
Bridge Anchor Type: DETAIL T-3

Approach Terminal Condition: GOOD
Departure Terminal Condition: POOR
Post and Block Condition: POOR
Bridge Anchor Condition: GOOD

Photo1:

Photo2:

Photo3: (if taken)



Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-062

General Information:

Asset ID: GR-062

Defect: Guardrail damage

Observation 1: SOS

Observation 2: EOS

Defect 1: Guardrail damage

Defect 2: Guardrail damage

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

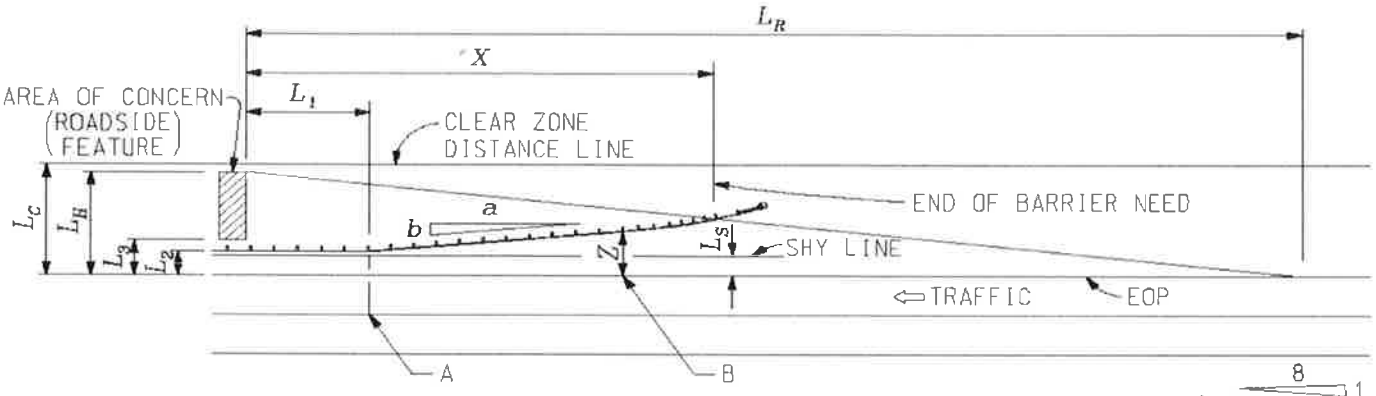
ROUTE **E Eisenhower Pkwy** CONTROL SECTION: _____ JOB # **20160521**

DESIGNED BY **ERS** DATE **5/10/2018** CHECKED BY: _____ DATE _____

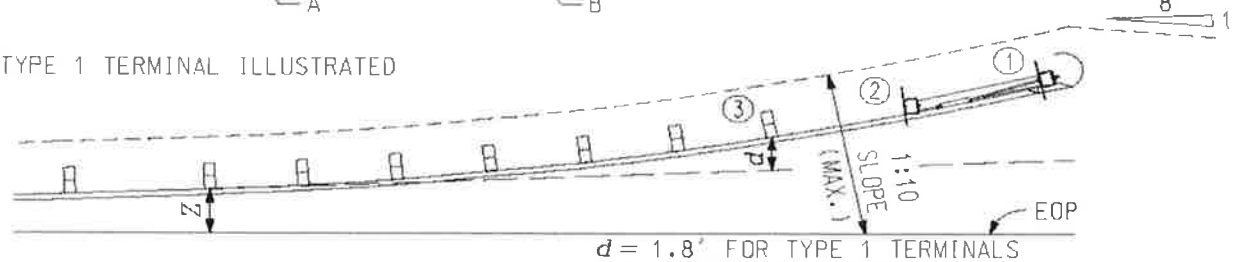
APPROX. STATION OR M.P. _____ DESCRIPTION: **E. of Boardwalk Dr, S. side of road**

GUARDRAIL RUN # **063**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT



NOTE: TYPE 1 TERMINAL ILLUSTRATED



$d = 1.8'$ FOR TYPE 1 TERMINALS
$d = 0$ FOR TYPE 2 TERMINALS

$$X = \frac{L_H + \left(\frac{b}{a}\right)(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right)\frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)\left(\frac{b}{a}\right) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED.....X = _____

RUNOUT LENGTH (7.01.19).....L_R= _____

GUARDRAIL TAPER RATE (R-59-SERIES).....$^b/_a$ = _____

E.O.P. TO FACE OF BARRIER (DESIGNED).....L_2= 3.00

CLEAR ZONE (7.01.11).....L_C= SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED).....L_3= 3.00

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE.....d = _____

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED).....L_H= 16.00

LATERAL OFFSET AT END OF FLARE.....Z = 3.00

DESIGN ADT

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S= 5 SHY LINE (7.01.18)

Curve Radius R= N/A '

If guardrail on outside of curve.

Curve Correction Factor Kcz= ____

STATION AT A N/A

STATION AT B _____

LENGTH OF NEED IN ADDITION TO CALCULATED X = 50.00 ft

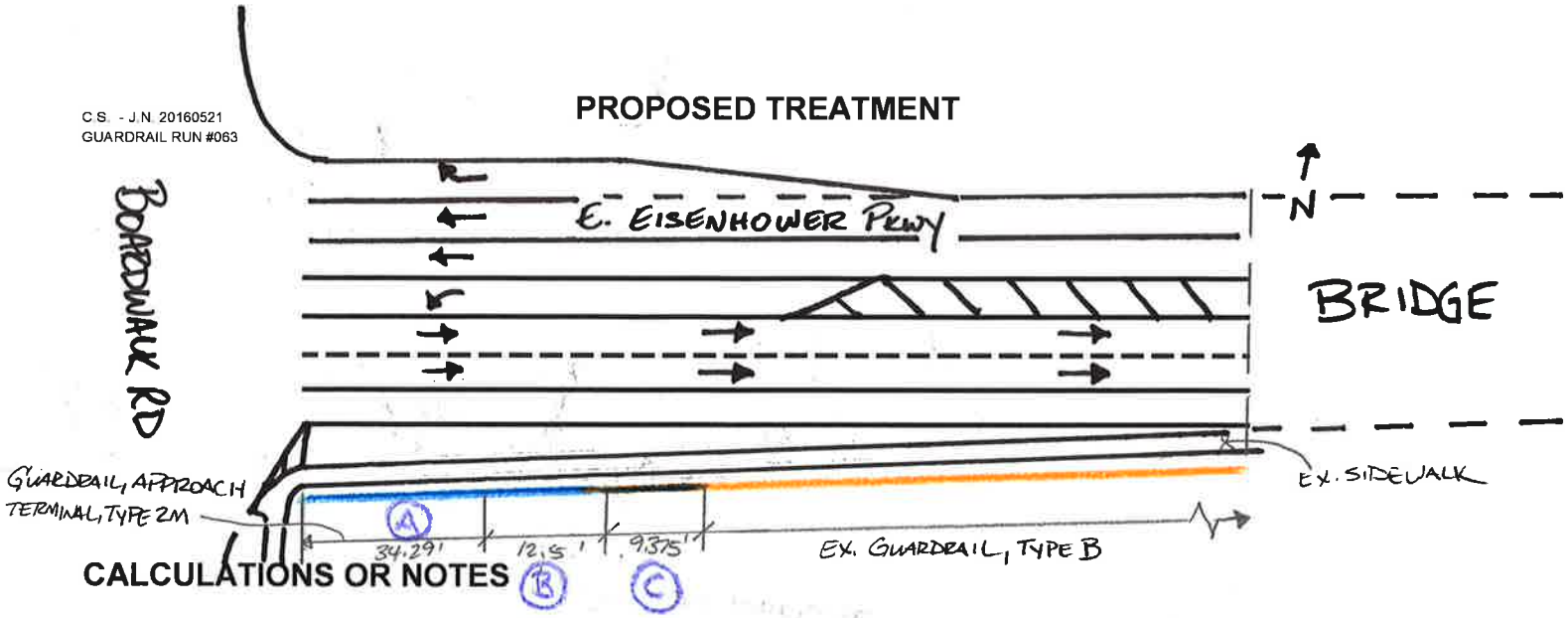
NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

$L_H <= L_C$

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #063

PROPOSED TREATMENT



CALCULATIONS OR NOTES

Calculated X = 50 ft (update existing terminal)
(A) Approach Terminal = -34.29 ft (Soft Stop)
(C) Transition from Guardrail, Type MGS-8 to Guardrail, Type B = -9.375 ft
Calculated X Remaining = 50 - 34.29 - 9.375 = 6.34
Guardrail Required
6.34 ÷ 12.5 = 0.51 → USE 1 Each
Guardrail, Type MGS-8 = 1 x 12.5 = 12.5 ft

(B) + (C) Transitions are included in item for MGS-8, therefore total Guardrail, Type MGS-8 = 12.5 + 9.375 = 21.875 ft

PAY ITEMS

(B) + (C) 21.88	FT	*	GUARDRAIL, TYPE MGS-8 1.75 BEAM ELEMENTS
	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-4
N/A	FT		BRIDGE RAILING, THRIE BEAM RETROFIT
(A) 1	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 2M
	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE ___
4	EACH		GUARDRAIL REFLECTOR
N/A	CYD		EMBANKMENT, LM
N/A	EACH		GUARDRAIL TERMINAL END SHOE (WHEN SPECIFIED)

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH ###### NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

TURF: (50'x5')/9 ≅ 30SyD

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-063

POOR

General Information:

Asset ID: GR-063	Edge Condition: CURB/GUTTER
Street Name: E Eisenhower Pkwy	Guardrail Purpose: STRUCTURE - BRIDGE/CULVERT
Road Attribute: ASPHALT	Posted Speed: 30 - 40 MPH
	Number of Lanes: 5

Guardrail Information:

Overall Condition: POOR	Guardrail Beam Condition: GOOD
Guardrail Type: TYPE B	Guardrail Curved: NO
Length: 593 Feet	

Miscellaneous:

Approach Terminal Type: OTHER	Approach Terminal Condition: POOR
Departure Terminal Type: BRIDGE CONNECTION	Departure Terminal Condition: GOOD
Post Type: BOTH	Post and Block Condition: FAIR
Bridge Anchor Type: DETAIL T-3	Bridge Anchor Condition: GOOD

Photo1:

Photo2:

Photo3: (if taken)

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-063

General Information:

Asset ID: GR-063

Defect: None

Observation 1: SOS

Observation 2: EOS

Defect 1: None

Defect 2: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

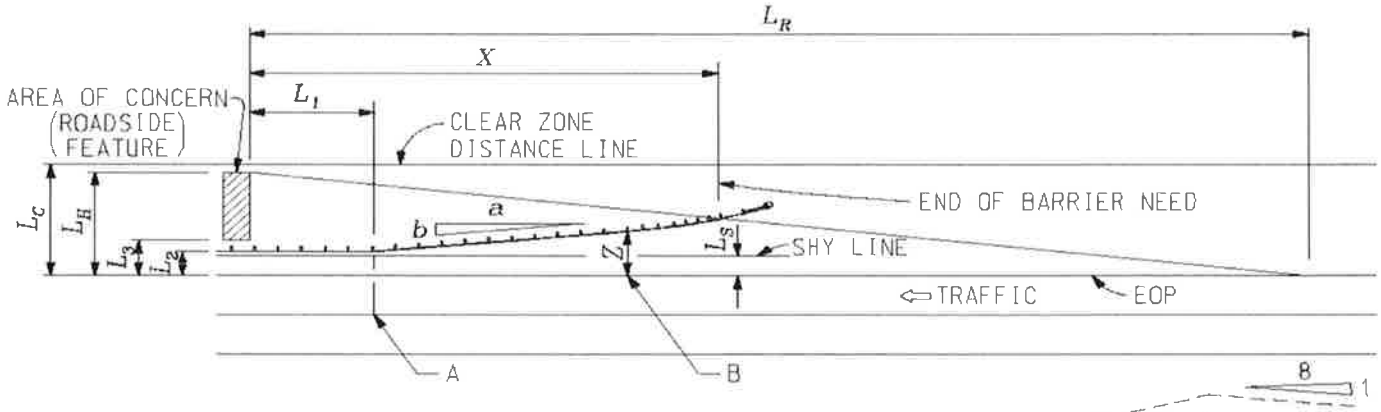
ROUTE **Fernwood Ave** CONTROL SECTION: _____ JOB # **20160521**

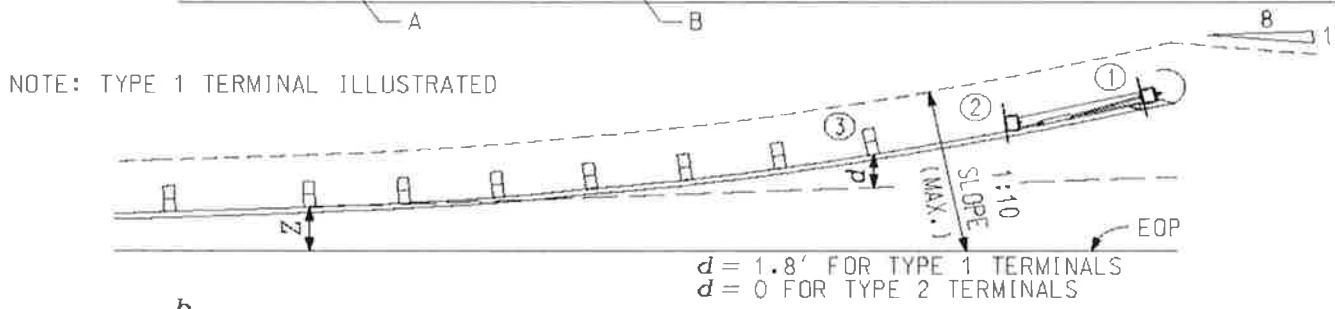
DESIGNED BY **ERS** DATE **5/10/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. _____ DESCRIPTION: **E. side of road at Creekwood Apts**

GUARDRAIL RUN # **069**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





$d = 1.8'$ FOR TYPE 1 TERMINALS
$d = 0$ FOR TYPE 2 TERMINALS

$$X = \frac{L_H + \left(\frac{b}{a}\right)(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right)\frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)\left(\frac{b}{a}\right) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED..... X = 44.00

RUNOUT LENGTH (7.01.19)..... L_R = 110.00

GUARDRAIL TAPER RATE (R-59-SERIES)..... $^b/_a$ =

E.O.P. TO FACE OF BARRIER (DESIGNED)..... L_2 = 12.00

CLEAR ZONE (7.01.11)..... L_C = SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED)..... L_3 = 16.00

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE..... d =

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED)..... L_H = 20.00

LATERAL OFFSET AT END OF FLARE..... Z = 12.00

DESIGN ADT

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S = 5 SHY LINE (7.01.18)

Curve Radius R= N/A

If guardrail on outside of curve.

Curve Correction Factor Kcz= ___

STATION AT A N/A

STATION AT B _____

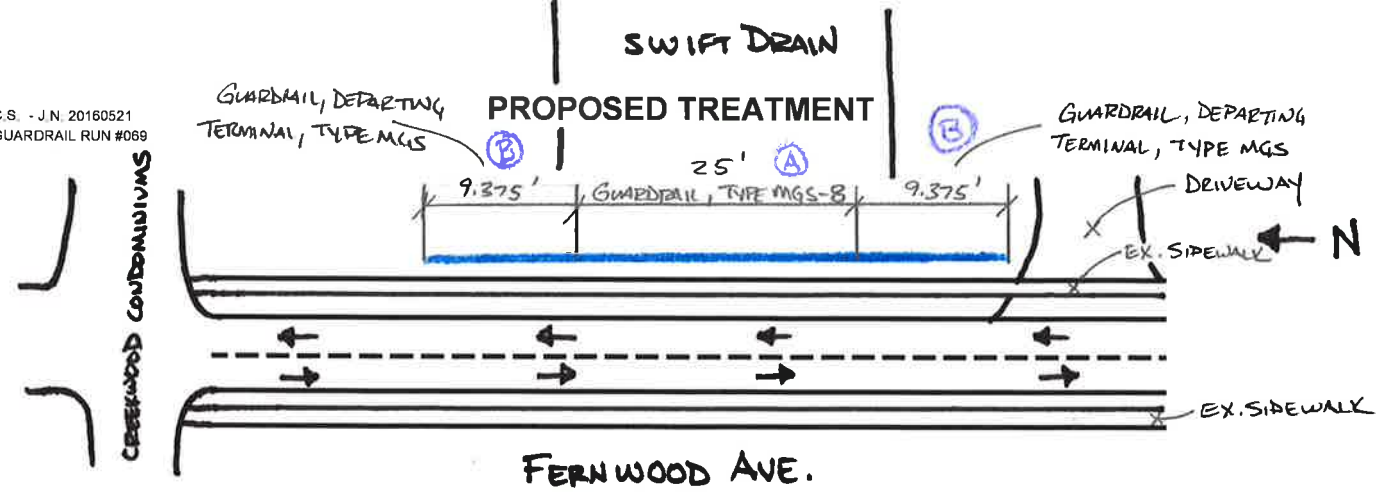
LENGTH OF NEED IN ADDITION TO CALCULATED X _____

NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

$L_H <= L_C$

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #069



CALCULATIONS OR NOTES

Lr = 110 ft (7.01.19)
Calculated X = 44 ft
(B) Guardrail, Departing Terminal, Type MGS = -9.375 ft (using 2 departing terminals)
Calculated X Remaining = 44 - 9.375 - 9.375 = 25.25
Guardrail Required
25.25 ÷ 12.5 = 2.02 → USE 2 Each
(A) Guardrail, Type MGS-8 = 2 x 12.5 = 25 ft

PAY ITEMS

(A) 25.00	FT	*	GUARDRAIL, TYPE MGS-8 2 BEAM ELEMENTS
	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-4
N/A	FT		BRIDGE RAILING, THRIE BEAM RETROFIT
	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 1B
(B) 2	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE MGS
4	EACH		GUARDRAIL REFLECTOR
N/A	CYD		EMBANKMENT, LM
N/A	EACH		GUARDRAIL TERMINAL END SHOE (WHEN SPECIFIED)

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL TYPE 1B PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

EMBANKMENT: 44'x5'x3' = 660/27 = 25CYD
TURF: 44'x5' = 220/9 = 25SYD

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-069

POOR

General Information:

Asset ID: GR-069	Edge Condition: CURB/GUTTER
Street Name: Fernwood Ave	Guardrail Purpose: EMBANKMENT
Road Attribute: ASPHALT	Posted Speed: 25MPH
	Number of Lanes: 2

Guardrail Information:

Overall Condition: POOR	Guardrail Beam Condition: GOOD
Guardrail Type: TYPE B	Guardrail Curved: NO
Length: 48 Feet	

Miscellaneous:

Approach Terminal Type: OTHER	Approach Terminal Condition: POOR
Departure Terminal Type: OTHER	Departure Terminal Condition: POOR
Post Type: METAL	Post and Block Condition: POOR
Bridge Anchor Type: N/A	Bridge Anchor Condition: N/A

Photo1:

Photo2:

Photo3: (if taken)

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Ann Arbor Guardrail Inspections

Inspection Report for:
ASSETID: GR-069

General Information:

Asset ID: GR-069

Defect: None

Observation 1: SOS

Observation 2: EOS

Defect 1: None

Defect 2: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

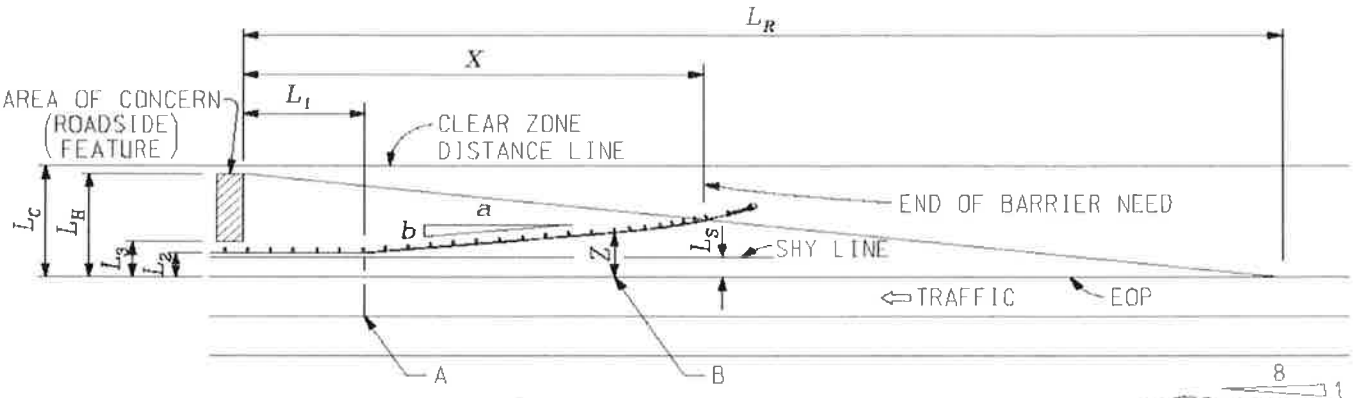
ROUTE **Fuller Road** CONTROL SECTION: _____ JOB # **20160521**

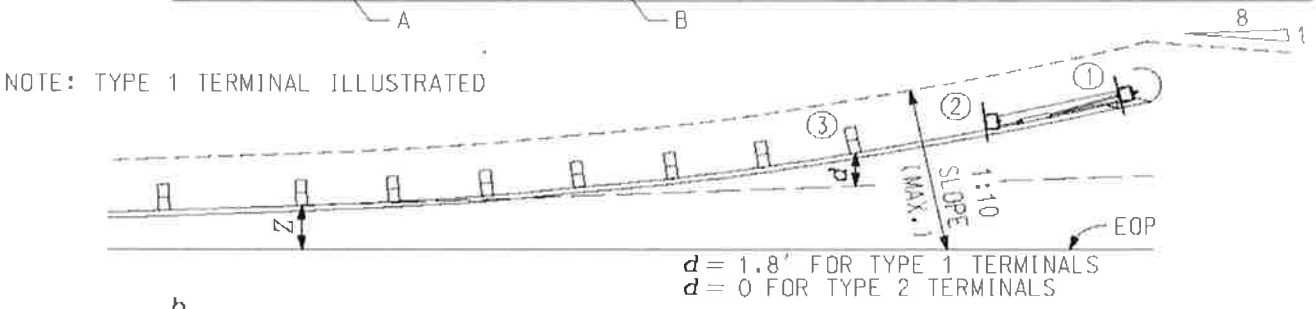
DESIGNED BY **BKD** DATE **5/11/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. **Right Side** DESCRIPTION: **WB Approach to RR (Amtrak) Bridg**

GUARDRAIL RUN # **071**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





d = 1.8' FOR TYPE 1 TERMINALS
d = 0 FOR TYPE 2 TERMINALS

$$X = \frac{L_H + (\frac{b}{a})(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right) \frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)(\frac{b}{a}) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED.....X = 40.00

RUNOUT LENGTH (7.01.19).....L_R = 160.00

GUARDRAIL TAPER RATE (R-59-SERIES).....$^b/_a$ = _____

E.O.P. TO FACE OF BARRIER (DESIGNED).....L_2 = 12.00

CLEAR ZONE (7.01.11).....L_C = SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED).....L_3 = 12.00

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE..... d = _____

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED).....L_H = 16.00

LATERAL OFFSET AT END OF FLARE.....Z = 12.00

DESIGN ADT

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S = 5 SHY LINE (7.01.18)

Curve Radius R= N/A

If guardrail on outside of curve.

Curve Correction Factor Kcz= ____

STATION AT A N/A

STATION AT B _____

LENGTH OF NEED IN ADDITION TO CALCULATED X _____

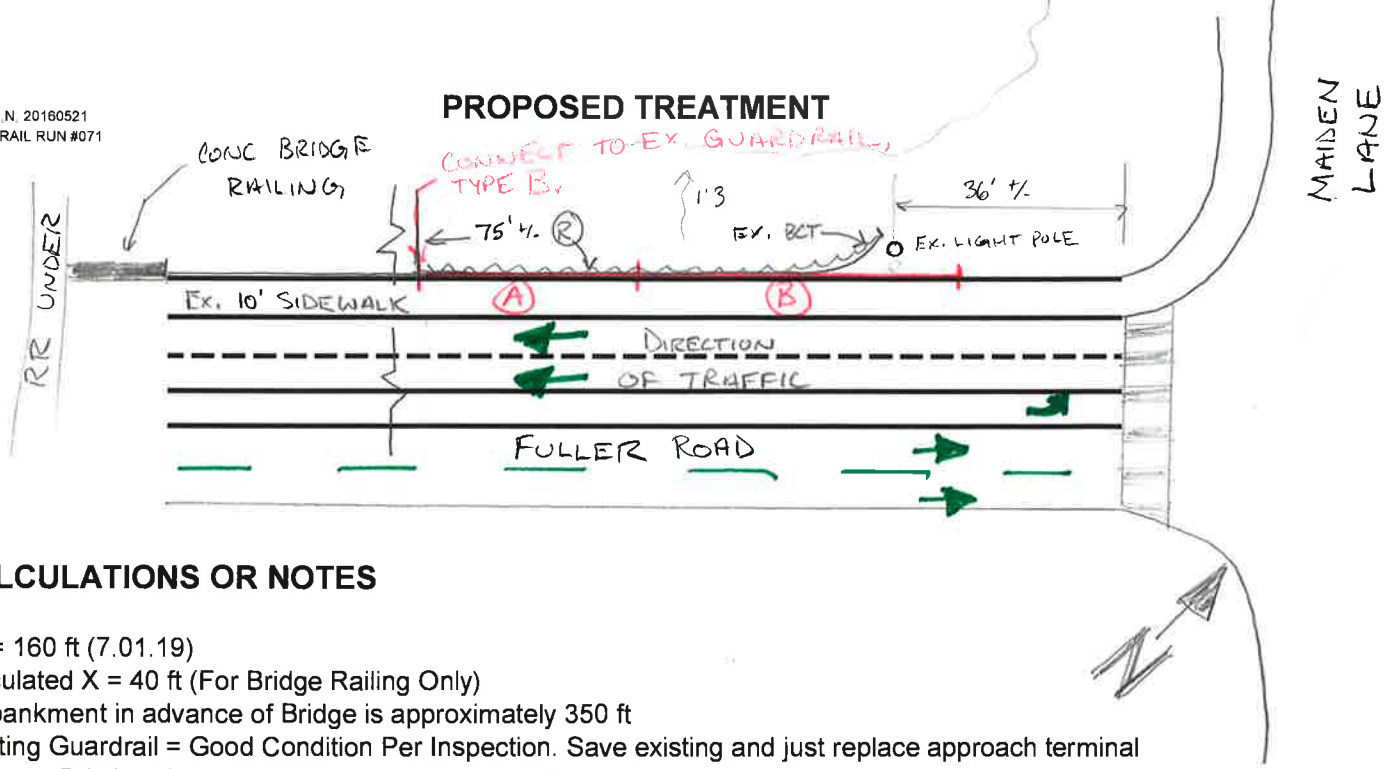
NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

$L_H <= L_C$

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #071

PROPOSED TREATMENT



CALCULATIONS OR NOTES

LR = 160 ft (7.01.19)
Calculated X = 40 ft (For Bridge Railing Only)
Embankment in advance of Bridge is approximately 350 ft
Existing Guardrail = Good Condition Per Inspection. Save existing and just replace approach terminal
Remove Existing Flaired BCT Approach Terminal = 4 sections x 12.5 ft/each = 50
(A) Transition from Ex. Guardrail, Type B to Guardrail, Type MGS-8 = -34.375 ft (A)
(B) Approach Terminal, Type 2M (Soft-Stop) = 50.79167 ft (34.29' = deduction from x, 16.5' = not part of x)

*Additional Guardrail Removal (to make room for transition) = 34.375 + 50.79167 - 50 = 35.167
→ 35 ÷ 12.5 = 2.8 → Use 2 Each
(25 ft of additional GR Removal)

→ Note that guardrail is constrained by intersection of Fuller and Maiden Lane so new approach terminal is designed to end no more than 25' from existing approach terminal ending

PAY ITEMS

75	FT	*	GUARDRAIL, REM
34.375	FT	*	GUARDRAIL, TYPE MGS-8 (A)
	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-4
	FT		GUARDRAIL, WOOD BACKING, SPECIAL
1	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 2M (B)
N/A	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE ___
2	EACH		GUARDRAIL REFLECTOR
	SYD		PAVT, REM
	SYD		CONC PAVT, MISC, NONREINF, 6 INCH

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL, TYPE 2M PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

Include 8' Posts along embankment
Shoulder, Cl II = 90' x 2' x 1' = 12 TON

Embankment = 90' x 5' x 3' = 50 cyd

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-071

GOOD

General Information:

Asset ID: GR-071
Street Name: Fuller St
Road Attribute: ASPHALT
Edge Condition: CURB/GUTTER
Guardrail Purpose: STRUCTURE - BRIDGE/CULVERT
Posted Speed: 30 - 40 MPH
Number of Lanes: 5

Guardrail Information:

Overall Condition: GOOD
Guardrail Type: TYPE B
Length: 331 Feet
Guardrail Beam Condition: GOOD
Guardrail Curved: NO

Miscellaneous:

Approach Terminal Type: TYPE 1 - SRT
Departure Terminal Type: BRIDGE CONNECTION
Post Type: WOOD
Bridge Anchor Type: OTHER
Approach Terminal Condition: GOOD
Departure Terminal Condition: GOOD
Post and Block Condition: GOOD
Bridge Anchor Condition: GOOD

Photo1:

Photo2:

Photo3: (if taken)

Ann Arbor Guardrail Inspections

Inspection Report for:
ASSETID: GR-071

General Information:

Asset ID: GR-071

Defect: None

Observation 1: SOS

Observation 2: EOS

Defect 1: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

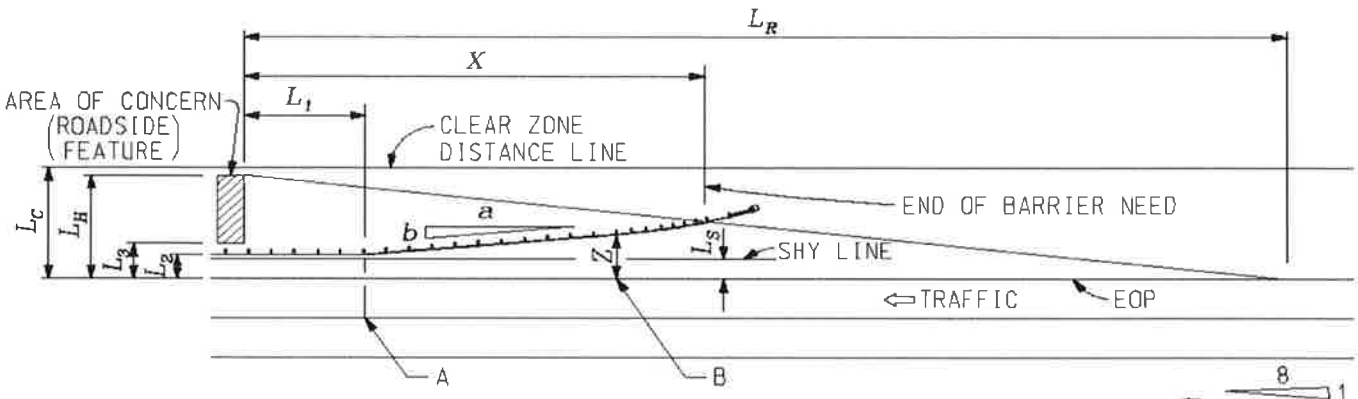
ROUTE **Depot St.** CONTROL SECTION: _____ JOB # **20160521**

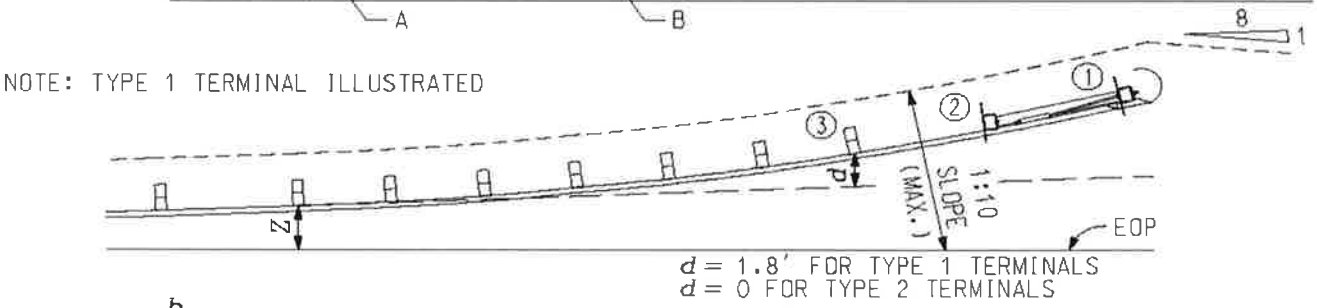
DESIGNED BY **ALM** DATE **5/10/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. _____ DESCRIPTION: **N side of the road, W of intersection w/ N State St**

GUARDRAIL RUN # **075**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





$$X = \frac{L_H + (\frac{b}{a})(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right) \frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)(\frac{b}{a}) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED.....X = 80.00

RUNOUT LENGTH (7.01.19).....L_R= 160.00

GUARDRAIL TAPER RATE (R-59-SERIES).....$^b/_a$ = _____

E.O.P. TO FACE OF BARRIER (DESIGNED).....L_2= 8.00

CLEAR ZONE (7.01.11).....L_C= SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED).....L_3= 16.00

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE.....d = _____

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED).....L_H= 16.00

LATERAL OFFSET AT END OF FLARE.....Z = 8.00

DESIGN ADT 10000 +

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S= 5 SHY LINE (7.01.18)

Curve Radius R= N/A '

If guardrail on outside of curve.

Curve Correction Factor Kcz= ___

STATION AT A N/A

STATION AT B _____

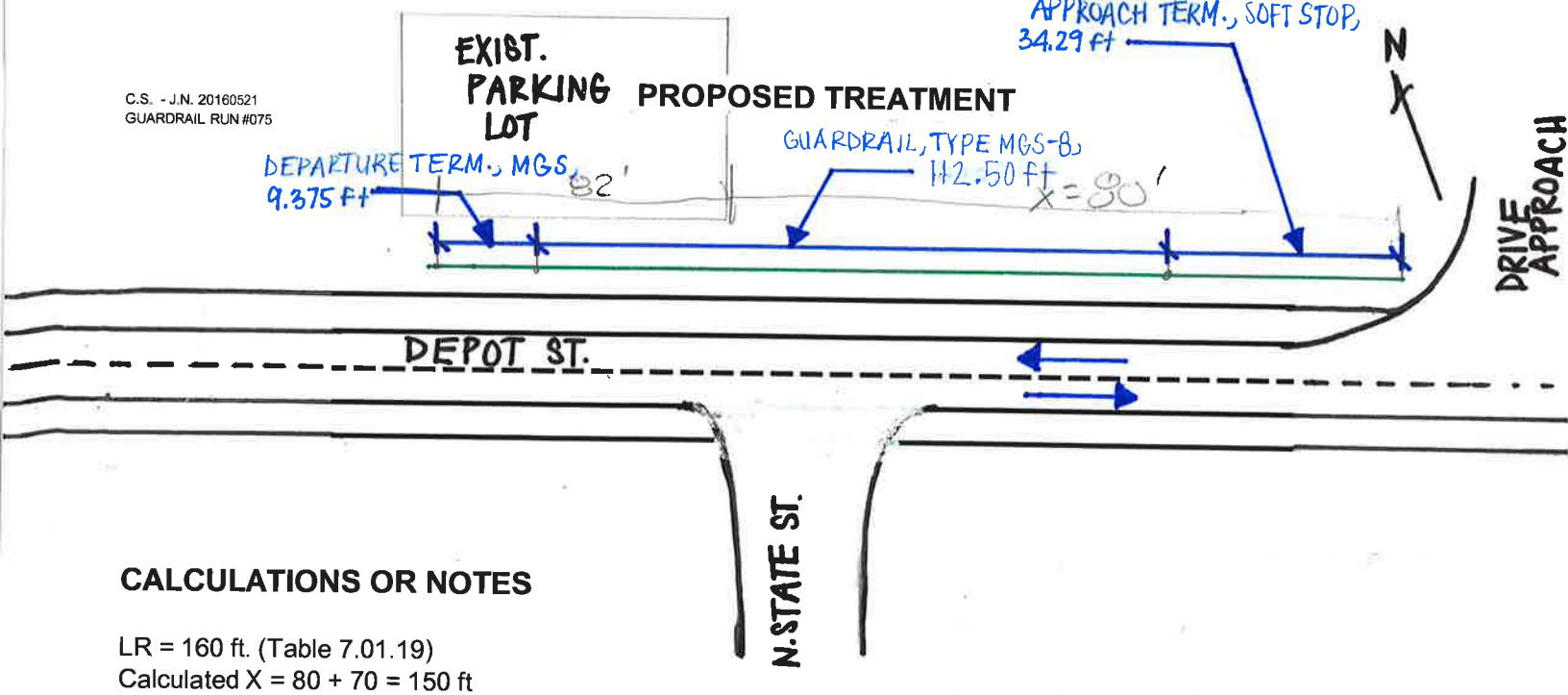
NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

$L_H <= L_C$

LENGTH OF NEED IN ADDITION TO CALCULATED X = 70.00 ft

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #075



CALCULATIONS OR NOTES

LR = 160 ft. (Table 7.01.19)
Calculated X = 80 + 70 = 150 ft
Approach Terminal = -34.29 ft (Soft Stop)
Departure Terminal = -9.375 ft
Calculated X Remaining = 150 - 34.29 - 9.375 = 106.335
Guardrail Required
106.335 ÷ 12.5 = 8.51 → USE 9 Each
Guardrail, Type MGS-8 = 9 x 12.5 = 112.5 ft

* contractor use 8ft post @ embankment *

162 - 9.375 - 34.29 = 118.335
GR Length = 125 = 8 Segments

100 FT = Guardrail, Rem

PAY ITEMS

125'

~~112.50~~	FT	*	GUARDRAIL, TYPE MGS-8 9 BEAM ELEMENTS
	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-2
N/A	FT		BRIDGE RAILING, THRIE BEAM RETROFIT
1	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 2M
1	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE MGS
8	EACH		GUARDRAIL REFLECTOR
N/A	CYD		EMBANKMENT, LM
N/A	EACH		GUARDRAIL TERMINAL END SHOE (WHEN SPECIFIED)

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL, TYPE 2M PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

280 SY Restoration

HRC

PRINTED 5/11/2018

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-075

POOR

General Information:

Asset ID: GR-075	Edge Condition: CURB/GUTTER
Street Name: Depot St	Guardrail Purpose: EMBANKMENT
Road Attribute: ASPHALT	Posted Speed: 30 - 40 MPH
	Number of Lanes: 3

Guardrail Information:

Overall Condition: POOR	Guardrail Beam Condition: GOOD
Guardrail Type: TYPE A	Guardrail Curved: NO
Length: 100 Feet	

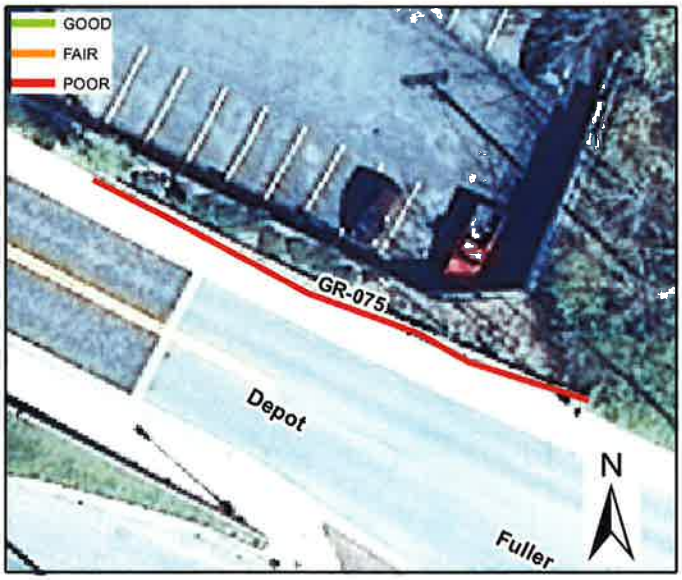
Miscellaneous:

Approach Terminal Type: OTHER	Approach Terminal Condition: POOR
Departure Terminal Type: OTHER	Departure Terminal Condition: POOR
Post Type: WOOD	Post and Block Condition: GOOD
Bridge Anchor Type: N/A	Bridge Anchor Condition: N/A

Photo1:

Photo2:

Photo3: (if taken)



Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-075

General Information:

Asset ID: GR-075

Defect: None

Observation 1: SOS

Observation 2: EOS

Defect 1: None

Defect 2: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

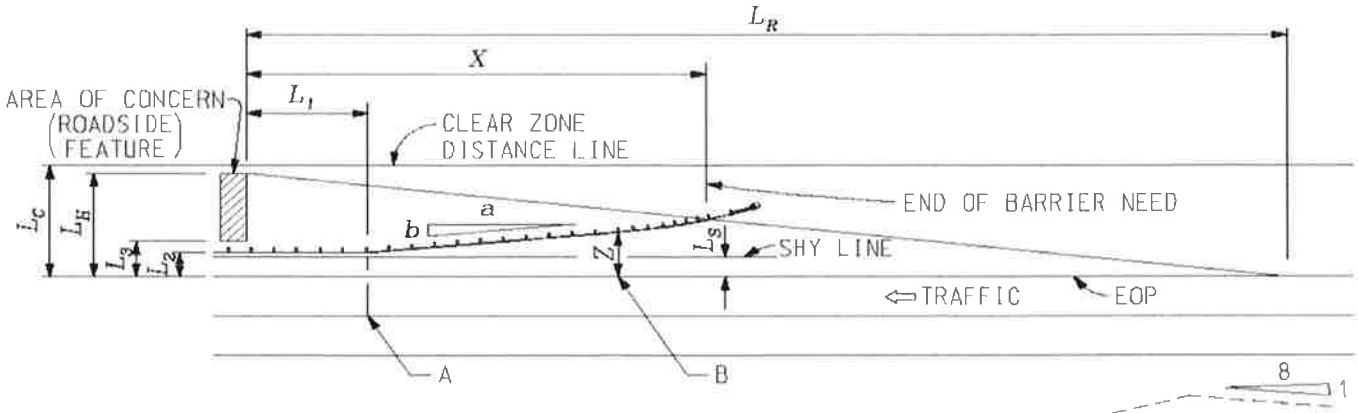
ROUTE **Fuller Road** CONTROL SECTION: _____ JOB # **20160521**

DESIGNED BY **BKD** DATE **5/11/2018** CHECKED BY: _____ DATE _____

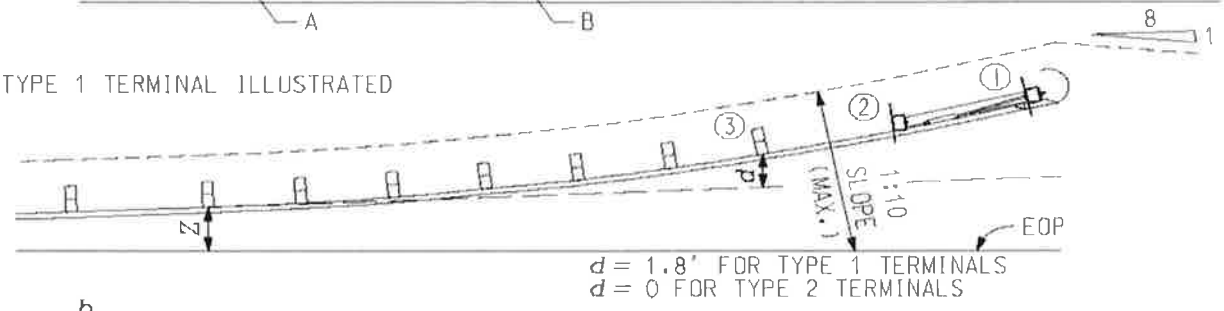
APPROX. STATION OR M.P. **Right Side** DESCRIPTION: **EB Embankment at Huron HS**

GUARDRAIL RUN # **081**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT



NOTE: TYPE 1 TERMINAL ILLUSTRATED



$d = 1.8'$ FOR TYPE 1 TERMINALS
$d = 0$ FOR TYPE 2 TERMINALS

$$X = \frac{L_H + (\frac{b}{a})(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right) \frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)(\frac{b}{a}) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED.....X = 182.47

RUNOUT LENGTH (7.01.19).....L_R= 230.00

GUARDRAIL TAPER RATE (R-59-SERIES).....$^b/_a$ =

E.O.P. TO FACE OF BARRIER (DESIGNED).....L_2= 6.20

CLEAR ZONE (7.01.11).....L_C= SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED).....L_3= 6.20

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE..... d =

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED).....L_H= 30.00

LATERAL OFFSET AT END OF FLARE.....Z = 6.20

DESIGN ADT 8,330

DESIGN SPEED 45 mph

FILL SLOPE 1:3

L_1 = _____ (25' MIN.)

L_S= 6.5 SHY LINE (7.01.18)

Curve Radius R= N/A '

If guardrail on outside of curve.

Curve Correction Factor Kcz= ____

STATION AT A N/A

STATION AT B _____

LENGTH OF NEED IN ADDITION TO CALCULATED X _____

NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

$L_H <= L_C$

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #081

PROPOSED TREATMENT

CALCULATIONS OR NOTES

LR = 230 ft (7.01.30)
Calculated X = 182.47 ft (In advance of 1:3 Slope for Embankment)
Ex. Embankment (1:3 Slope) starts at ex. departing terminal and ends approximately 135 ft west
Ex. Guardrail appears rusty, posts reported to be in fair condition with some signs of aging → R&R All
Start new guardrail run with departing terminal (Type MGS) approximately 35' east of existing departing terminal
Install approximately 350 ft of new Guardrail, Type MGS-8
Approach Terminal, Type 2M (Soft-Stop) = 50.79167 ft (34.29' = deduction from x, 16.5' = not part of x)

Sketch is attached on separate sheet.

PAY ITEMS

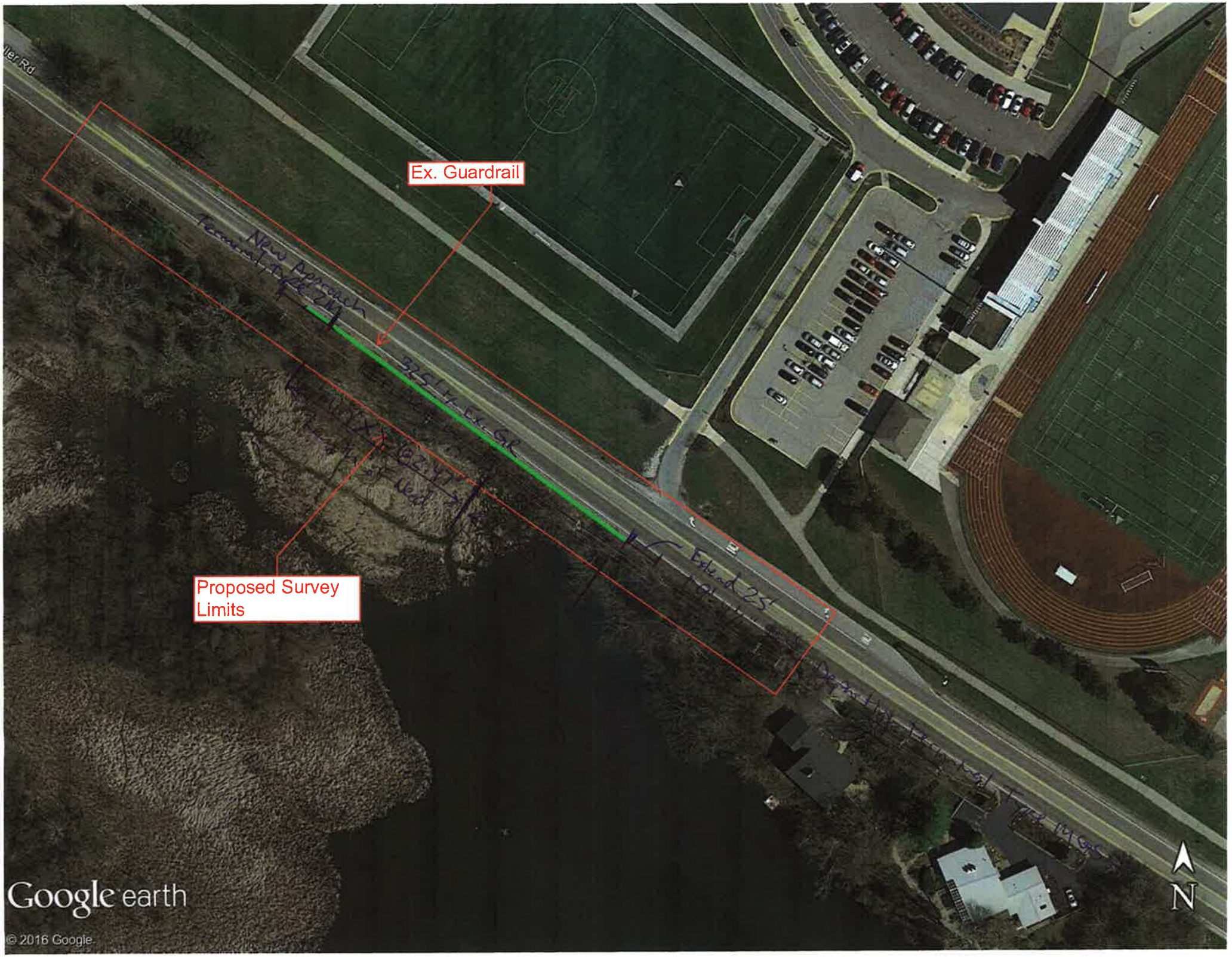
332	FT		GUARDRAIL, REM
350	FT	*	GUARDRAIL, TYPE MGS-8
	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-4
	FT		GUARDRAIL, WOOD BACKING, SPECIAL
1	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 2M
1	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE MGS
8	EACH		GUARDRAIL REFLECTOR
	SYD		PAVT, REM
	SYD		CONC PAVT, MISC, NONREINF, 6 INCH

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL, TYPE 2M PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

Include 8' Posts along embankment
Shoulder, Cl II = 400' x 2' x 1' = 55 TON (Along GR)
+ 6' x #" x 600' = +80 TON > 135 TON
Embankment = 400' x 5' x 3' = 225 CYD


Ex. Guardrail
Proposed Survey Limits
Google earth
© 2016 Google
N

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-081

POOR

General Information:

Asset ID: GR-081
Street Name: Fuller Rd
Road Attribute: ASPHALT
Edge Condition: PAVED SHOULDER
Guardrail Purpose: EMBANKMENT
Posted Speed: 30 - 40 MPH
Number of Lanes: 2

Guardrail Information:

Overall Condition: POOR
Guardrail Type: TYPE B
Length: 332 Feet
Guardrail Beam Condition: GOOD
Guardrail Curved: NO

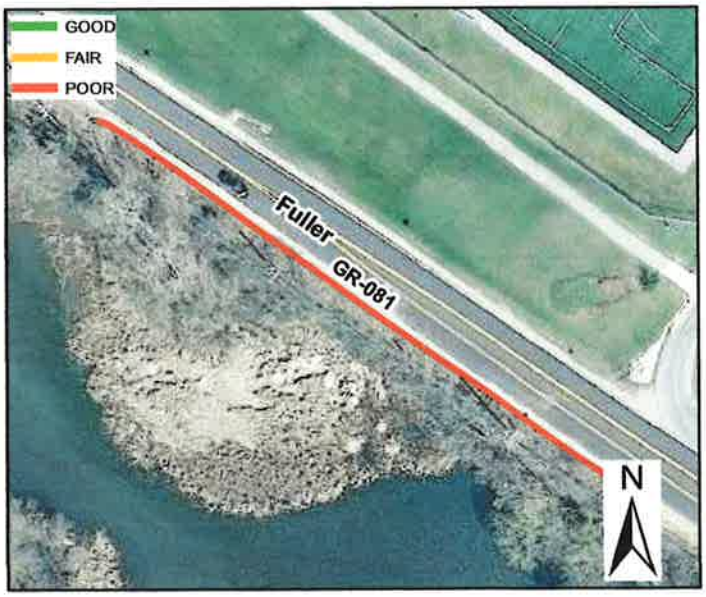
Miscellaneous:

Approach Terminal Type: OTHER
Departure Terminal Type: DEPARTING TERMINAL (NOT SRT)
Post Type: WOOD
Bridge Anchor Type: N/A
Approach Terminal Condition: POOR
Departure Terminal Condition: FAIR
Post and Block Condition: FAIR
Bridge Anchor Condition: N/A

Photo1:

Photo2:

Photo3: (if taken)



Ann Arbor Guardrail Inspections

Inspection Report for:
ASSETID: GR-081

General Information:

Asset ID: GR-081

Defect: None

Observation 1: SOS

Observation 2: EOS

Defect 1: None

Defect 2: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

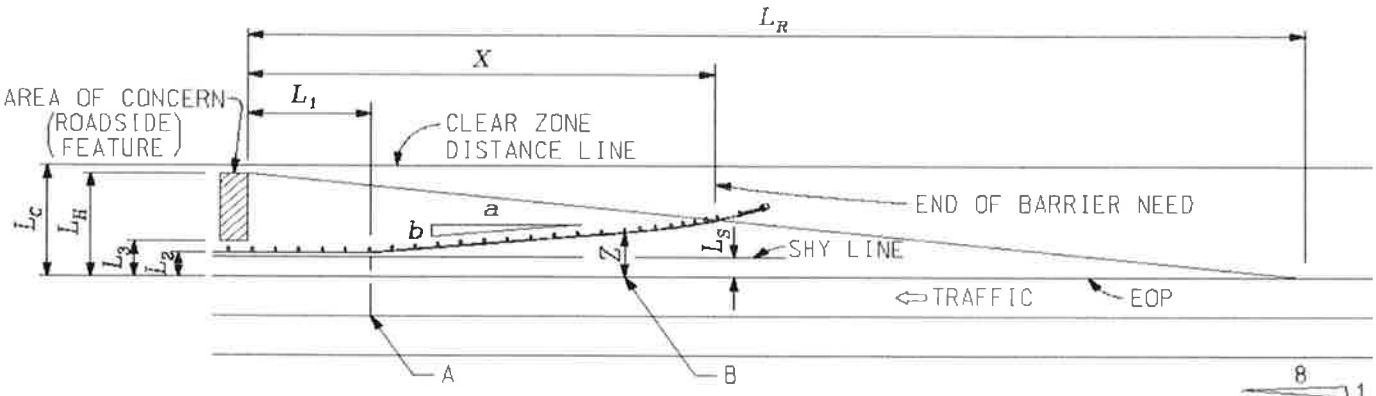
ROUTE **Miller Ave** CONTROL SECTION: _____ JOB # **20160521**

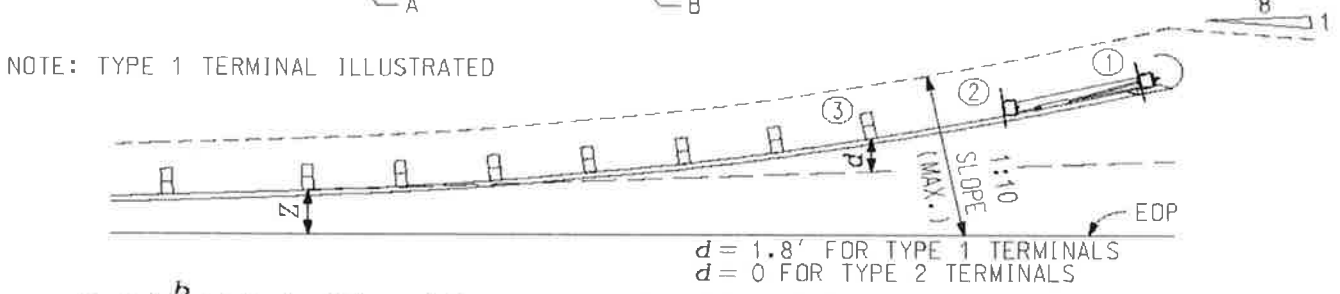
DESIGNED BY **ERS** DATE **5/10/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. _____ DESCRIPTION: **EB Bridge approach, S. side**

GUARDRAIL RUN # **103**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





$$X = \frac{L_H + \left(\frac{b}{a}\right)(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right)\frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)\left(\frac{b}{a}\right) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED.....X = 100.00

RUNOUT LENGTH (7.01.19).....L_R= 160.00

GUARDRAIL TAPER RATE (R-59-SERIES).....$^b/_a$ = _____

E.O.P. TO FACE OF BARRIER (DESIGNED).....L_2= 8.00

CLEAR ZONE (7.01.11)..... L_C= SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED).....L_3= 9.00

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE.....d = _____

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED).....L_H= 12.00

LATERAL OFFSET AT END OF FLARE.....Z = 8.00

DESIGN ADT

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S= 5 SHY LINE (7.01.18)

Curve Radius R= N/A '

If guardrail on outside of curve.

Curve Correction Factor Kcz= _____

STATION AT A N/A

STATION AT B _____

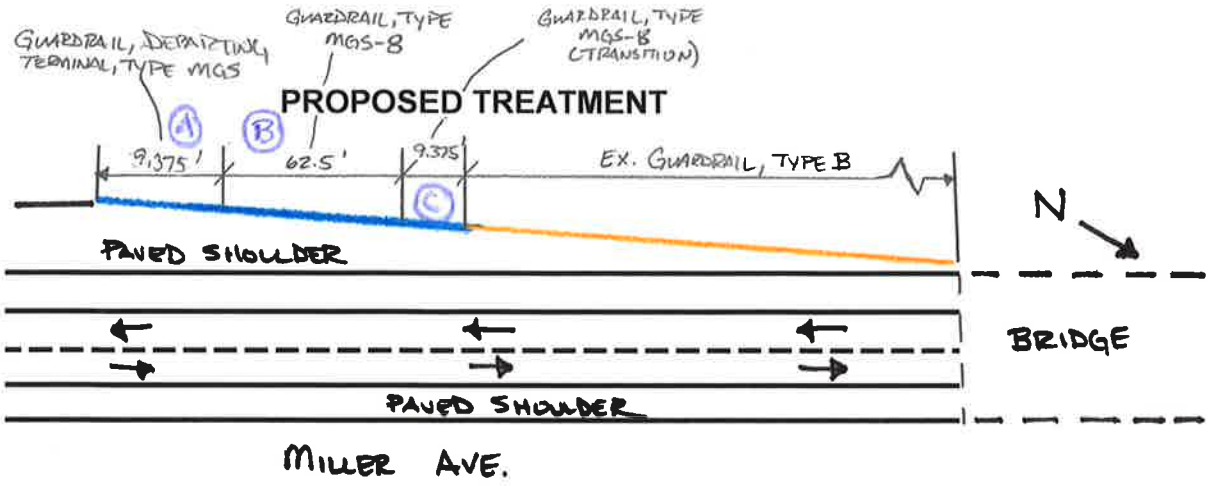
LENGTH OF NEED IN ADDITION TO CALCULATED X _____

NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

$L_H <= L_C$

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #103



CALCULATIONS OR NOTES

Calculated X = 100 ft (replace/update guardrail beams past damaged section)
(A) Guardrail, ~~Approach~~ DEPARTING Terminal, Type ~~2M~~ MGS = ~~-34.29 ft~~ -9.375 ft
(B) Transition from Guardrail, Type MGS-8 to Guardrail, Type B = -9.375 ft
Calculated X Remaining = 100 - ~~34.29~~ 9.375 - 9.375 = 56.335
Guardrail Required
56.335 ÷ 12.5 = ~~4.5~~ 5 → USE ~~5~~ 7 Each 87.5
(C) Guardrail, Type MGS-8 = 5 x 12.5 = ~~62.5~~ 87.5 ft

X Transitions are included in item for MGS-8, therefore total Guardrail, Type MGS-8 = ~~62.5~~ 87.5 + 9.375 = ~~71.875~~ 96.875 ft
(B) + (C)

PAY ITEMS

(C) + (B) 96.875

~~71.88~~	FT	*	GUARDRAIL, TYPE MGS-8 5.75 BEAM ELEMENTS
	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-4
N/A	FT		BRIDGE RAILING, THRIE BEAM RETROFIT
	EACH		GUARDRAIL APPROACH TERMINAL, TYPE
(A) 1	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE MGS
6	EACH		GUARDRAIL REFLECTOR
N/A	CYD		EMBANKMENT, LM
N/A	EACH		GUARDRAIL TERMINAL END SHOE (WHEN SPECIFIED)

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL TYPE 1B PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

TURF ESTABLISHMENT (SYD) : (100' x 5')/9 = 60 SYD

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-103

POOR

General Information:

Asset ID: GR-103
Street Name: Miller Ave
Road Attribute: ASPHALT

Edge Condition: PAVED SHOULDER
Guardrail Purpose: STRUCTURE - BRIDGE/CULVERT
Posted Speed: 30 - 40 MPH
Number of Lanes: 2

Guardrail Information:

Overall Condition: POOR
Guardrail Type: TYPE B
Length: 275 Feet

Guardrail Beam Condition: FAIR
Guardrail Curved: NO

Miscellaneous:

Approach Terminal Type: BRIDGE CONNECTION
Departure Terminal Type: TYPE 1 - SRT
Post Type: BOTH
Bridge Anchor Type: DETAIL T-3

Approach Terminal Condition: GOOD
Departure Terminal Condition: GOOD
Post and Block Condition: FAIR
Bridge Anchor Condition: GOOD

Photo1:

Photo2:

Photo3: (if taken)

Ann Arbor Guardrail Inspections

General Information:

Inspection Report for: ASSETID: GR-103

Asset ID: GR-103

Defect: Damage

Observation 1: SOS

Observation 2: EOS

Defect 1: Damage

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

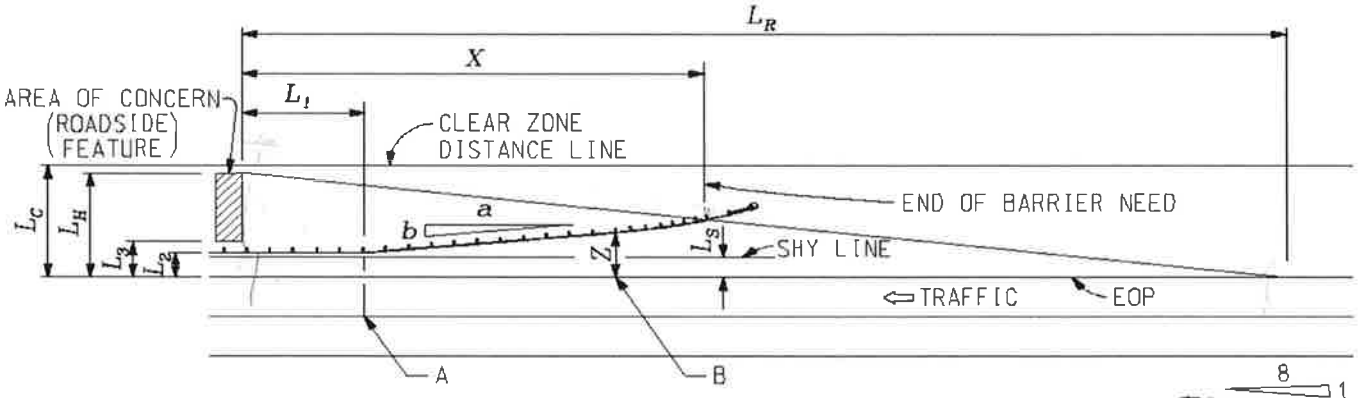
ROUTE **Plymouth Rd.** CONTROL SECTION: _____ JOB # **20160521**

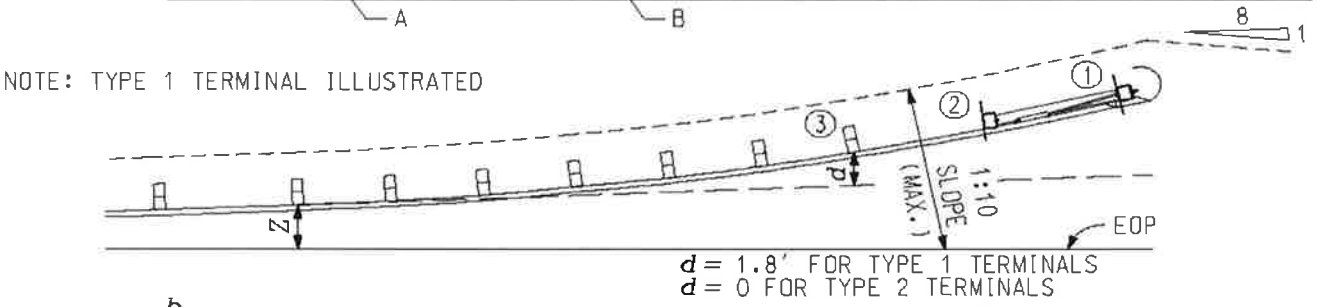
DESIGNED BY **ALM** DATE **5/10/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. _____ DESCRIPTION: **S side of road, W bridge approach to US-23 overpass**

GUARDRAIL RUN # **120**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





$d = 1.8'$ FOR TYPE 1 TERMINALS
$d = 0$ FOR TYPE 2 TERMINALS

$$X = \frac{L_H + (\frac{b}{a})(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}} \qquad X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right)\frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)(\frac{b}{a}) + L_2 \qquad Z = L_2 \text{ (For Type 2 Terminals)}$$

LENGTH OF NEED.....X = 153.33

RUNOUT LENGTH (7.01.19).....L_R = 230.00

GUARDRAIL TAPER RATE (R-59-SERIES).....$^b/_a$ = _____

E.O.P. TO FACE OF BARRIER (DESIGNED).....L_2 = 8.00

CLEAR ZONE (7.01.11).....L_C = SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED).....L_3 = 8.00

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE.....d = _____

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED).....L_H = 24.00

LATERAL OFFSET AT END OF FLARE.....Z = 8.00

DESIGN ADT 10000 +

DESIGN SPEED 45 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S = 6 SHY LINE (7.01.18)

Curve Radius R= N/A '

If guardrail on outside of curve.

Curve Correction Factor Kcz= _____

STATION AT A N/A

STATION AT B _____

NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

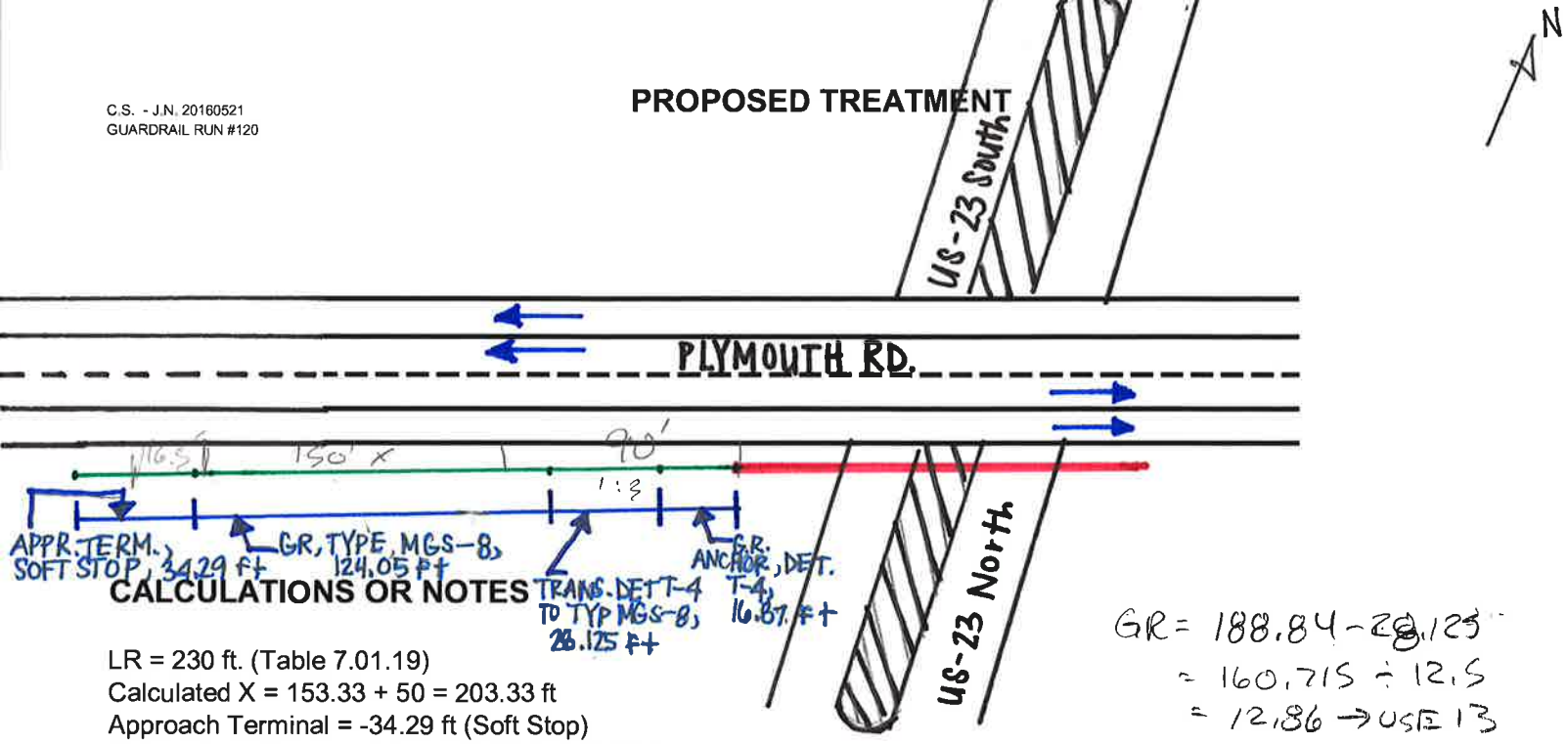
$L_H <= L_C$

LENGTH OF NEED IN ADDITION TO CALCULATED X = 50.00 ft

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #120

PROPOSED TREATMENT



CALCULATIONS OR NOTES

LR = 230 ft. (Table 7.01.19)
Calculated X = 153.33 + 50 = 203.33 ft
Approach Terminal = -34.29 ft (Soft Stop)
Guardrail Anchorage, Bridge, Det T-4 = -16.87 ft
Transition from Guardrail Anchorage, Bridge Det T-4 to Guardrail, Type MGS-8 = -28.125 ft
Calculated X Remaining = 203.33 - 34.29 - 16.87 - 28.125 = 124.05
Guardrail Required
124.05 ÷ 12.5 = 9.92 → USE 10 Each
Guardrail, Type MGS-8 = 10 x 12.5 = 125 ft

GR = 188.84 - 28.125
= 160.715 ÷ 12.5
= 12.86 → USE 13
13 x 12.5 = 162.5

MGS = 162.5 + 28.125 = 190.625

Transitions are included in item for MGS-8, therefore total Guardrail, Type MGS-8 = 125 + 28.125 = 153.125 ft

75' Ft Guardrail, Rem

PAY ITEMS

190.625
~~153.13~~ FT * GUARDRAIL, TYPE MGS-8
12.25 BEAM ELEMENTS

1 EACH GUARDRAIL ANCHORAGE, BRIDGE, DET T-4

N/A FT BRIDGE RAILING, THRIE BEAM RETROFIT

1 EACH GUARDRAIL APPROACH TERMINAL, TYPE 2M

___ EACH GUARDRAIL DEPARTING TERMINAL, TYPE ___

10 EACH GUARDRAIL REFLECTOR

N/A CYD EMBANKMENT, LM

N/A EACH GUARDRAIL TERMINAL END SHOE (WHEN SPECIFIED)

3/5 541 Restoration (280' x 10')

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH TERMINAL, TYPE 2M PORTION OF LENGTH OF NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

Ann Arbor Guardrail Inspections

Inspection Report for:
ASSETID: GR-120

POOR

General Information:

Asset ID: GR-120
Street Name: Plymouth Rd
Road Attribute: ASPHALT

Edge Condition: CURB/GUTTER
Guardrail Purpose: STRUCTURE - BRIDGE/CULVERT
Posted Speed: 45 - 50 MPH
Number of Lanes: 4

Guardrail Information:

Overall Condition: POOR
Guardrail Type: TYPE B
Length: 73 Feet

Guardrail Beam Condition: POOR
Guardrail Curved: NO

Miscellaneous:

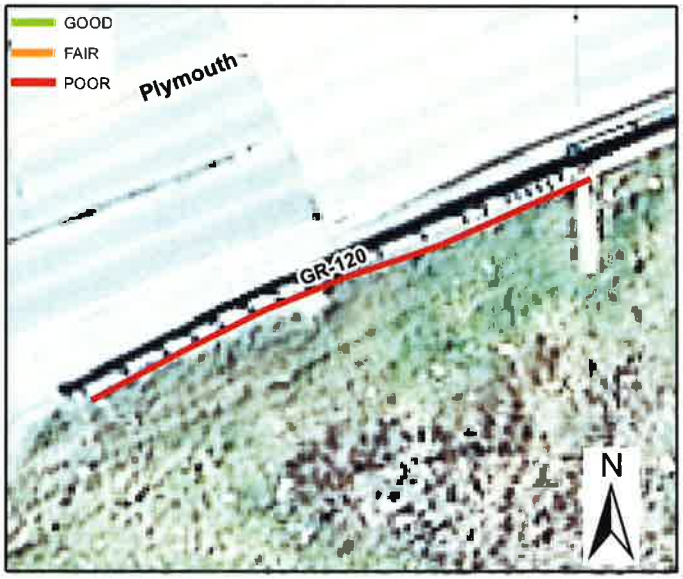
Approach Terminal Type: TYPE 1 - SRT
Departure Terminal Type: BRIDGE CONNECTION
Post Type: BOTH
Bridge Anchor Type: DETAIL T-3

Approach Terminal Condition: GOOD
Departure Terminal Condition: GOOD
Post and Block Condition: POOR
Bridge Anchor Condition: GOOD

Photo1:

Photo2:

Photo3: (if taken)



HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-120

General Information:

Asset ID: GR-120

Defect: Damage

Observation 1: SOS

Observation 2: EOS

Defect 1: Damage

Defect 2: None

GUARDRAIL WORKSHEET

FOR APPROACH TERMINAL ON R-61-SERIES AND R-62-SERIES

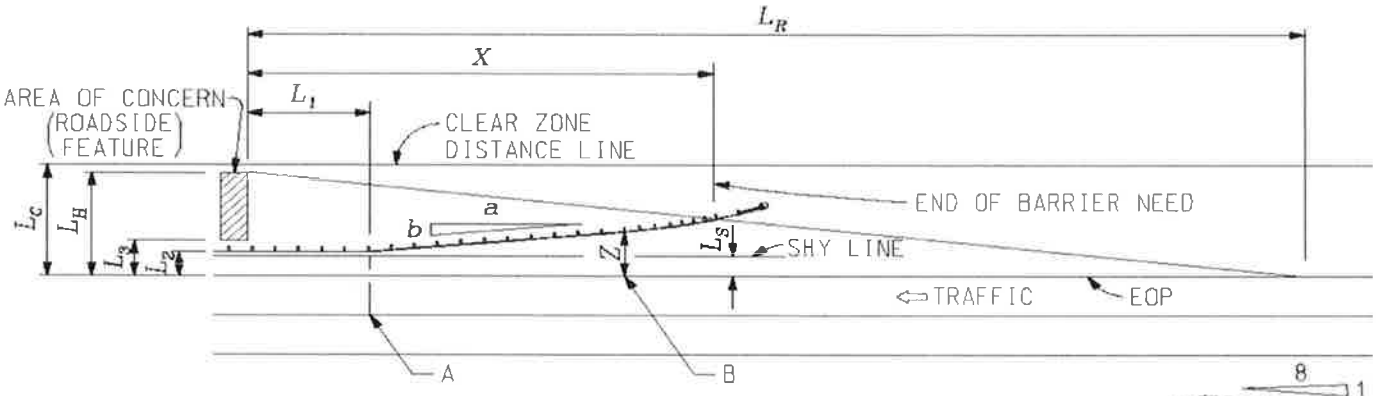
ROUTE **Scio Church Rd** CONTROL SECTION: _____ JOB # **20160521**

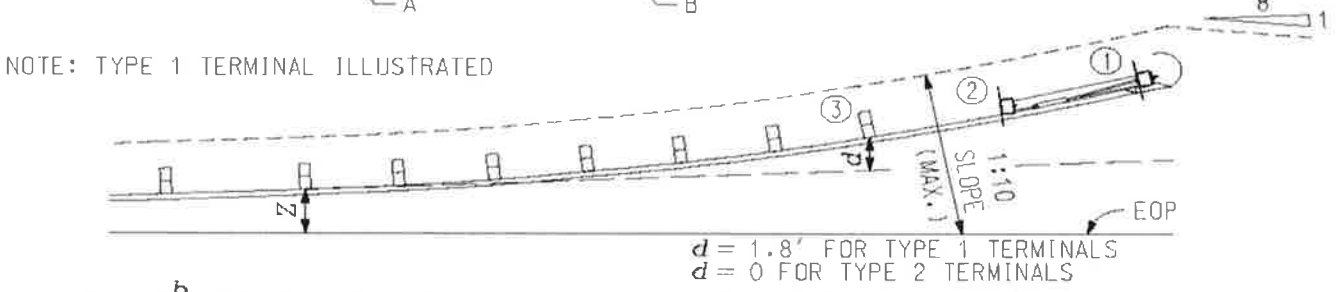
DESIGNED BY **ERS** DATE **5/10/2018** CHECKED BY: _____ DATE _____

APPROX. STATION OR M.P. _____ DESCRIPTION: **EB Bridge Approach over I-94**

GUARDRAIL RUN # **125**

IF STATIONING NOT AVAILABLE, LOCATE TO NEAREST FIXED OBJECT





$d = 1.8'$ FOR TYPE 1 TERMINALS
$d = 0$ FOR TYPE 2 TERMINALS

$$X = \frac{L_H + (\frac{b}{a})(L_1) - (L_2 + d)}{\frac{b}{a} + \frac{L_H}{L_R}}$$

$$X = \frac{L_H - (L_2 + d)}{\left(\begin{matrix}\text{No Flare}\\ \text{or Type 2}\\ \text{Terminals}\end{matrix}\right) \frac{L_H}{L_R}}$$

$$Z = (X - L_1 - 25)(\frac{b}{a}) + L_2$$

$$Z = L_2 \quad (\text{For Type 2 Terminals})$$

LENGTH OF NEED.....X = 106.67

RUNOUT LENGTH (7.01.19).....L_R= 160.00

GUARDRAIL TAPER RATE (R-59-SERIES).....$^b/_a$ = _____

E.O.P. TO FACE OF BARRIER (DESIGNED).....L_2= 2.00

CLEAR ZONE (7.01.11)..... L_C= SEE MANUAL

E.O.P. TO ROADSIDE FEATURE (MEASURED).....L_3= 4.00

EFFECTIVE TURNED OUT DISTANCE OF ANCHORAGE.....d = _____

LATERAL EXTENT OF ROADSIDE FEATURE (MEASURED).....L_H= 6.00

LATERAL OFFSET AT END OF FLARE.....Z = 2.00

DESIGN ADT

DESIGN SPEED 40 mph

FILL SLOPE 1:3

L_1 = 25 (25' MIN.)

L_S= 5 SHY LINE (7.01.18)

Curve Radius R= N/A '

If guardrail on outside of curve.

Curve Correction Factor Kcz= ___

STATION AT A N/A

STATION AT B _____

LENGTH OF NEED IN ADDITION TO CALCULATED X _____

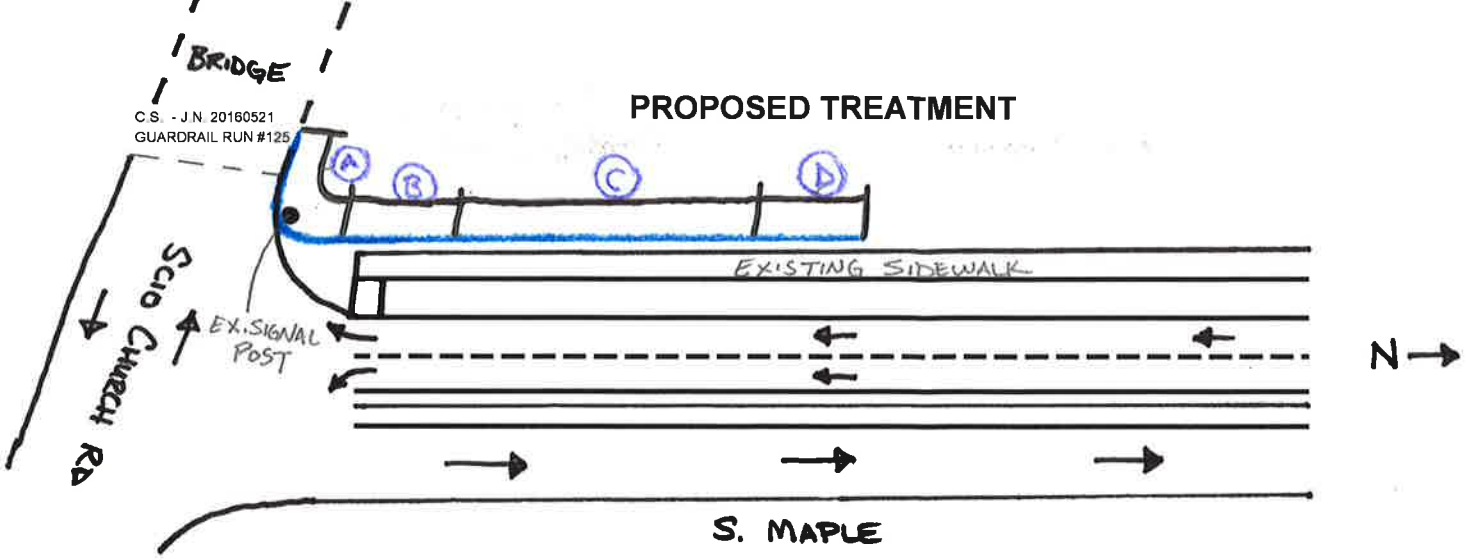
NOTE: DISTANCE OF OBJECT FROM BACK OF BARRIER MUST BE GREATER THAN THE MAXIMUM DEFLECTION (7.01.20)

$L_H <= L_C$

REFER TO STANDARD PLAN R-59-SERIES AND DESIGN MANUAL SECTION 7.01.30 FOR GUARDRAIL AT EMBANKMENTS

C.S. - J.N. 20160521
GUARDRAIL RUN #125

PROPOSED TREATMENT



CALCULATIONS OR NOTES

Lr = 160 ft (7.01.19)
Ls = 5 ft (7.01.18)
Calculated X = 106.67 ft
Guardrail, Approach Terminal, Type 2M = -34.29 ft (D)
Guardrail Anch, Bridge, Det T-4 = -16.87 ft (A)
Transition from Guardrail Anchorage, Bridge Det T-4 to Guardrail, Type MGS-8 = -28.125 ft (B)
Calculated X Remaining = 106.67 - 16.87 - 34.29 - 28.125 = 27.385
Guardrail Required
27.385 ÷ 12.5 = 2.19 → USE 2 Each
(C) Guardrail, Type MGS-8 = 2 x 12.5 = 25 ft

Transitions are included in item for MGS-8, therefore total Guardrail, Type MGS-8 = 25 + 28.125 = 53.125 ft

PAY ITEMS

(B)+(C) 53.13	FT	*	GUARDRAIL, [redacted], TYPE MGS-8 4.25 BEAM ELEMENTS
(A) 1	EACH		GUARDRAIL ANCHORAGE, BRIDGE, DET T-4
N/A	FT		BRIDGE RAILING, THEIR BEAM RETROFIT
(D) 1	EACH		GUARDRAIL APPROACH TERMINAL, TYPE 2M
	EACH		GUARDRAIL DEPARTING TERMINAL, TYPE MGS
6	EACH		GUARDRAIL REFLECTOR
N/A	CYD		EMBANKMENT, LM
N/A	EACH		GUARDRAIL TERMINAL END SHOE (WHEN SPECIFIED)

* FOR THIS PAY ITEM, THE GUARDRAIL APPROACH ###### NEED (X) MUST BE DEDUCTED

DEDUCTION TABLE		
	GUARDRAIL APPROACH TERMINAL	
	TYPE 1	TYPE 2
GUARDRAIL, TYPE B	25'	37.5'
GUARDRAIL, TYPE T	31.25'	43.75'

PAY LENGTHS MUST BE DIVISIBLE BY 12.5'
ROUND TO NEXT HIGHEST RAIL LENGTH.

TURF EST. = (20'x20') + (107x5) = 935'/9 = 105 SYD
EMBANKMENT = (107x5x3)/27 = 60 CYD

Ann Arbor Guardrail Inspections

Inspection Report for: ASSETID: GR-125

POOR

General Information:

Asset ID: GR-125	Edge Condition: CURB/GUTTER
Street Name: Scio Church Rd	Guardrail Purpose: STRUCTURE - BRIDGE/CULVERT
Road Attribute: CONCRETE	Posted Speed: 30 - 40 MPH
	Number of Lanes: 2

Guardrail Information:

Overall Condition: POOR	Guardrail Beam Condition: POOR
Guardrail Type: TYPE B	Guardrail Curved: YES
Length: 43 Feet	

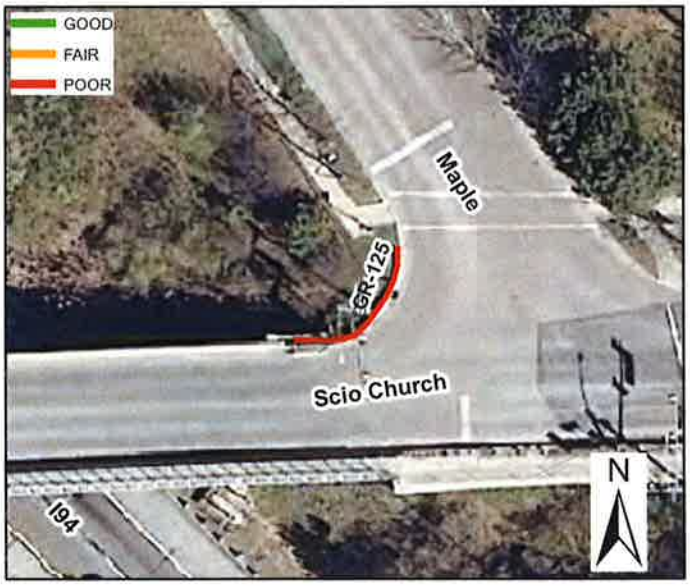
Miscellaneous:

Approach Terminal Type: OTHER	Approach Terminal Condition: GOOD
Departure Terminal Type: BRIDGE CONNECTION	Departure Terminal Condition: GOOD
Post Type: BOTH	Post and Block Condition: POOR
Bridge Anchor Type: DETAIL T-5	Bridge Anchor Condition: GOOD

Photo1:

Photo2:

Photo3: (if taken)



Ann Arbor Guardrail Inspections

Inspection Report for:
ASSETID: GR-125

General Information:

Asset ID: GR-125

Defect: None

Observation 1: SOS

Observation 2: EOS

Defect 1: None

GR-103
GR-045
GR-075
GR-071
GR-021
GR-018
GR-017
GR-081
GR-120
GR-046
GR-125
GR-052
GR-062
GR-060
GR-061
GR-063
GR-037
GR-036
GR-069

2018 Guardrail Repair/Replacement Locations

Condition

- GOOD
- FAIR
- POOR

Observations

- Beam damage
- Damage
- EOS
- Guardrail damage
- SOS

N

0 1,000 2,000 4,000
Feet

Document Path: Y:\2016\03\20\16052103_Studies\Working\GIS\RepairLocations24x36.mxd

CITY OF ANN ARBOR MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
GUARDRAIL APPROACH TERMINAL, TYPE 2M

GCB:CT 1 of 3 APPR:CAL:DBP:04-24-18
FHWA:APPR:04-27-18

a. Description. This work consists of furnishing and delivering a tangent *Manual for Assessing Safety Hardware* (MASH), Test Level 3 (TL-3) compliant guardrail approach terminal (Type 2M), selected from those listed herein, to the job site; submitting detailed drawings and installation manuals for the selected terminal(s) to the Engineer; and installing the device(s) as shown on the plans or as directed by the Engineer. Complete this work in accordance with manufacturer's details and specifications, and this special provision.

b. Materials. Select from the following guardrail approach terminals.

1. MSKT, manufactured by Road Systems, Inc.

2. Soft-Stop, manufactured by Trinity Highway Products, LLC.

3. MAX-Tension, manufactured by Lindsay Transportation Solutions, Inc.

Ensure all posts within the terminal limits are made of steel. Provide materials for the selected terminal(s) meeting manufacturer's specifications and the requirements of this special provision. Ensure the selected guardrail terminal meets MASH, TL-3 criteria and has an FHWA federal aid eligibility letter.

Provide detailed drawings of the selected guardrail approach terminal(s) prepared by the respective guardrail approach terminal manufacturer(s). The drawings must contain details depicting the terminal attached to MDOT Type MGS-8 guardrail, detailed in Standard Plan R-60-Series.

Provide materials meeting the requirements of subsection 807.02 of the Standard Specifications for Construction for transitions required for connecting Guardrail Approach Terminal, Type 2M to Type B or Type T guardrail, as depicted in Standard Plan R-60-Series.

Provide installation and maintenance manuals for the selected guardrail approach terminal(s) prepared by the respective guardrail approach terminal manufacturer(s).

Provide high intensity adhesive reflective sheeting for placement on the terminal's impact head. The reflective sheeting must meet the stripe dimensions, colors, and pattern, based on traffic conditions, as shown on Standard Plan R-62-Series. The three-inch stripes, alternating black and yellow, on the reflective sheeting must slope downward at an angle of 45 degrees toward the roadway. The yellow stripes on the reflective sheeting must meet *ASTM D 4956* specifications for Type IX retroreflective sheeting, and must meet the requirements of Section 2C.64 and 2C.65 of the *MMUTCD*.

c. Construction. At least 14 days prior to terminal installation, provide the Engineer one electronic copy of the detailed drawings, installation manuals, and maintenance manuals for the selected guardrail approach terminal(s). Before terminal installation commences, all questions, comments, or concerns raised by the Engineer concerning the detailed drawings, installation manuals, and/or maintenance manuals must be addressed.

The Contractor must ensure that the guardrail terminal manufacturer is available to consult, by telephone or e-mail, with the Engineer, the Engineer's designated representative, at no additional cost to the Department. Consultation will encompass the installation of guardrail terminals. Provide the manufacturer's name, telephone number, and e-mail address to the Engineer prior to terminal installation. Provide responses from the manufacturer to any telephone or e-mail inquiries from the Engineer, the Engineer's designated representative, within 2 working days.

Provide staff that have been trained by the respective guardrail terminal manufacturer to install the guardrail terminals utilized on the project. Training materials and course content for guardrail installation crew training will be as determined by the respective manufacturer. Provide manufacturer issued and dated training certificates for all staff on the guardrail installation crew. Training must have occurred within the previous 3 years. Training certificates must be provided to the Engineer 14 days before guardrail installation work commences. Provide updated training certificates no later than 48 hours after personnel changes occur.

Construct guardrail terminals in accordance with section 807 of the Standard Specifications for Construction, the manufacturer's installation manual(s), and the detailed drawings provided by the manufacturer.

Construct transitions for connecting Guardrail Approach Terminal, Type 2M to Type B or Type T guardrail in accordance with the appropriate details on Standard Plan R-60-Series and section 807 of the Standard Specifications for Construction.

Do not attach reflectors or other attachments within the limits of the guardrail approach terminal. Attach guardrail reflectors within the limits of transition sections, detailed on Standard Plan R-60-Series, when connecting Guardrail Approach Terminal, Type 2M to guardrail Type B or Type T.

Unless otherwise specified by the Engineer, install guardrail approach terminal with a 1 foot-0 inch offset, in relation to the rear of the terminal, measured at the nose (front) of the terminal.

Completely cover the portion of the impact head assembly facing traffic with high intensity adhesive reflective sheeting meeting the requirements of this special provision.

Provide the guardrail terminal manufacturer's installation checklist, completed and signed by the Contractor, for each individual guardrail terminal installed. Upon completion of guardrail work, provide written certification from the Contractor that all guardrail terminal installations have been installed per the contract and the manufacturers' specifications and guidelines.

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

Pay Item	**Pay Unit**
Guardrail Approach Terminal, Type 2M	Each

Guardrail Approach Terminal, Type 2M includes all materials, labor, and equipment required to furnish and install a guardrail approach terminal meeting the requirements of this special provision.

Payment for **Guardrail Approach Terminal, Type 2M** includes all materials, labor, and equipment within the length of each terminal, as defined in subsections d.1, d.2, and d.3 of this special provision, and also includes payment for all materials, labor, and equipment required to construct a transition section, per Standard Plan R-60-Series, for connecting Guardrail Approach Terminal, Type 2M to guardrail Type B or Type T.

The lengths specified in subsections d.1, d.2, and d.3 of this special provision do not include a transition section, per Standard Plan R-60-Series, for connecting Guardrail Approach Terminal, Type 2M to guardrail Type B or Type T.

1. MSKT. Overall length is 59 feet, 4½ inches, measured from Post 1.

2. Soft-Stop. Overall length is 50 feet, 9½ inches, measured from Post 0.

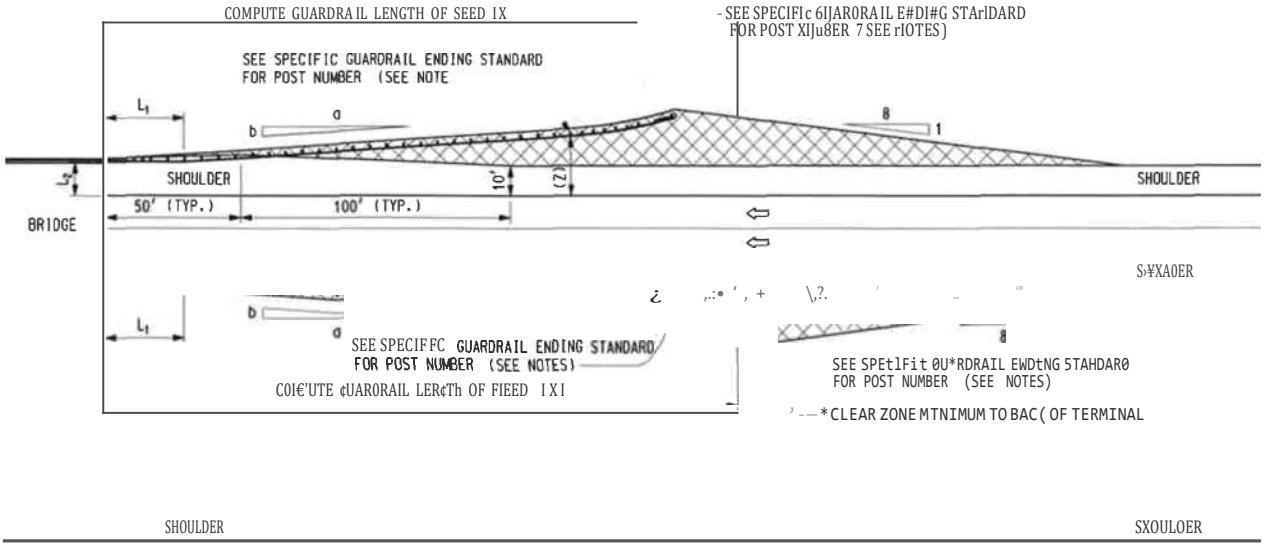
3. MAX-Tension. Overall length is 55 feet, ½ inch, measured from the soil anchor.

If the pay item lengths defined in this special provision conflict with the pay item lengths specified in the manufacturer's details and/or specifications, the pay item lengths defined in this special provision will take precedence.

Payment for all consultations between the manufacturer and the Engineer, the Engineer's designated representative, and/or Contractor, preparing and submitting detailed drawings, installation manuals, operation/maintenance manuals, and other required documentation will be included as part of this pay item, and will not be paid for separately.

The required reflective sheeting on the impact head is included as part of this pay item, and will not be paid for separately.

Unless otherwise specified by the Engineer, payment will be made after guardrail terminal installation has been completed and all required documentation has been submitted to the Engineer.



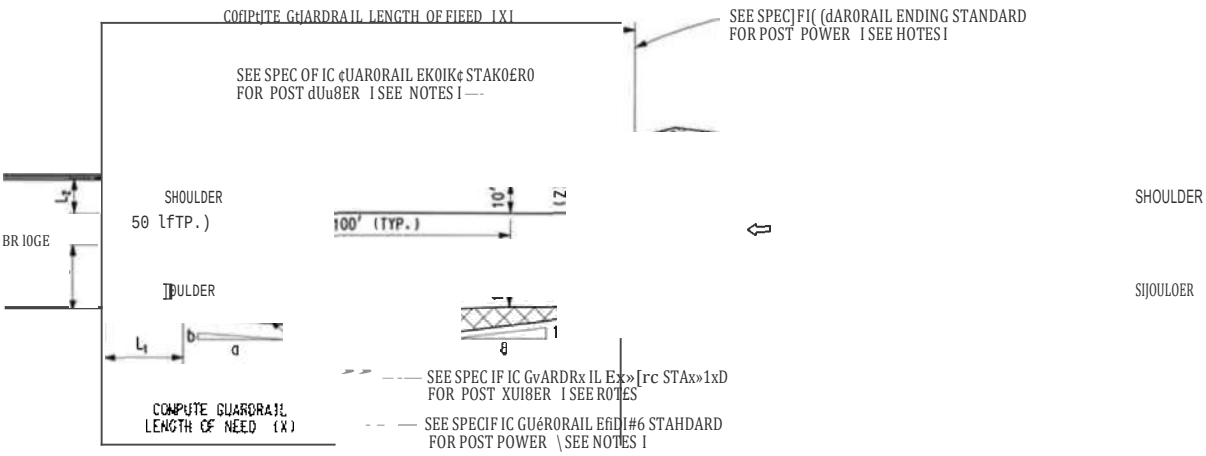
SHOULDER SXOULOER

WftERE CLEAR 70nC 015fAfICE CAh RIOT BE uET BT \JSI60 THE FLARE RATE 11:151. IXYESTIGAIE ID THE F0LL0YIX6 ORDER OF PREFERE tCE T8E TREATI4EHTS LISTEO BELOY:

t. USEBUL1N0SE]ITHI N THELIMITS SPECTFltD0N STANDARD PLAN R-fi6-SERTES.

2. IrISTALL ¢UAR0RAIL ¥ ITH LESS FLARE RATE AS DETER¥I8E0 BY BACKSIDE NIJ INJM CLEAR ZO#E.

BEAM GUARDRAIL AT BRIDGES - DUAL ROADWA YS



BEAM GUARDRAIL AT BRIDGES - TWO —WAY ROADWAYS

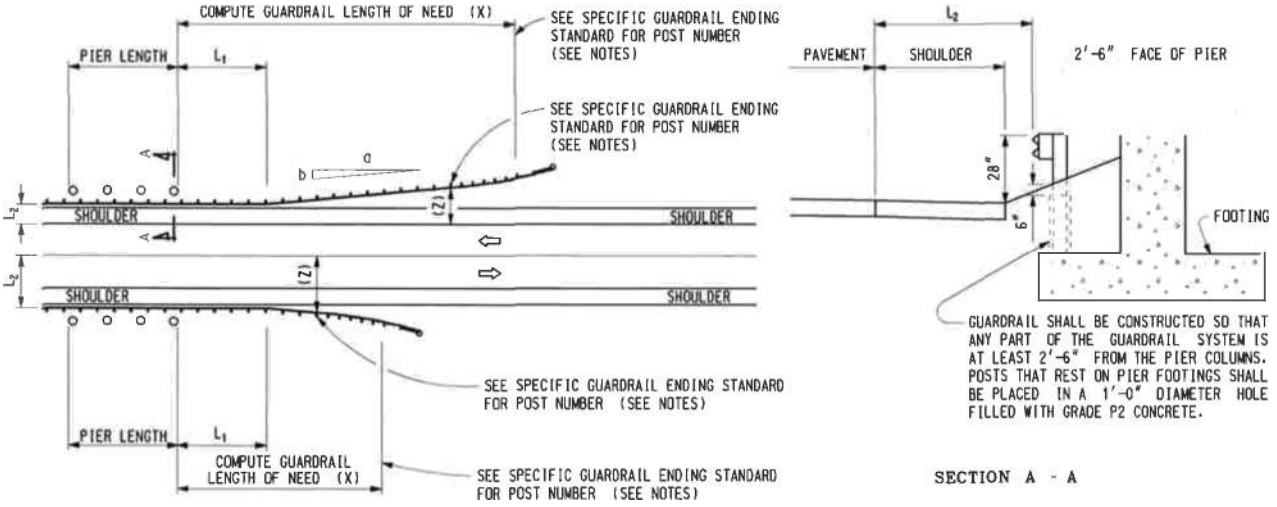
LEGEND

1:10 SLOPE BETWEEN SHOULDER L[NE AND 2'-0" BEHIND FACE OF POST.

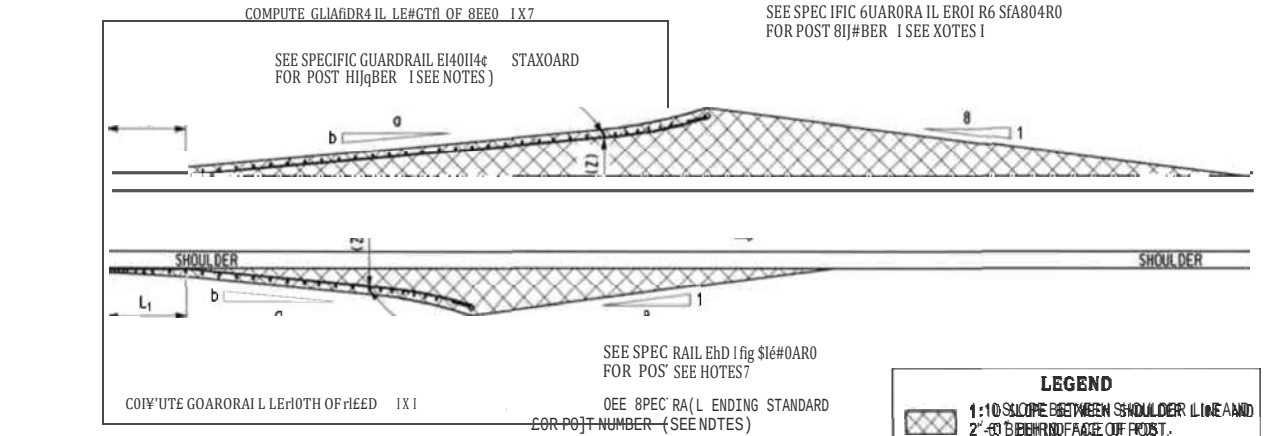
L, = T*MGENT LEflGT] OF BAflRTER UPSTRE*W FROw THE HAZARD. (25' MTN.)

L,A Z= L*TER*L DTST*MCCS M£**UREA FA4* FACE OF 0UARDRA(L. (AS SH0W#)

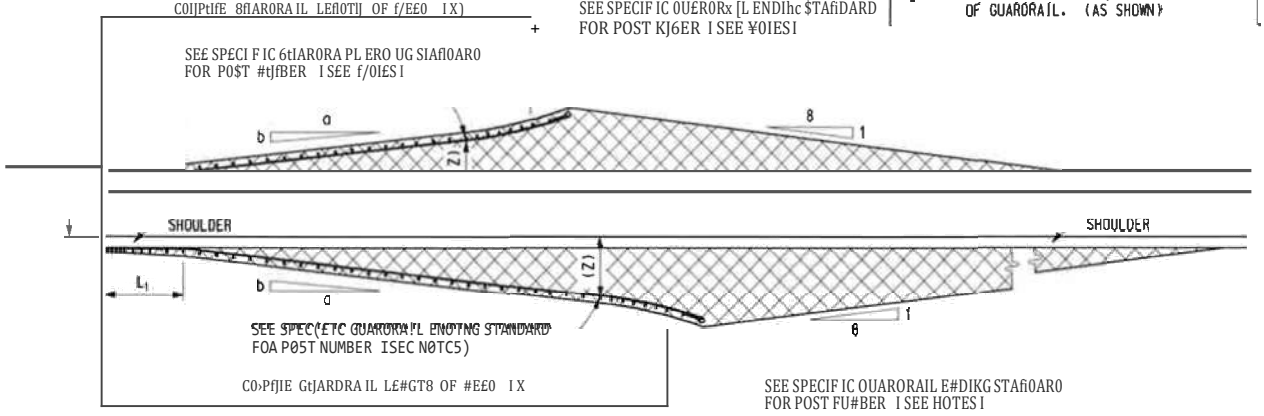
MDOT Michigan Department of Transportation PREPARED BY DESIGN SUPPORT AREA DRAWN BY: B.L.T. CHECKED BY: W.K.P.	ENGINEER OF CONSTRUCTION & TECHNOLOG ENGINEER OF MAINTENANCE ENGINEER OF TRAFFIC AND SAFETY	ENGINEER OF DESIGN SUPPORT AREA DEPARTMENT DIRECTOR Gloria J. Jeff ENGINEER OF DEVELOPMENT	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR GUARDRAIL AT BRIDGES AND EMBANKMENTS	11-14-2003	S-17-200z	R-IS9-E	SHEET i OF



BEAR GUARDRAIL AT PIERS - LOCAL ROADWAYS - UNDER



BEAM GUARDRAIL AT BRIDGES - LOCAL ROADWAYS - OVER

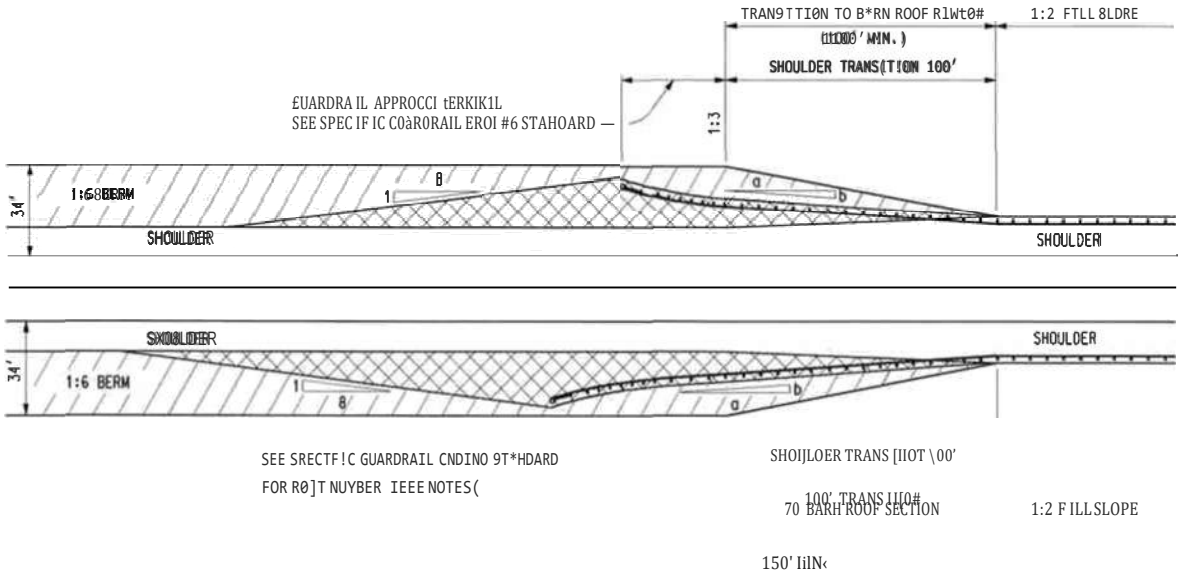


BEAR GUARDRAIL AT BRIDGES - SINGLE RAMPS

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

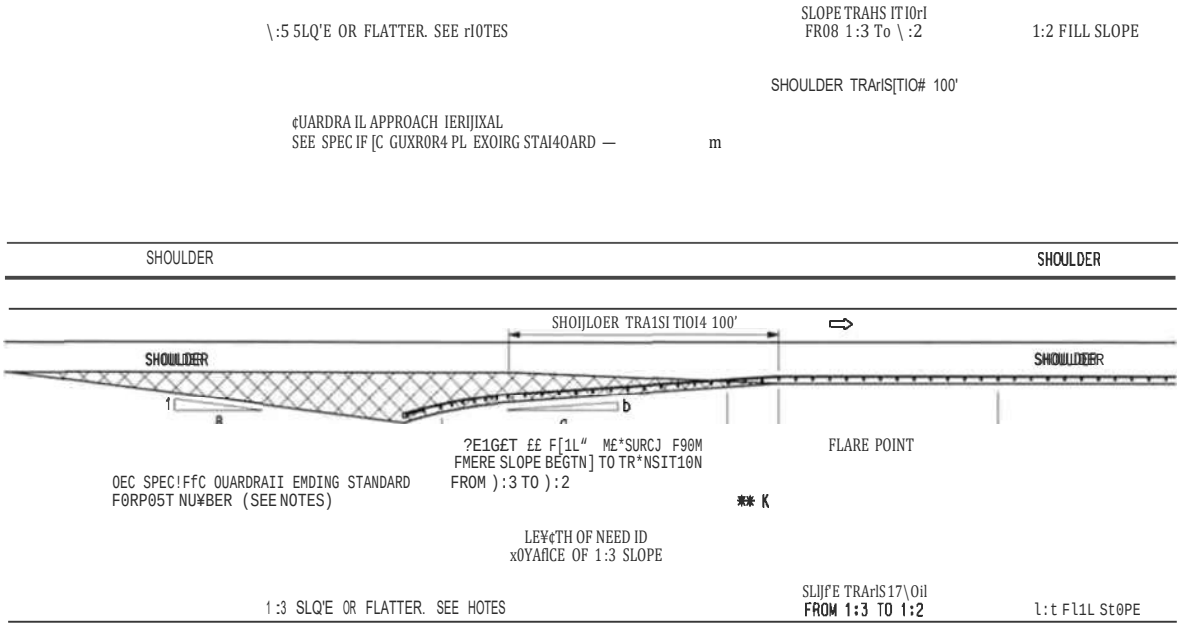
GUARDRA IL AT BRIDGES AND EMBANKMENT S

11—14—2003 S-17-2002 R—59—E



BEAM GUARDRAIL AT EMBANK MENT 5 - T WO -WAY ROADWAYS

I BARB ROOF SLQ'E I



$$ 9EE CHART FOR T]E ']' AMD THE "R' DTSTAMCC. (SHEET 6 OF 6l

BEAM GUARDRAIL AT EMBANKMENT5 - TWO -WAY ROADWAYS

LEGEIID

in›,»'›t.!.›'i›«'‹f'›i!!'"" "o

_____ I :6 8ERlt

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

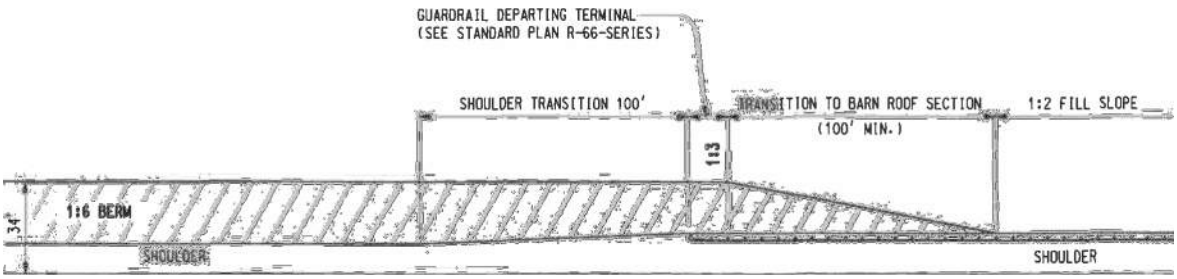
GUARDRA IL AT BRIDGES AND EMBANKMENTS

11 —14—2003
F.H.W.A. APPROVAL

5-II-2002
PLAN DIT{

R—59—E

SHCCT
3 OF 6



SHOOLOER SHOULOER

Sfl00t0ER IRltiS 11109 1 00'

SEC SPEC(FIC GUARDRAIL END!MO STANDARD FOA POST NUMBER (SEE NOTESI -

TOO' TRAMS1T(ON TO BARN R0(ESEtTl0# 1:IFILL SLOPE

150' dI#.

BEAII GUARDRAIL AT EIiBANKMENTS - DUAL ROADWAYS

\ BARfI ROOF SLOPE I

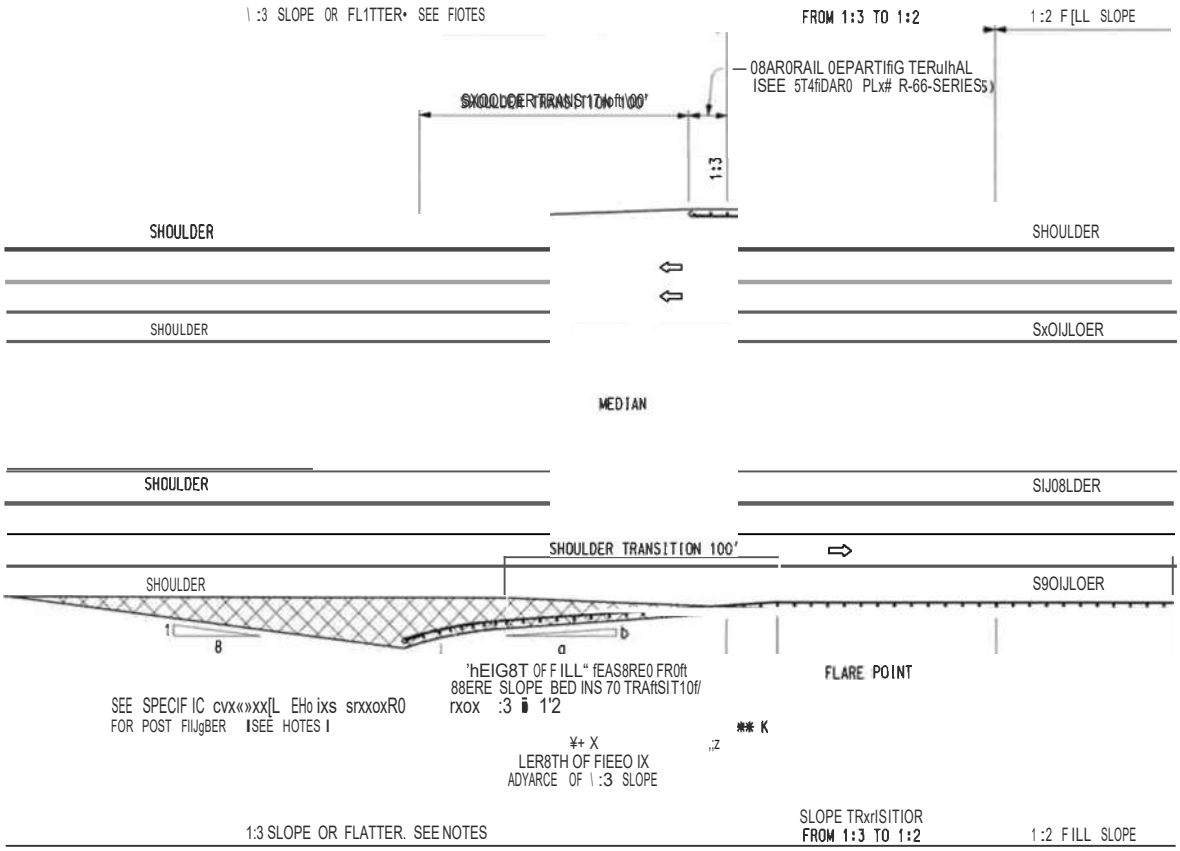
LEGEND

1:10 SLOPE BETWEEN SHOULDER LINE AND 2'-0" BEHIND FACE OF POST.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DSYELOPMENT STANDARD PLAN FOR

GUARDRAIL AT BRIDGES AND EMBANKMENTS

11—14—2003 5-11-2002 R-ID 9-E SHEET 4 0F 6



¥¥ SEE C« RT FOR THE 'X" AND THE "K' D ISTAxCE. ISHEET 6 OF 6 I

BEATI GUARDRAIL AT EMBANKIIENTS - DUAL ROADWAYS

LEGEND

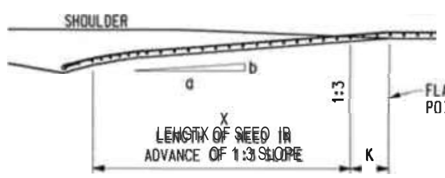
1 :10 SLOPE BETXEE# SHOULDER LINE ATO 2' -0" BED ISO FACE OF POST.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

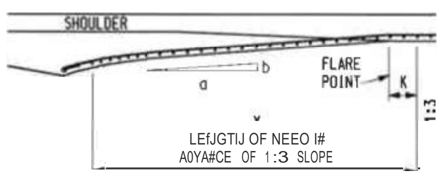
GUARDRAIL AT BRIDGES AND EMBANKMENTS

1)-)4-2003	5-17-2002	R—59—E	SHEET
F.H.D.A. ARPR04At	RUD DATE		5 0F 6

** 6tlàflD8A IL AT EuBArlKfl£fl TS f FLAREO IrlSTALLA f[OXS. bla l							
HE IGHT OF F ILL AT 1:3 SLOPE IFEET		70 MPIJ FLARE 1 : 15		60 #PfJ FLARE 1 : 14		50 I¥'H FLARE 1 : 11	
OYER	10	X	K	X	K	X	G
5	10	100	3z.5	100	12.s{	100	0
i0	it	)00	J7.5	i00	i2.8	100	0
12	‹4	100	37.s	‹00	‹2.s]	100	0
1‹	‹G	« z	2‹.5	«0	2.s]	‹00	0
16	18	155	-1›.5	149	-36.5]	101	-1
16	20	193	-55.5	182	-£9.SQ	127	-27
2»	2t	z23	-es.5	201	-S‹.5{	«e	-48
22	2‹	2t6	-104.5	UT	-113.5)	164	-6‹
24	25	z5G	-116.5	235	-12t.s	UI	-TI



FOR POS [7 IYE "It" D ISTAfJC£S. B£0 IR FLAg£ PO[UT BEYOXO TX£ 1 :3 SLOPE•



FOR flE6AT IYE "It" 0 ISTAflC£ 5› 8£0 [# FLAR£ PO IKT IfJ A0¥4f/CE OF T8E 1 :3 $LOPE.

NOTES:

THE CORSTRIJCTIOX DF GUARDRAIL SHALL BE AC¢0R0 IFIO 70 THE CURRENT STAXOARO PLANS. APPROPRIAI E APPR0ACfl CURB ArD GUTTER OETA ILS ARO 00¥#SP00T HEADER DETAILS• ¥8Ed USEO • ARE SPEC IFIEO 0X THE CURRENT STA#OARO PLAH R—32—SERIES'

ALL POST FIIJfBERS ARE REFERESCEO ACCOROISG 70 THOSE SPEC IFIED 0# THE SPEC IF IC GUARDRAIL EI4DISG STA8OARO.

A i:i0 SLORC SMALL BE @AINT*INED lN FRONT OF AND t'-0" BEH1fD T8£ G8AR0RAIL B£AN OUTS IOE ThE OE$ IGXAT£0 SHOOLOER AR£4• SLOPE B£T0R0 THE 2 ' -0' IJ Irl6E L ICE BEIJ ISO 78£ GUARORAIL BEAN Afi£A VAT BE 1 :2 OR FLATTER AfiD S8ALL BE TRAftS ITIOXEO 70 fJ0R¥AL 6RA0E0 SL0P£S I# SUCH A ¥AY AS 70 0IYE A PLEASIX6 APPEARArICE.

GUARDRAIL ¥ILL fJ0T BE RE0tI IREO 0X 0EPX8T IR6 £fJ0 0£ STRtICT8RES OR 0flAL R0A08ATS YH ICU HA¥£ CORT tfJtI0IJS ABtITI€fJTS OR XflEfJ F ILL SL0P£S AR£ 1 :4 OU FLATT£R• IF A 00¥RSF00f H£A0£R IS 8£0U tR£D OK TX£ 0£PART UG £I40S OF STROCTORES • IT ¥ ALL B£ R£C£SSAR\ 70 SU IELO IT ¥IT8 GOARORA IL.

TX IS STAROARO PLAfl APPLIES OXLT 70 KEY COrlSTRUCT IOR UnLESS SPEC IFICALLT CALLED FOR ON IJPGRAO IHO PROJECTS.

AREA BEH ORD THE 6UARDRA IL OEPART[SG EFD TERN IHAL SX4LL hAVE 4 1:3 SLOPE OR FLATTER.

AREA 8£fJIX0 THE OUARORAIL APPROACH TERxlrlAL SHALL f]AVE A 1:1 SLOPE OR FLATTER UNLESS THE Eft0IfJ0 CARROT BE PLACEO UI A 1:4 BECAUSE THE PfiE0f IIfJAIE SLOPE PfiECE0 UG THE APPR0ACfl TERXIfJAL IS A 1:1. IU IB IS CASE. TUE ERO IUG UAT BE PLACEO IX IflE 1:3 SLOPE.

GbAR0RAIL ASC8ORAGE. BRIDGE IS I8CL8OEO I# THE gbAR0RA IL LE#GI8S SPEC IFIEO. ISEE CURRENT SIAfIDAR0 PL4d R-67-SERIE5 1.

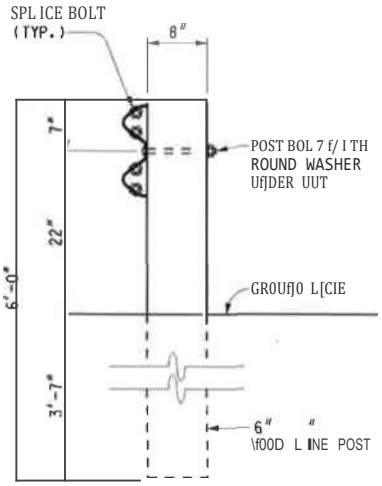
ALL 1 : 10 SL0P£S SftALL BE GRAOED IO "CLASS A" SLIJf-'E TOL FRANCEs.

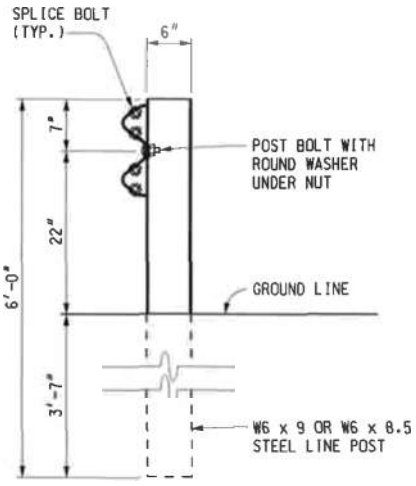
MICHIGAN DEPARTMENT OF TRANSPORTATION

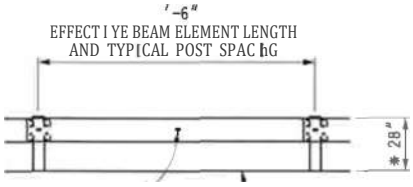
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL AT BRIDGES AND ER BANKUENTS

l)<4-2003	5-)T-200t	R — 59—E	SHEET 6 OF 6
F.H.W.A. APPROVAL I	PLAN DATE		







WOOD POST STEEL POST ELEVATION SHOWING POST SPACING

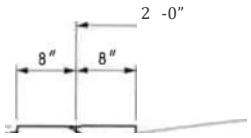
¥ SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUARDRAIL, TYPE A

NORMAL SHOULDER

xx 5'-0" OR AS SPECIFIED ON PLANS

SPLICE BOLT



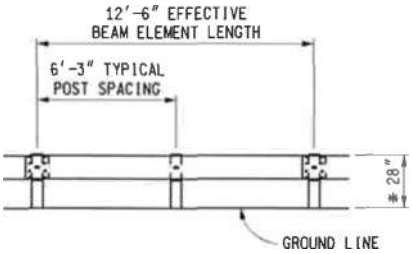
TOE PLATE GOOD BLOCK TO
EXTEND MINIMUM OF TWO
3" LONG HOT-DIP ZINC
COATED RAIL

"POST BOLT WITH ROUND
WASHER UNDER HEAD

GROUND LINE — SHOULDER POINT

I s" x 8" ¥000 LITTE POST

++ FOR PAVED SHOULDER WIDTHS OF AT LEAST 12'› USE 3'-0".

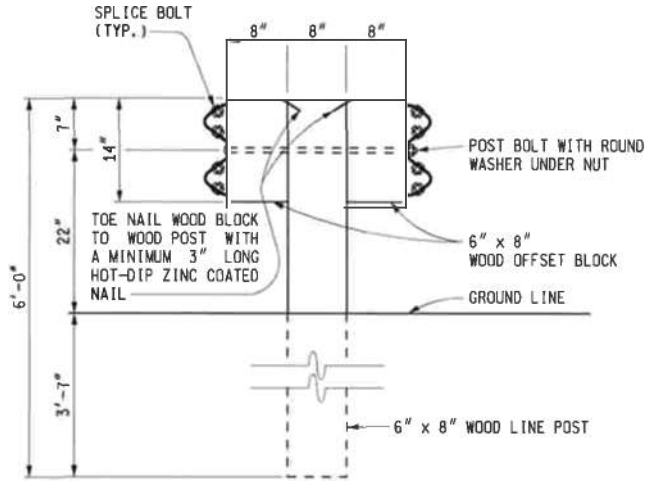


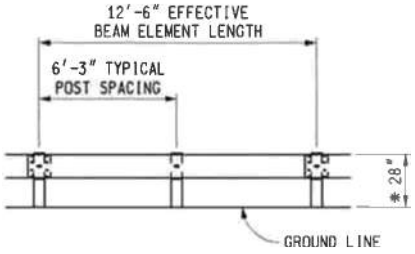
ELEVATION SHOWING POST SPACING

+ SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUARDRAIL, TYPE B
(WOOD POST)

MDOT Michigan Department of Transportation PREPARED BY OESIGUI DIYIS10fl ggjyg gy' B.L• T. CHECKED BY: W.K.P._	DEPARTMENT DIRECTOR Kirk T Steudle ARRROYCD Bt: _____ DIRECTOR. BUREAU OF FIEID fERYlCCS APPROVED BY: _____ »ix£cT@. 8tixrxv or D£v£Lori€xT	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR GUARDRAIL, TYPES A, B, BD, T, TD, MGS—8, 8‹ MGS—BD			
		F.X.¥•L 4PPR0¥XL	7-26—20 17 PLAN DATE	R-60-J	SHEET t OF 17



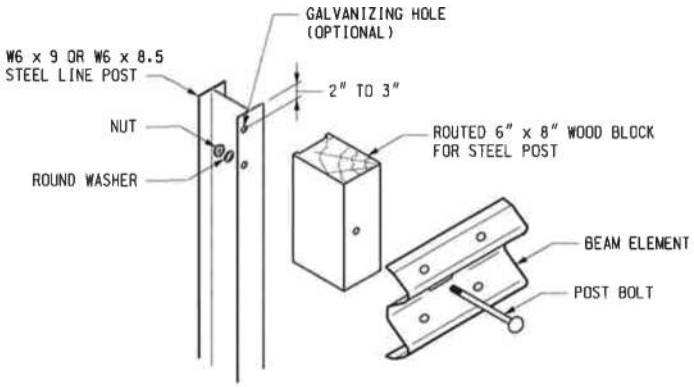


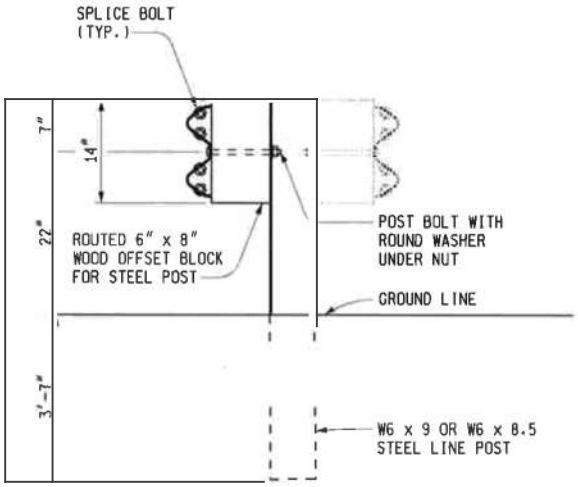
ELEVA T ION SHOW ING POST SPACING

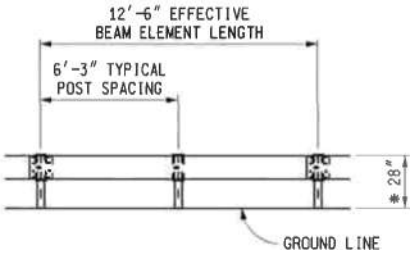
G SEE HOTES FOR GUARDRA[L IN CONJUHCT I ON g ITH CURB

GUA R DRA IL, TY PE BD

l GOOD POST)







ELEVATION SHOWING POST SPACING

¥ SEE HOTES FOR GUARDRAIL IN COHJUNCT IOH 8 ITH CURB

GUARDRAIL, TYPE B IOR BDT

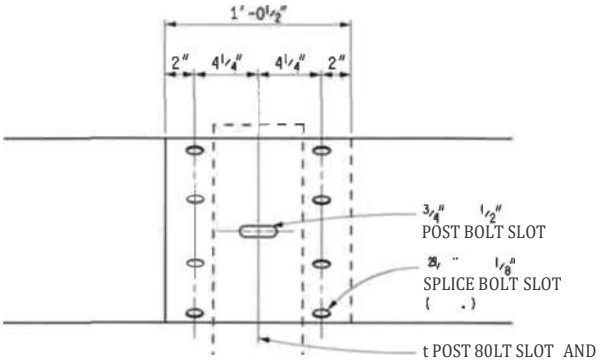
(STEEL POST)

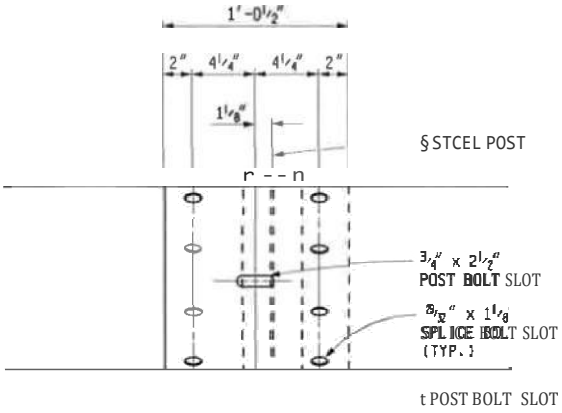
MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, SGS-8, & SGS-8D

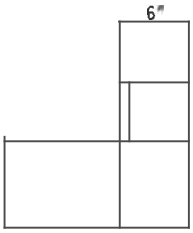
.x.».A. xssBzM 7-26-201t »vAir R -60-J SHCET 2 OF 17



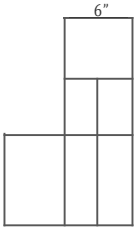


WOOD POST STEEL POST

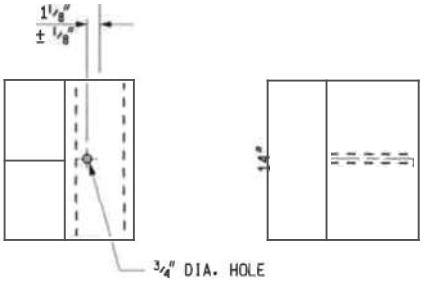
BEA M ELEMENT SPLICE DETAILS



TOP

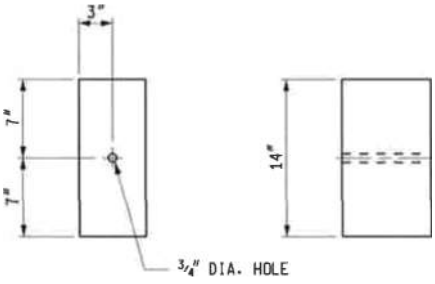


TOP



FRONT SIDE

FOR USE ON STEEL POSTS



FRONT CIDE

FOR USE ON GOOD POSTS

fSEE NOTES 0H SHEET 16 OF 16

WOOD OFFSET BLOCKS FOR GUA RDRAIL, T YPE B AND T YPE BD

MICHIGAN DEPARTMENT OF TRANSPORTATION

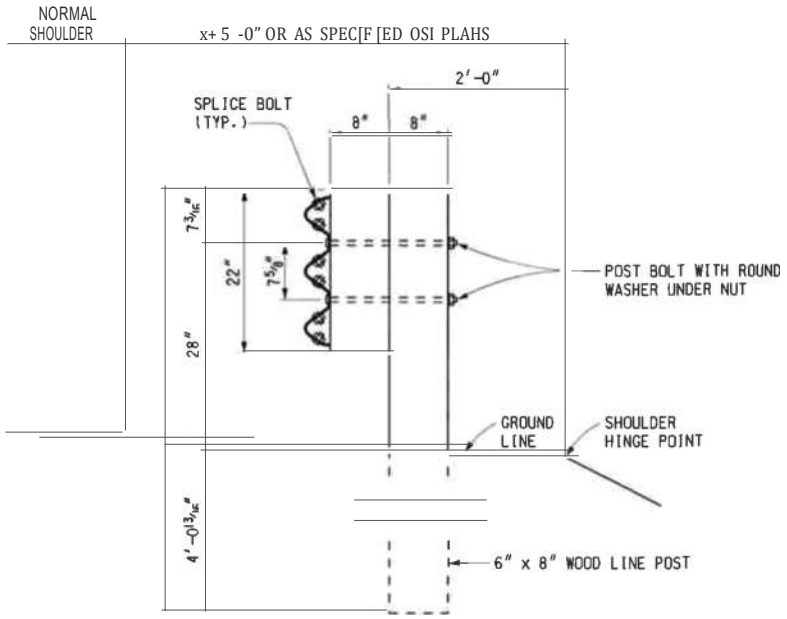
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

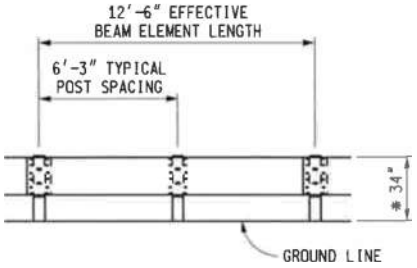
GUARDRAIL, TYPES A, B, BD, T, TD, MGS—8, 8‹ MGS—8D

F.C.¥.à. àPPRüYàL ?—26—20t l PLAN DATE

R-60—J

SHEET 3 OF 17



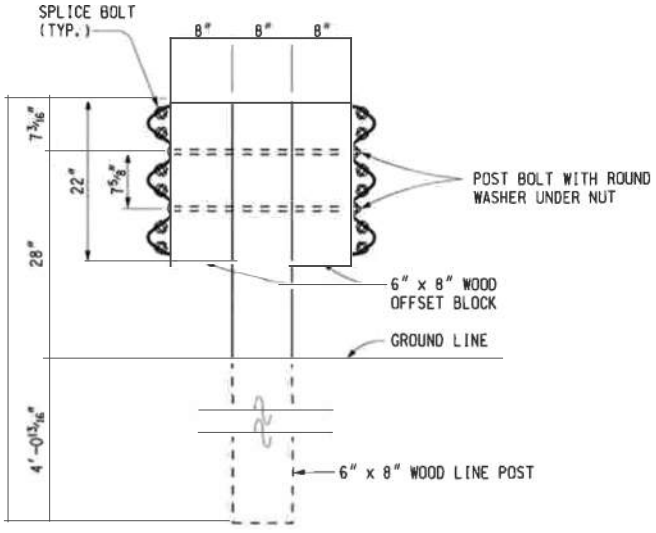


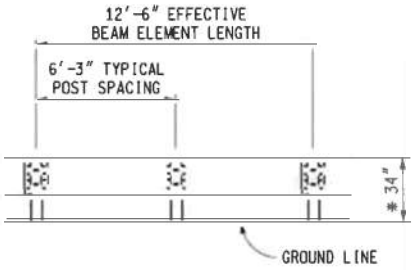
ELEVAT ION £1 HOW ING POST SPACING

+ SEE fJOTES FOR 6UARDRA I L [N C0I4JUNCT ION ¥l TU CURB

+e FOR PA¥£D SHOIJL OER IIOTFIS OF AI LEAST 12'• USE 3'-0".

GUARDRA IL, TYPE T
t WOOD POST)





ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUA RDRA IL, T Y PE TD
(WOOD POST I

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

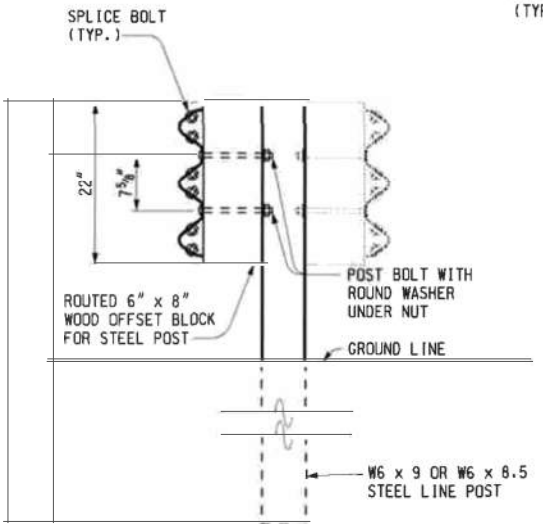
GUARDRAIL,
TYPES A, B, BD, T, TD,
SGS-8, & SGS-8D

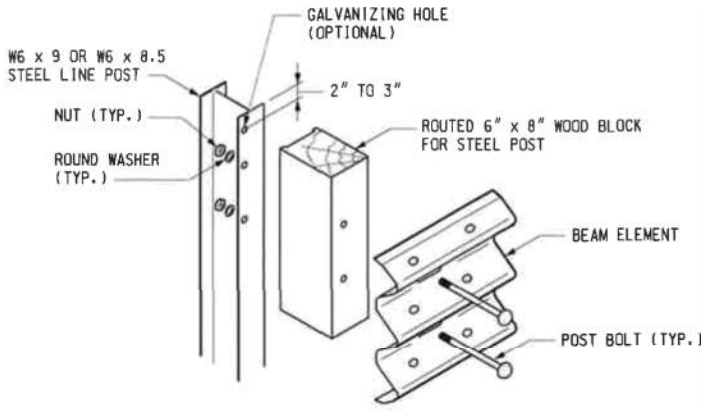
F.8.g.X. 4PPR0Y4L

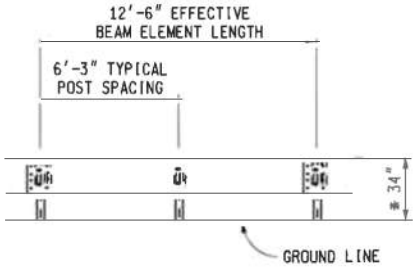
7-26-2017
PLAN DATE

R -60-J

SHEET
4 OF I







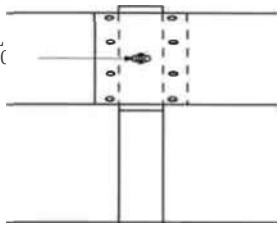
ELEVATION SHOWING POST SPAC1NG

¥ SEE NOTES FOR GUARORAI L I14 CO8JIJI4CT[0N r ITH CURB

GUA RDRA IL, T Y PE T OR T D

I STEEL POST I

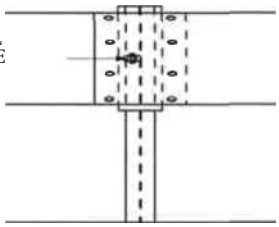
POST BOLT
COFIFIECT I BIG STEEL
70 GOOD OFFSET BL(



GU A RDRA IL, TYPE B

WOOD POST

POST BOLT
C0kftECT 111¢ STEEL
ROUTED GOOD OFFSE



GUA RDRA IL, TYPE B

STEEL POST

POSI BOLT
CoNflECTi«c STErr osr
70 ¥00D OFFSET BLOCK

POST BOLT
CONNECT I BIG STEEL POST TO
ROUTED YOOD OFFSET BLKG

GUA RDRA IL, TYPE T

¥00D POST

GUARDRA1L, TYPE T

5 TEEL POST

BLOCK AN D POST CONNECTION DETA ILS

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

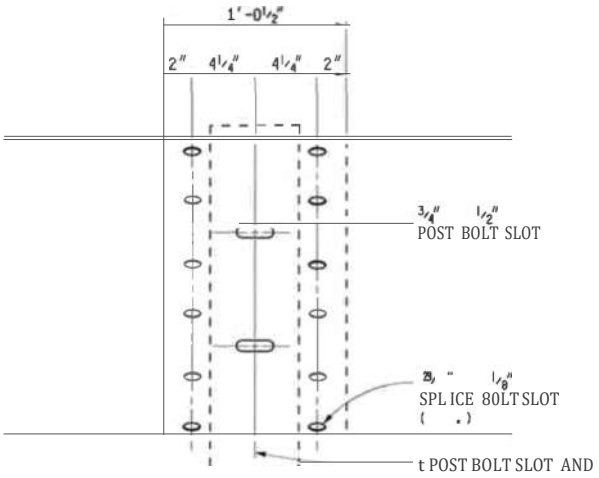
GUARDRAIL, TYPES A, B, BD, T, TD, **SGS-8, & SGS-8D**

.x.¥.A. PPR0¥AL

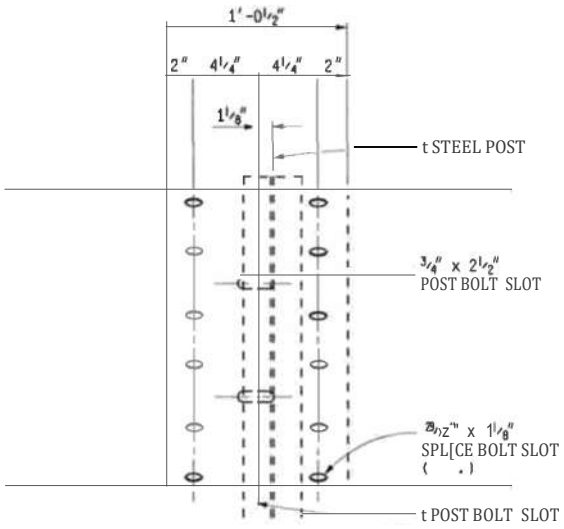
7-26-20t7
r i‹ DATE

R -60-J

SHEET
5 OF 17

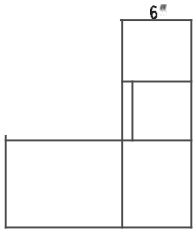


WOOD POST

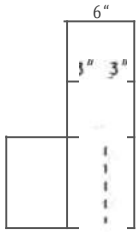


STEEL POST

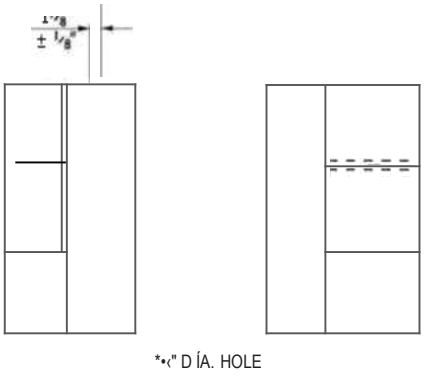
TH RIE BEA M ELEMENT SPLICE DETAILS



TOP

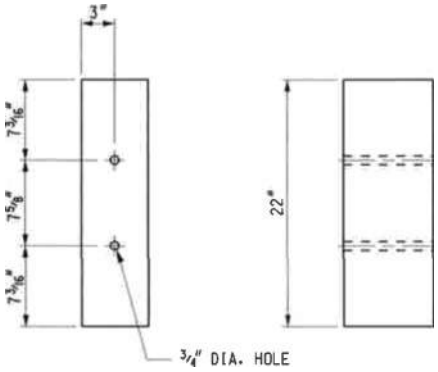


TOP



FRONT 5ID E

FOR USE ON STEEL **POSTS**



FRONT **StDE**

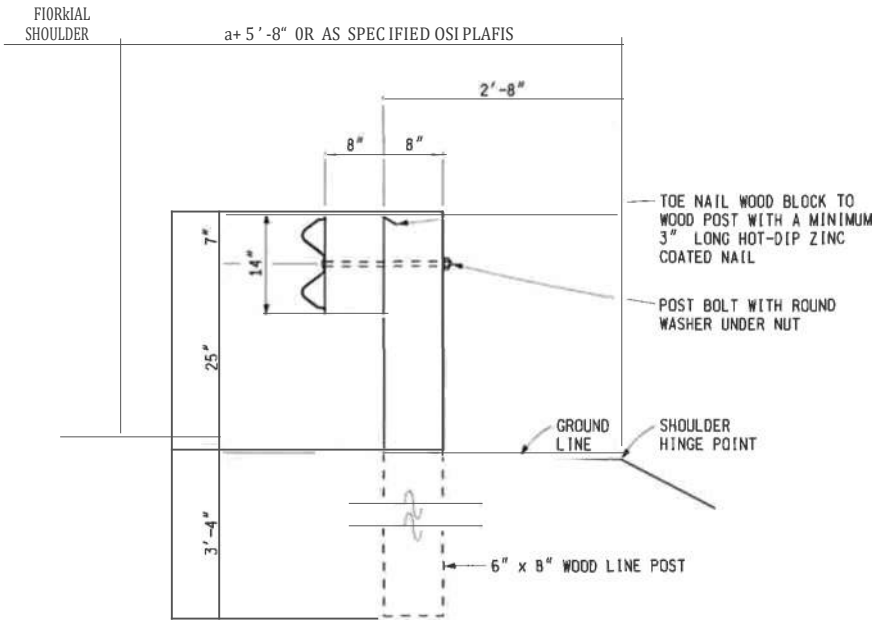
FOR USE ON HOOD POSTS
f SEE LOTES OH SWEET t6 OF t6)

WOOD OFFSET BLOCKS FOR GUA RDRA IL, TYPE T AN D T Y PE T D

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

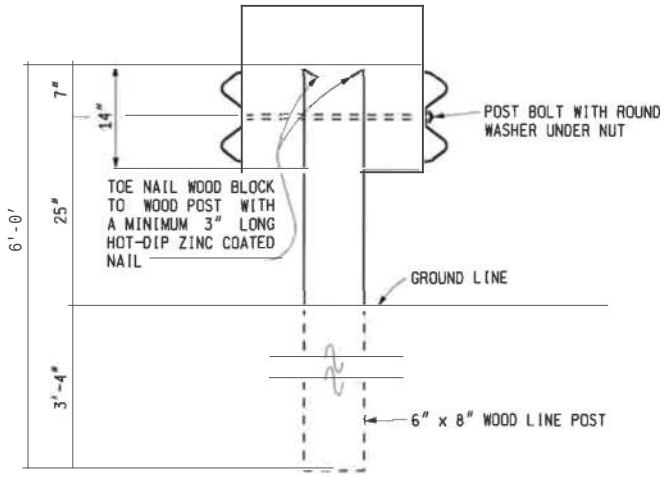
GUARDRAIL, TYPES A, B, BD, T, TD, **SGS-8, & NGS-8D**

F.8.X. 4. 4PPR0Y4L 7—26—2011 PLAN DATE R—60—J SHEET 6 OF 1]



¥¥ FOR PAYED SHOULDER YIDTHS OF AT LEAST t2' • USE 3' -8".

GUARDRAIL, TYPE MGS—8
('BLOOD POST)



*$ FOR PAVED SHOULDCR D!DTHS OC AT LEAST 12' . USE 3'-0".

GUARDRAIL, TYPE MGS-8D
t GOOD POST)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

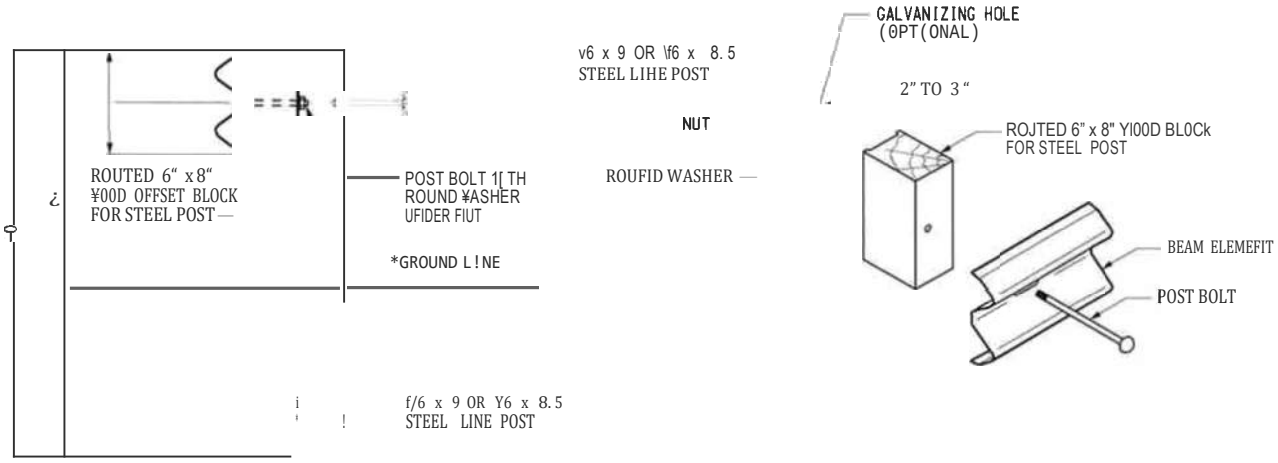
GUARDRAIL, TYPES A, B, BD, T, TD, MGS—8, 8 MGS—8D

F.N.D.A. AR&0YAL

7-26-2017
PLAN DATE

R -60-J

SHEET
7 OF 1]



GUARDRAIL. TYPE SGS-8 (OR SGS-8D)

(STEEL POST)

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

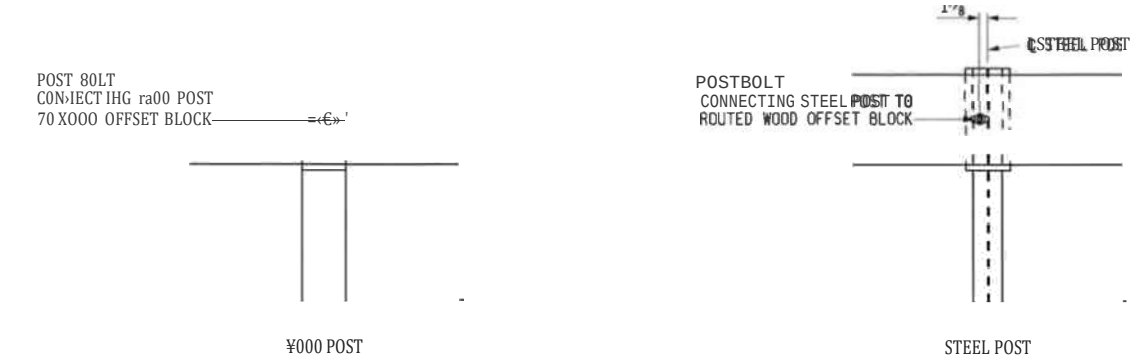
GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS—8, 8‹ MGS-8D

F.].D.*. APRR0YAL

7—26—20t I
PLAN DATE

R-60—I

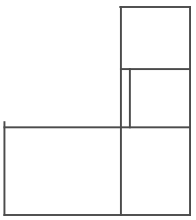
SHEET
8 OF 17



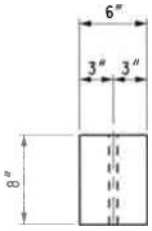
¥000 POST

STEEL POST

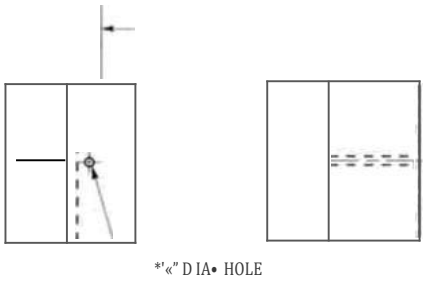
BLOCK AND POST CONNECT ION DET A ILS



TOP

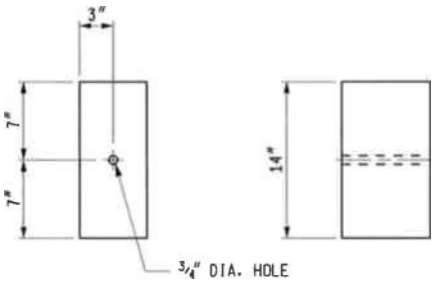


TOP



FRONT SIDE

FOR USE ON STEEL POSTS



FRONT SIDE

FOR USE ON GOOD POSTS
I SEE h0TES OU S8EET t6 OF t6)

WOOD OFFSET BLOCKS FOR GUA RDRA IL, T YP E MGM —8 AND T YP E MG 5—8D

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OG DEVELOPMENT STANDARD PLAN FOR

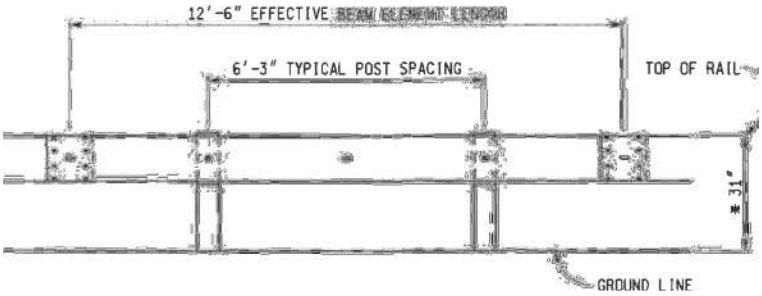
GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, 8‹ MGS-8D

.h.¥.£ 4PPR0Y4L

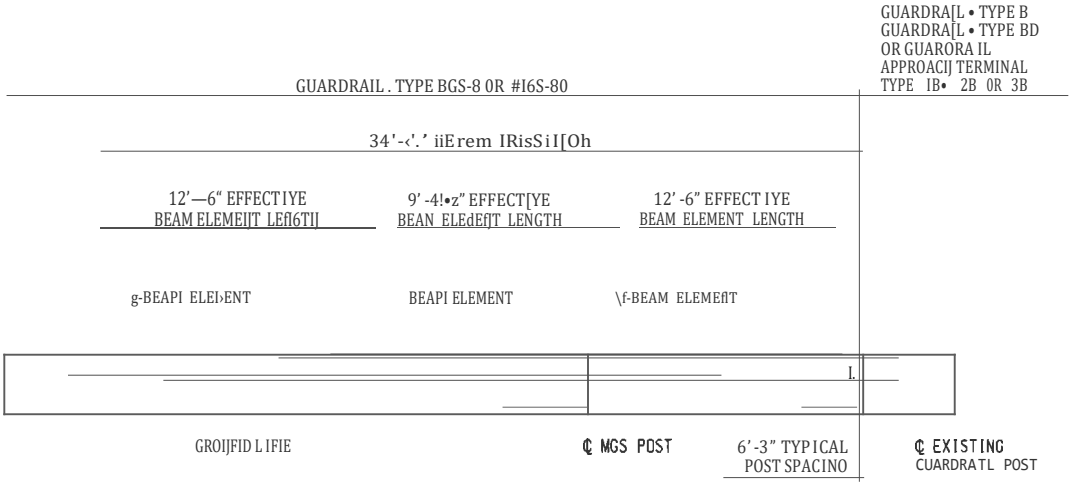
7-26-201 I
PLAN DATE

R-60-I

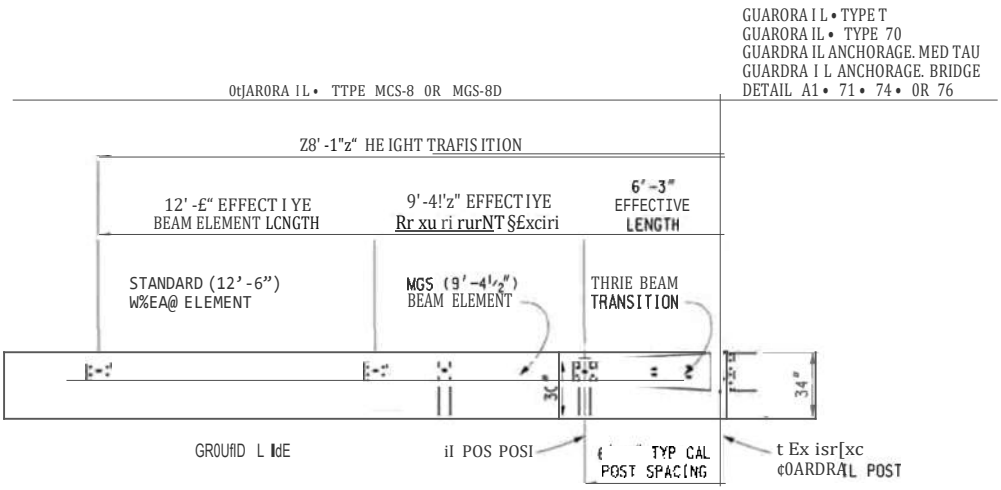
SHEET
9 OF 17



ELEVAT ION SHOWI NG POST SPACING FOR
GUA RDRA IL, TYPE MGS-8 OR MGS—8D
x SEE fl0TES FOR 6hARDRA IL IU C0fJJUfJCT I0fl If I TH CURB



ELEVA T IO N 5HOV ING TRANS ITION DETA IL FOR CONNECT ING
GUA RDRA IL, TY PE MGS—8 OR MGS-8D TO
GU A RDRA IL, TY PE B, GUA RDRA IL, TYPE BD, OR
GUA RDRA IL APPROACH TERM INAL TY PE IB, 2B, OR 3B



ELEV AT ION SHOW ING TRANS ITION DETA IL FOR CONNECTING
GU A RDRA IL, TY PE MGS—8 OR MGS-8D TO
GUA RDRA IL, TYPE T, GUA RDRAIL, TYPE TD,
GUA RDRA IL ANCHORAGE, MEDIAN,
GU A RDRA IL ANCHORAGE, BRIDG E DETAIL AI, TI, T4 OR T6

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

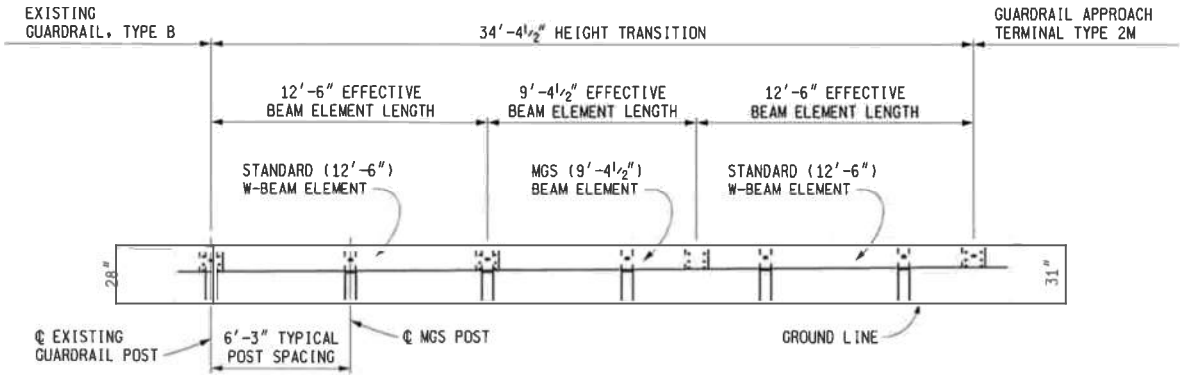
GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, 8‹ MGS-8D

F.].F.*. APPROVAL

I—26—2017
PLAN DATE

R—60—I

SHEET
10 OF t]



ELEVA T ION SHOW ING TRANSITION DETA IL FOR CON NECTING
GUARD RAIL, T Y PE B TO
GUA RDRAIL APPROACH TERMINAL TYPE 2M

EX [ST IBIG
GIJARDRA IL • TYPE 7

z8 -i'•," HE1GHT TRA›IS IT [ON

GUARDRA IL APPROACH
TERNI VIAL TTPE 2M

EFFECT IYE
LEFIGtH

9 -4!•e" EFFEC7[YE
BEAM ELEMENT LEfiGT8

t2' -6" EFFECT[YE
BEAM ELEMEFIT LERGT8

THR BE BEAM
TRAhS I TION

MGS (9'-4½")
BEAM ELEMENT

STANDARO 112'-6"1
Y-BE Ad ELEMENT

$ EX IS I I8G
GUARDRAIL POST

p' 6'-J" T7P T CAL
POST SPACING

℄ MGS POST

GROUFID LIBE -

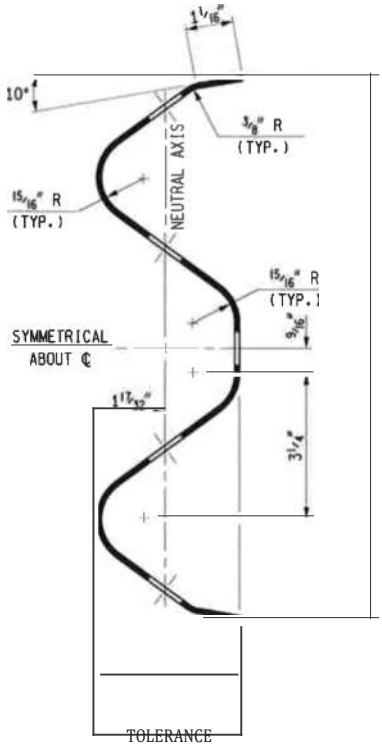
ELEVATION SHOI ING TRANSIT ION DETA IL FOR CONNECT ING
GUARD RA IL , TYPE T TO
GUA RDRA IL A PPROA CH TEIIMINAL TYPE 2M

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

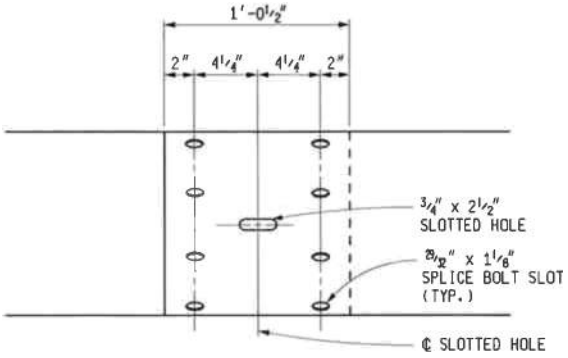
GUARDRAIL, TYPES A, B, BD, T, TD, **SGS-8, & SGS-8D**

7-26-2017
F.H.W.A. APPROVAL PL48 DATE

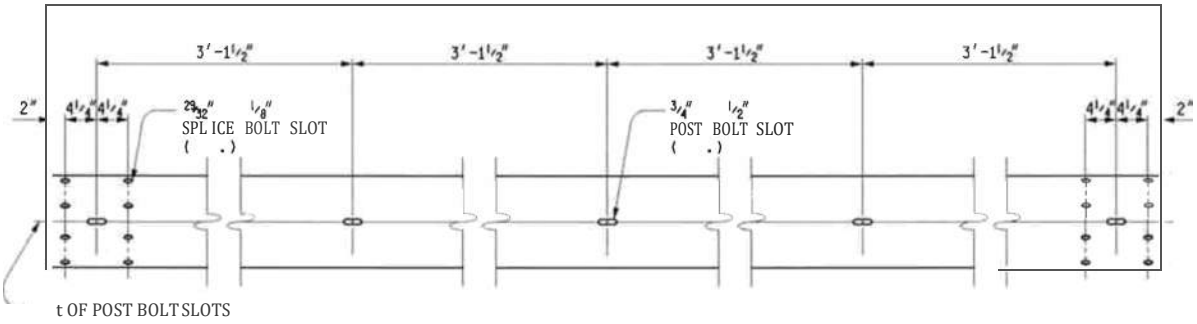
SHEET
R-60–I
11 OF 17



SECT 10N THROUGH BEAM ELEMENT

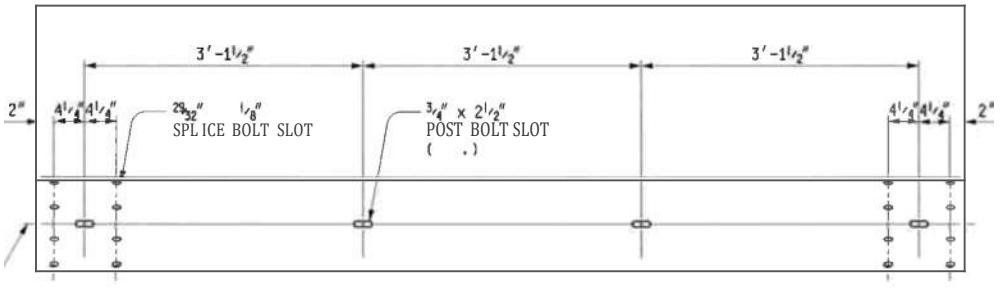


BEAM ELEMENT SPLICE DET A ILS



t OF POST BOLT SLOTS

FRONT ELEVA T ION OF BEA M ELEMENT



I OF POST BOLT SLOTS

FRONT ELEVAT ION OF SGS f9'-4 2") BEA UI ELEVENT

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS—8, 8‹ MGS—8D

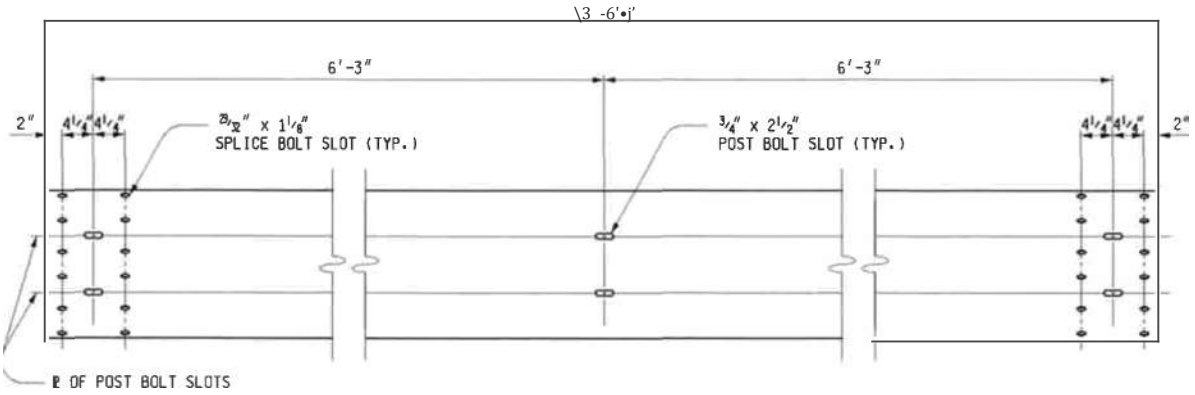
F.H. ¥.4. 4PPR0Y£L

7—26—201 I

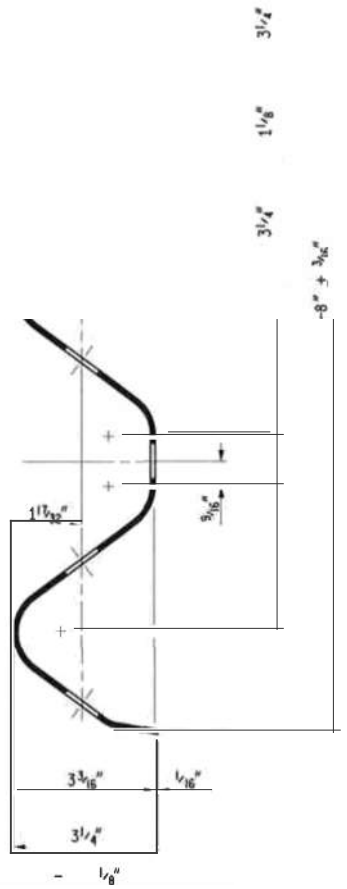
PLAN DATE

R—60—I

SHEET 12 OF 17



FRONT ELEVATION OF THRIE BEAM ELEMENT

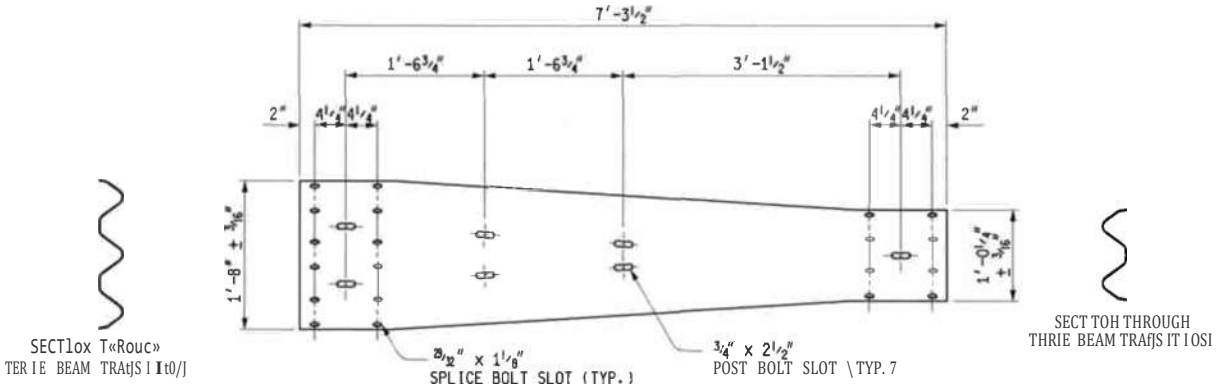


SECTION THROUGH THRIE BEAM ELEMENT
FOR GIJARORAIL • TYPE 7 AND TD I

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL,
TYPES A, B, BD, T, TD,
SGS-8, & SGS-8D

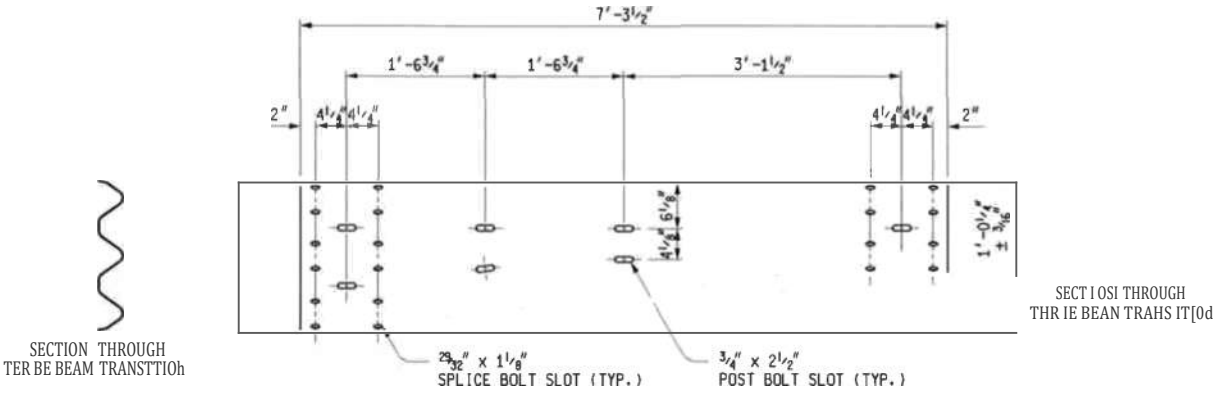
F. x. ¥. . PPR?vxL | 7-26-2017 PLEfl 01TE | R-60-J | SHEET 13OF 17



SECTlox T«Rouc»
TER I E BEAM TRAtJS I It0/J

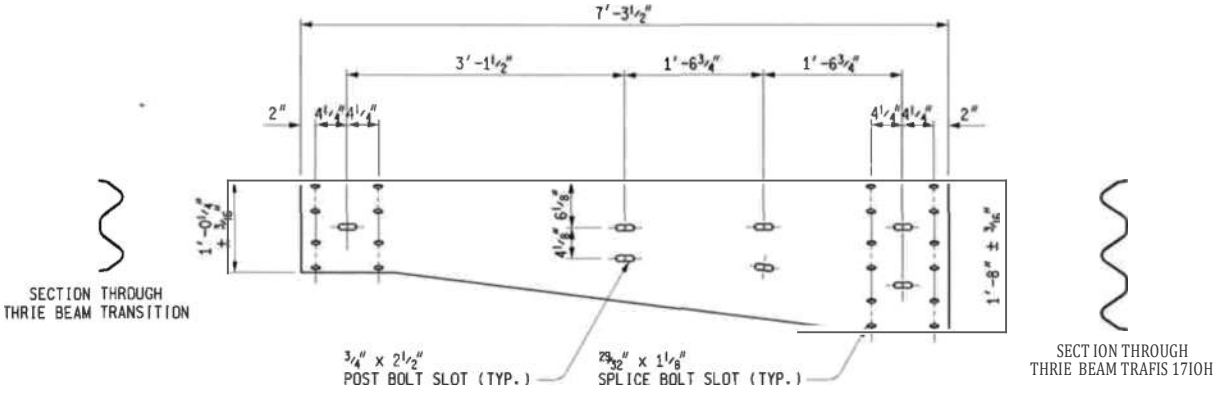
SECT TOH THROUGH
THRIE BEAM TRAfJS IT I OSI

T HRIE BEAM TRANS IT ION



SECTION THROUGH
TER BE BEAM TRANSTTIOh

SECT I OSI THROUGH
THR IE BEAN TRAHS IT[0d



SECTION THROUGH
THRIE BEAM TRANSITION

SECT ION THROUGH
THRIE BEAM TRAFIS 17IOH

ASY MM ETRICAL THR IE BEA M TRANSITIONS

NOTE: ASYUNETRTCAL TRAN$[T[ON T7PE DTLL VART B7 LOCATTOH DEPCNOTNO ON OUARDRA TL LAYOUT

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DE\/E LOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS—8, 8 MGS—8D

F•8•¥.£• 4PPR0YXL

7—26—20t I
PLAN DATE

R-60–I

SHEET
14 OF 17

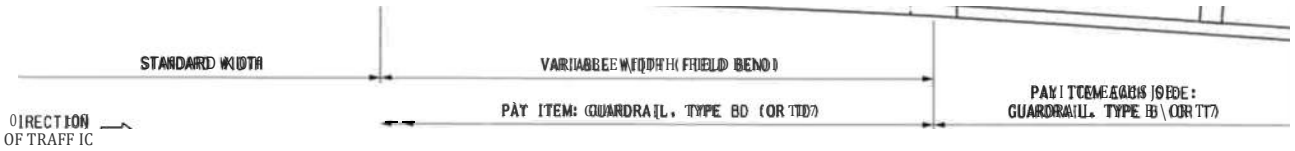
OFFSET BLOCKS (TYPE BD 1 6" X 1'-0" X I'-3"
OFFSET BLOCKS I TYPE 70 7 6" x 1'-0" x 1'-10"

OF' T9A£F IC

OFFSET BLOCKS I TYPE BD I 6 ' X 9 " x I' -3 "
OFFSET BLOCKS I TYPE TD) 6 ' x 9 " x 1 ' -10'

POST BOLT LEX¢TH 2'-4°
I0fJE REQUIRED FOR TYPE BD I
ITtf0 REQUIRED FOR TYPE TD I

POST BOLT LENGTH 2' -10"
fONE REüUIREü FOR TYPE eü)
fTOO REüUIREü FOR TYPE TD 7



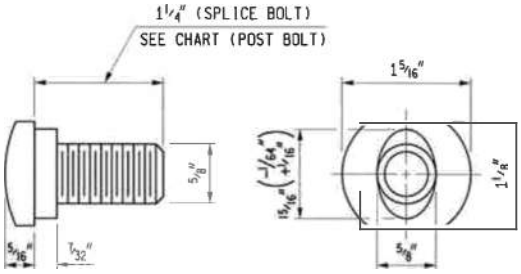
DETA IL SHOW ING TRANSITION FROM GU A RDRA IL, TY PE B FOR T YP E TO TO GUA RDRA IL, T YP E BD TO R TYPE TDD

POST BOLTS, SPLICE BOLTS AND WASHERS AT BEA M ELEl4 ENT SPLICE POSTS AND A T INTERMEDIATE POSTS							
GUARDRAIL TYPE	POST	OFFSET BLOCK	POST BOLTS		SPLICE BOLTS		\fASHERS
			FIO. RE0'D	LENGTH	f 1!'x" LOXC J I f10. RE0'0)		\ ROUFID T (NO. RE0'D)
	STEEL	N/A		2"			1
B	GOOD	h00D	1	IB "			1
	STEEL	h00D	1	9!•j"	•		1
80	GOOD	DOOD	t	s26',,"			
	STEEL	WOOD	2	9 1/2"			2
T	YOOO	800D	2	18'	12		2
	STEEL	G00D	2	9!•y"			2
TD	tf00D	WOOD	2	*26 1/2	24		
	STEEL	WOOD	4	9 1/2"			4

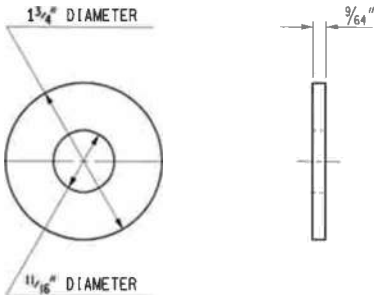
bI INIMU M POST BOLT THREAD LENGT H	
BOLT LEf/6TIJ	M IN [MUM THREAD LEN0TfI
9 1/2"	1 3/4"
26 1/2"	3"

THR [E BEAM TRArlS IT IORS REQU[RE 20 SPL ICE BOLTS EACH 112 OSI TYPE 7 CND AND 8 OU TYPE B END t.

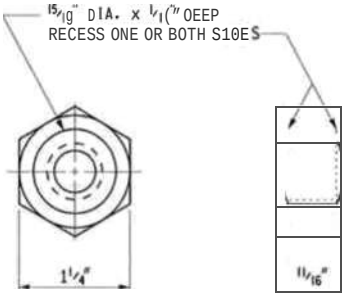
$ EXCEPT AS SPECTF TED ON 0ETA!L SHODTNG TRANSITION FROM GUARDRAIL. TYPE B I OR TYPE 7 70 GUARDRA TL • TTPE BD I OR TYPE TD 1. POST BOLTS SHALL I4OT EXTEfJD MORE THArl !'z" BEYOND fJUT•



SPLICE BOLT AN D POST BOLT

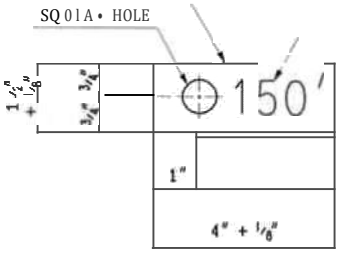


ROUND WASHER



NUT

0• 0t2 " III [CK



CUR¥E0 GUARDRA I L R/D IU5 EMBOSSED *•<" rl 1611 Ofl TUE METAL TAO

METAL TAG

FOR CURYEO OUARORA I L ¥ ITH RAD I US OF \50 ' OR LESS

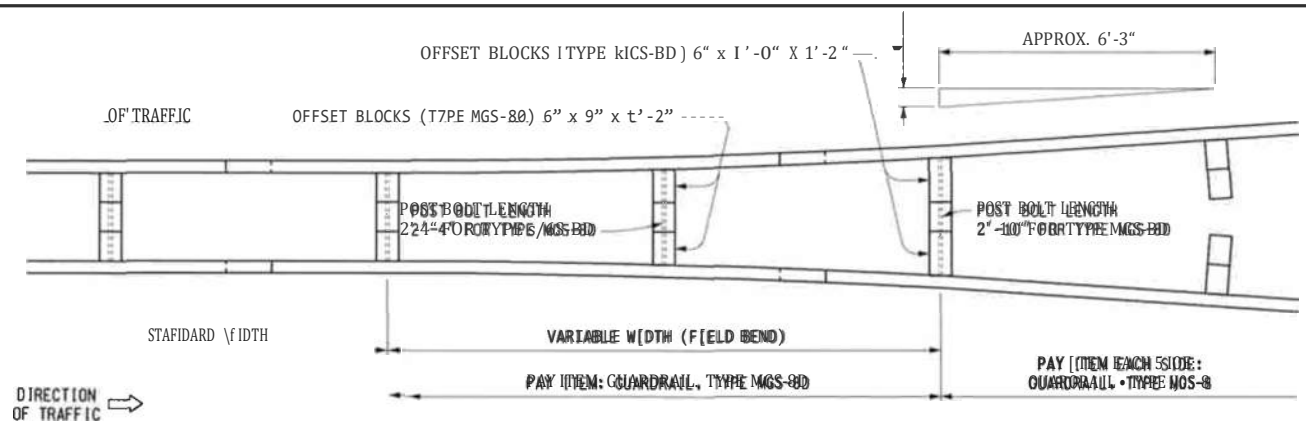
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS—8, 8‹ MGS—8D

F.].D.A. tPRROYA(7—26-20tT PLAN DATE

R -60-J

SHEET 15 OF 17



DETA IL 5HOWING T RANSIT ION FROM
GUARDRAIL, TYPE MG5–8 TO GUARDRAIL, TYPE MGS–8D

POST BOLTS SPL1CE BOLTS AND WASHERS AT BEAM **ELEMENT SPL1CE POSTS AND AT !NTERMED1ATE POSTS**						
GUARDRAIL TYPE	POST	OFFSET BLOCK	POST BOLTS		SPLICE BOLTS	¥AS8ERS
			N0. RE0’D	LENGTH	fl',” LONO) N0. RE0’D)	(ROUND) (NO. REO'D)
	YOOD	¥00D		t8“		1
	STEEL	YOOO	I	9!zy”		I
MCS-BD	DOOD	FOOD	1	+„„'„	16	
	STEEL	¥00D		9!•y"		2

THR[E BEAR TeANST T!0NS REouTRE 20 SPLICE BOLTS EACH lt2 ON T7PE T END AND 8 0N TYPE uGS END 7 .

+ EXCEPT AS SPEC IFIEO 0h DETAIL SH0¥ING TRANS [7[OH FROM GUARDRAIL. TYPE 805-8 To 4u*RDRAlL. T7PE *cs-4o POST BOLTS SHALL NOT E%TEND NORE THAN '.,” BEYOND

IIINInfUM POST BOLT THREAD L ENGTH	
BOLT LEXGTU	MINIMUM THREAD LEhGTH
9 1/2”	1 3/4”
18 ”	2 1/2”
26 1/2”	3”

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

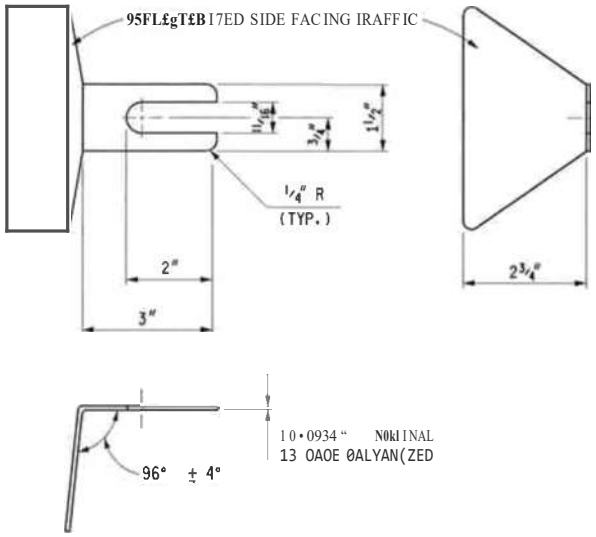
GUARDRAIL, TYPES A, B, BD, T, TD, **SGS-8, & SGS-8D**

F.I.J.¥. X. 4PPR0YXL

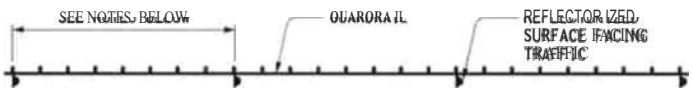
7—26-2017
PLAN DATE

R-60-]

SHEET
16 OF t7



GUARDRAIL REFLECTOR

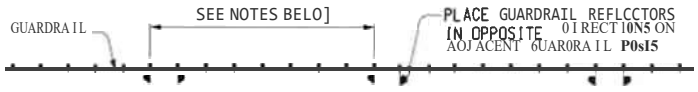


DI9ECTIQI OF TRg£FIC

DIRECTION OF TRAFFIC

GUARDRA

ONE—WAY TRAFFIC



DIRECTION OF TRAFFIC

D IRECT IOk
OF TRAFF [C

GUARDRA

TWO—WAY TRAFFIC

PLACEMENT OF GUARDRAIL REFLECTORS

NOTES G0YERNfNO THE USE OF GUARDRAIL REFLECTORS

1. GUARDRAIL REFLECTORS SHALL BE USED ON ALL STAXDARO 6JARDRAIL RUSS. REGARDLESS OF R0A0¥AY LIGHT IH¢.

2. GUARDRAIL REFLECTORS ARE 70 BE SPACED AT TUE F0LL0fl I NG I UT EB YAL 5:

   o) 50'-0" ON TANGENT SECTIONS AND CUR¥ES WITH A R*D[us oF **1150** ' 0R MORE.

   b 25 '-0" 0R CUR¥ES I ITU A RAD I US LESS Tfl AfJ **1150'.**

3. FOR GUARDRAIL REFLECTOR PLACEMEFIT OSI APPROACH TER#I[NALS. SEE THE APPROPRI ATE GUARDRAIL APPROACH TERMINAL STAfJOARO PLAN.

4. A **OUARORA** IL REFLECTOR IS 70 B£ PLACED ON IIJE SECOND POS I FROM TfIE OUARORA IL DEPARTING TERMIICAL.

5. ON GUARDRAIL. T7PE T AND T7PE TD OUARDRATL REFLECTORS ARE TO BE PLACED 0f/ THE UPPER POST BOL T.

6. **6UAR0RA** I L REFLECTORS SHALL MAICH COLOR OF EOGE L IHE.

DIRECTION OF TRAFF IC

D1RCCTI0N OF TRAFFIC

ONE-WAY TRAFFIC

DIRECTION OF TRAFFIC

DIRECTION OF TRAFFIC

TTO—WAY TRAFFIC

DIRECTION OF RAIL LAP

NOTES:

DETAILS SPEC IFI ED OH TH IS STANDARD ARE ACCORD IN6 70 THE AASHT0-A6C-ARTBA J01NT COMMI TTEE. TASK FORCE 13 PUBL ICAT I0ft 7ITLEO "A 6U[DE 70 STAI4OARD IZED H I 0fl\MAY BARRIER HARD\fARE •"

BEAM CLELEXTS SHALL BC SHOP BEIJT 70 PLAIN RAD I US FOR CUR YE RAO I I 150' OR LESS. A TAG IDENT I FY IN¢ THE CURVATURE OF THE SHOP BENT SECT ION WILL BE REQUIREO FOR EACH CURBED ELEMENT.

SEE STAI4DARD PLAN R-61-SER[ES. R--62-SERIES OR R-63-SER[ES FOR GUARORA IL APPROACH TER#I I PALS. STANDARD PLAft R-66-SER [ES FOR GUARDRA IL DEPART II4G TERM I PALS AND STAI4DARD PLAN R-67-SER[ES FOR GUARORA IL AIJCHORAGE. BR IDOE.

YIIIEfl TI1E PLANS SPEC IFT GUARORA I L fTYPE B OR 7 7 70 BE PLACED OU THE Sh0üLDER II INGE POI XT. RATHER IhAfl AS SPEC IFIED OU TH IS PLAfl . 8 ' -0" POSTS SHALL BE PR0¥ TDED Y ITH THE ADD I TI0I4AL LEI4GTH EMBEDDED FOR ADDED STAB I L ITT • t NOT fJECESSART YfIEfJ THE SLOPE IS REASONABL Y LEYEL BEYOND TUE SH0tJLD£R fJ1TIGE POINT• AS DETERMI LED BY TUE EWG IhEER. t

WHEN Tfl E PLANS SPECIFY GIJARORA IL TYPE MCS-8 70 BE PLACED ON THE SHOULDER HIN6E POINT. RATHER THAFI AS SPECIFIED OSI THIS PLAN. 9'—0" POSTS SHALL BE PROVIDED. \T ITH THE ADDITIONAL LEI46TH EIJ8E0DED FOR AOOED STABILITY. 7 NOT FIECESSARY fTHEd Tfl E SLOPE IS REASONABLY LEVEL BE70ND TNE 5H0ULDER H TNGE POTNT. AS DETERH[NED BT TUE Erl6 I NEER • ›

tl00D POSTS \y ITIJ !•z" BEYELS 47 TUE TOP MAY BE USED IN LIEU OF **fl00D** POSTS 8ITfJ0UT BEVELS SPEC IF IE0• TfIE LEfJ6TIJ• ¥ I0TH ACID OEPTH OF I8E POST SHALL 8E A5 SPEC IFIEO 0k TU IS STAROARD ACID TUE POST BOLT IJOLES SI1ALL BE LOCATED 70 ENSURE PROPER RAIL

fl00D OFFSEI BLOCKS YITIJ !"t" BE¥ELS AT TIJ£ TOP **ATO BOTTOM** 0R A 1" BEVELED TOP HA7 BE USED TN L TEU OF DOOD BLoCIs VlTEouT BEYELS SPEC IF IED. THE LEFIGTH I FROFIT **AI4O BACK** FACE 7 . WIDTH **ATO** DCPTH OF THE BLOCK SHALL BE AS SPECIFIED 014 TH IS STAHDARO ATO TUE POST BOLT £I0LES SHALL BE LOCATED 70 EIJSURE PROPER RAIL HEIGHT AUD COMPAT IBIL ITT ffITH POST H0LES•

fiHEfl ThE FACE OF GUARORA I L I S PLACED FLUSft III TH FACE OF CURB . THE RAIL HE IGHT SHOULD BE MEASURED FROM THE FROfJT EDGE OF THE GUTTER PAN• YIJ ICH I S ThE PO[NT ON TUE OUT TER PAL THAT IS CLOSEST 70 THE EDGE OF TUE TRAVELED LANE. YHEFI TUE FACE OF THE GUARDRAIL PAI4EL IS LOCATED BEH UID THE CURB THE RA[L HE I OHT SHOULD BE dE A SURED FROM THE GROUI4D JUST IN FROfIT OF THE GUARORA IL.

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVF LOPME NT STANDARD PLAN FOR

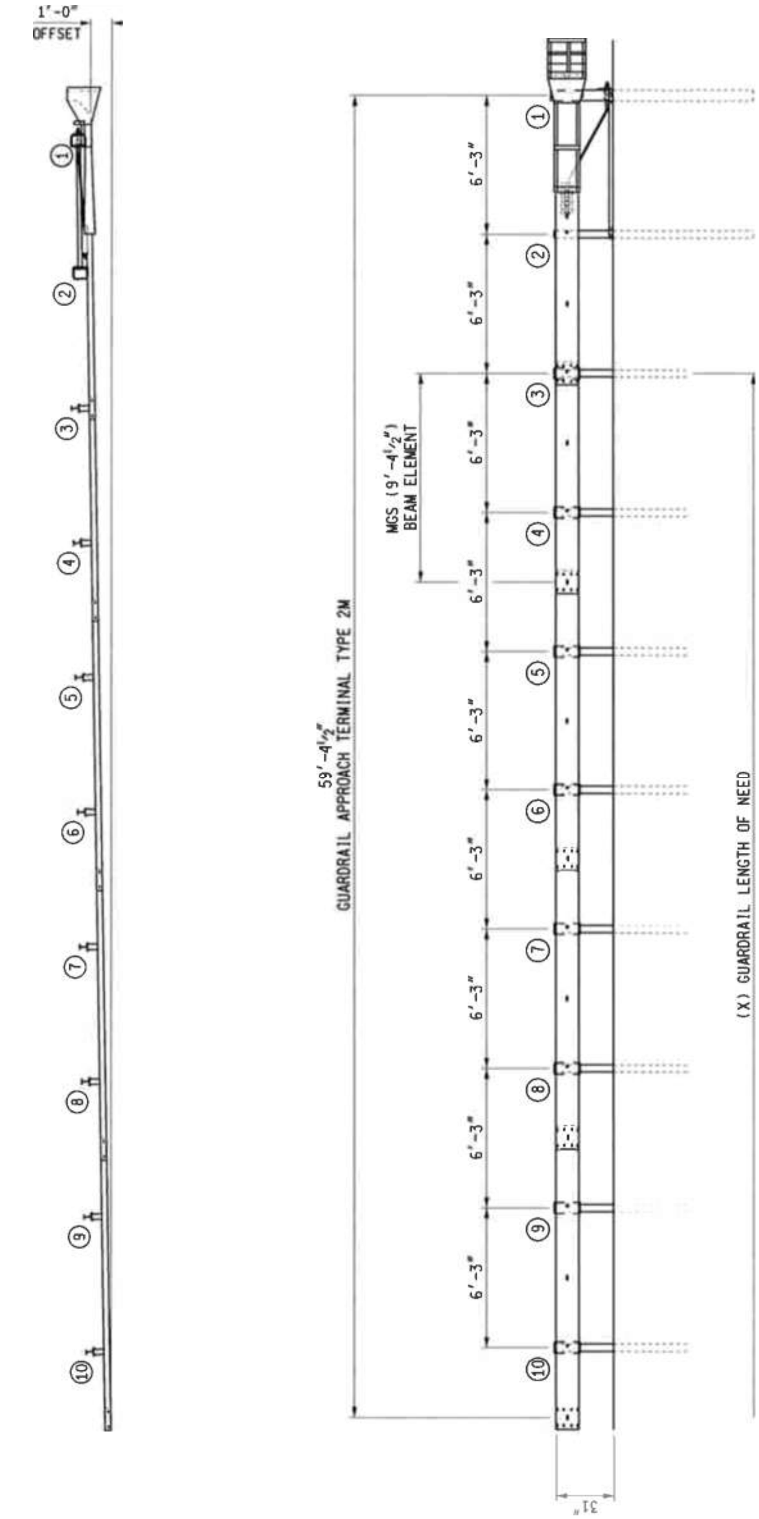
GUA RDRAIL, TYPES A, B, BD, T, TD, MGS—8, 8‹ MGS—8D

R-60—J

SHEET

F.0.¥.A. APPROVAL

7-26-2017
PLAN DATE



OPTION 1

MDOT
Michigan Department of Transportation

Kirk T. Steudle

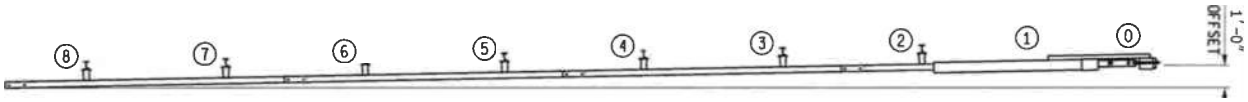
APPROVED BY: DIRECTOR, BUREAU OF FIELD SERVICES

GUARDRAIL APPROACH TERMINAL TYPE 2M

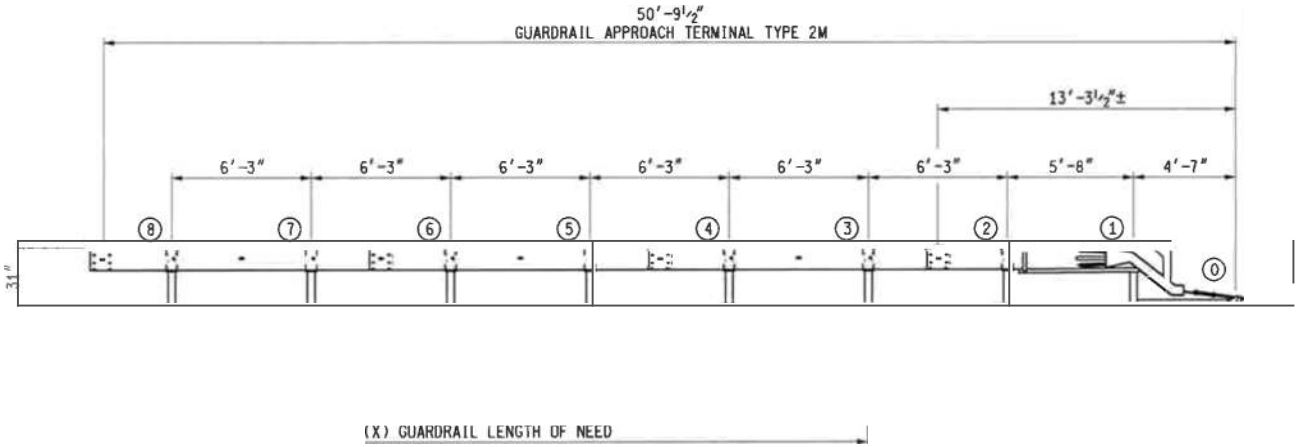
F.H.W.A. APPROVAL

H-29-Q

SHEET F 30



P LAN VIEW



ELEVATION

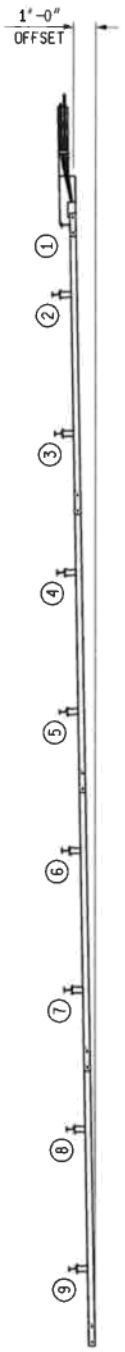
GUARDRAIL APPROACH TERMINAL TYPE 2If

"SOFT -STOP"

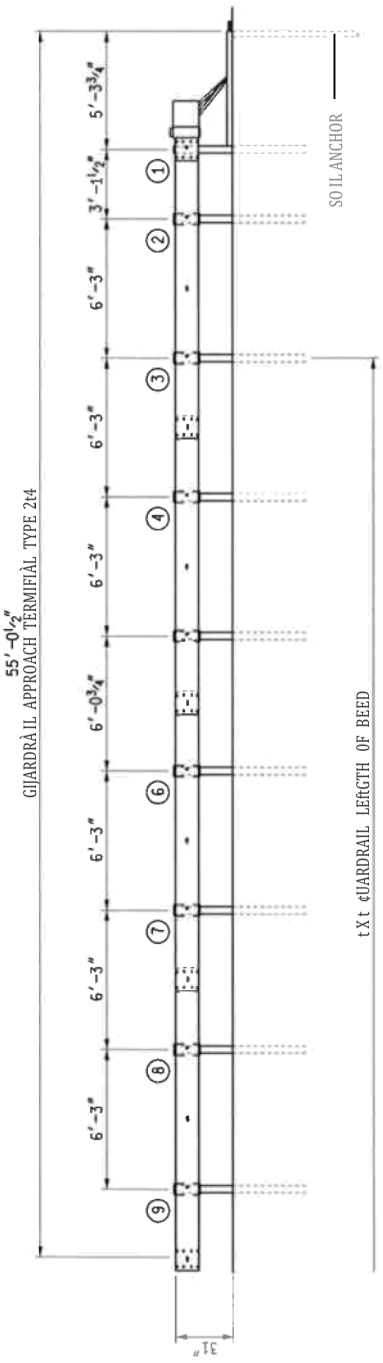
F.H.W.A. APPROVAL

5-1-2018

PLAN DATE



PLAN VIEW



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE EM
"HAX-TENSION"

OPTION 3

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPE 2M

F.H.W.A. APPROVAL	5-1-2018 PLAN DATE	R-62-H	SHEET 3 OF 4

f/0TES:

ALL POSTS • OFFSET BLOCKS • BEAM ELEMENTS • **ATO** HAROXARE I IHCLUD TING BOLTS. FIUTS. ASIO WASHERS 7 SHALL **¢08F0RM 70** THE MAfIUFACTURER'S DETAILS AUD SPECIFICATIOI4S.

ALL I :10 SLOPES SHALL BE GRADED 70 CLASS A SLOPE TOLERANCES.

XHEI4 5 FTE COHD[TIOHS 8ARRAI4T AHD WITH THE APPROVAL OF THE EHG IREER• GIJARORA IL APPROACH TERMINAL TYPE 2M CAN BE INSTALLEO STRAIGHT I g ITROUT THE 1'--0" OFFSET FROM THE TAH8EfIT L ICE TO THE TRAFF[C F1cE OF POST 11.

GIJARDRAIL REFLECTORS Af/D OTHER ATTAC8liENTS ARE NOT 70 BE USED ODI ThE GIJARORA IL APPROACH TERN QUAL. PLACE REFLECTORS BE¢ I IJd I FI¢ 0X STAFIDARD RUN OF GUARDRA IL.

USE REV LECT [YE SHEET I BIG ACCORD I UG 70 TUE F0LL0¥I NO TRAFF IC C0fJ0 IT I**0fl5:**
T x0TE: 4L TERNATE 3" BLACK 4fl0 3 " **T£LL08** STR I PE$ ON A 45° Af/GLE I

TRAFF IC PASS IUG 0N TSE LEFT SIDE

TRAFF IC PASSIFIG ON BOTH S IDES

TRAFF TC PA$5TNG 0N THE R ! GHT STDE

TUE PORTIOfl OF THE IMPACT HEAO ASSEI¢ILY FACIIJG TRAFF[C SIJALL BE COXPLETEL Y cOYERED ¥ ITH HIGH I ff TEI4S I TY ADhESI YE RÈFLECT I YE SHEET IHG.

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF HIGHWAY DEVE LOPMENT STANDARD PLAN FOR

GU A RDRA IL AP PRO ACH TERMINAL TYPE 2M

F.H.W.A. APPROVAL	5-1-2018 PLAN DATE	R-62-H	SHEET A OF

Washington State Department of Transportation

PREPARED BY DESIGN DIVISION

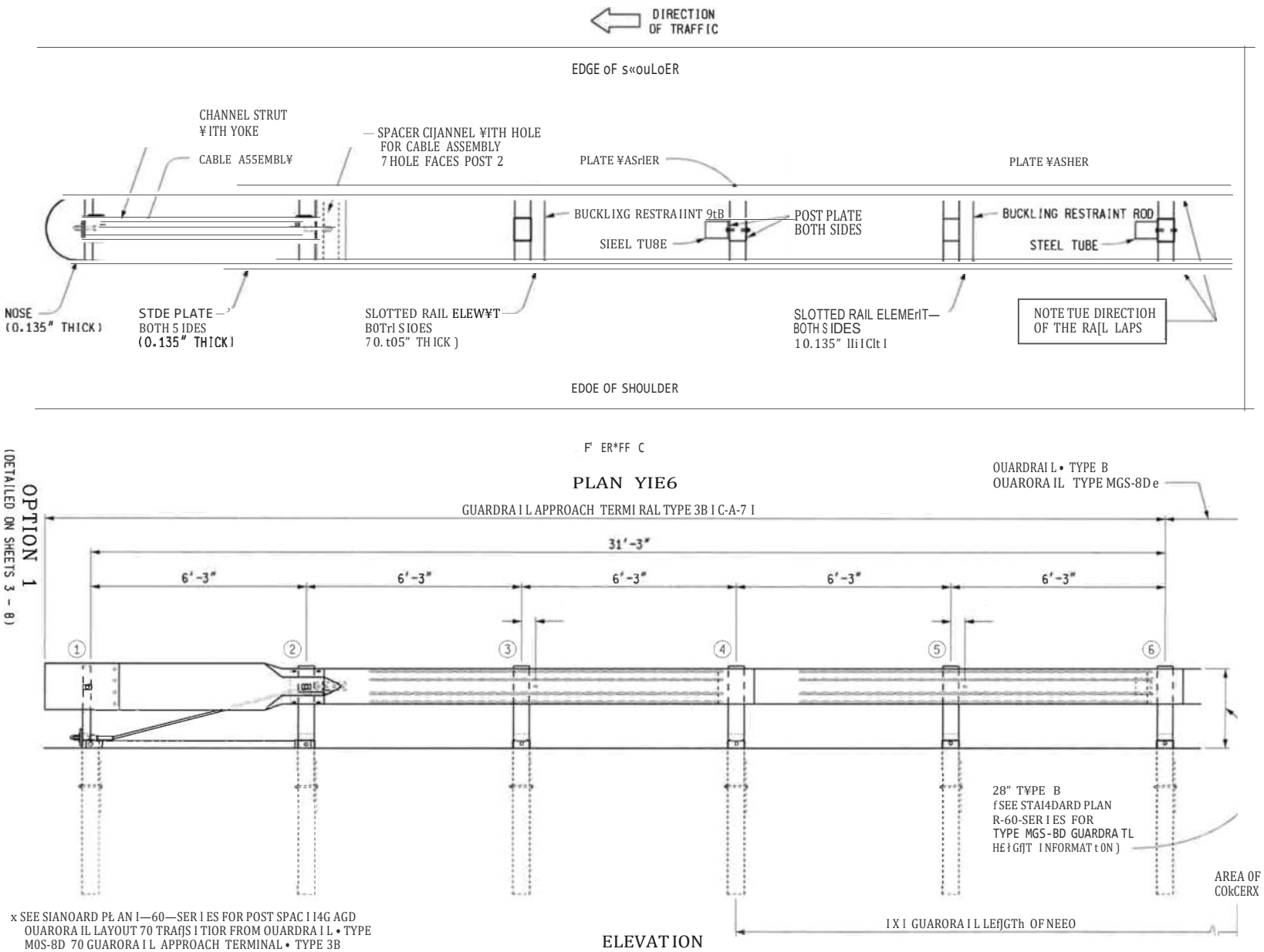
DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

APPROVED BY: _____ DIRECTOR, BUREAU OF FIELD SERVICES

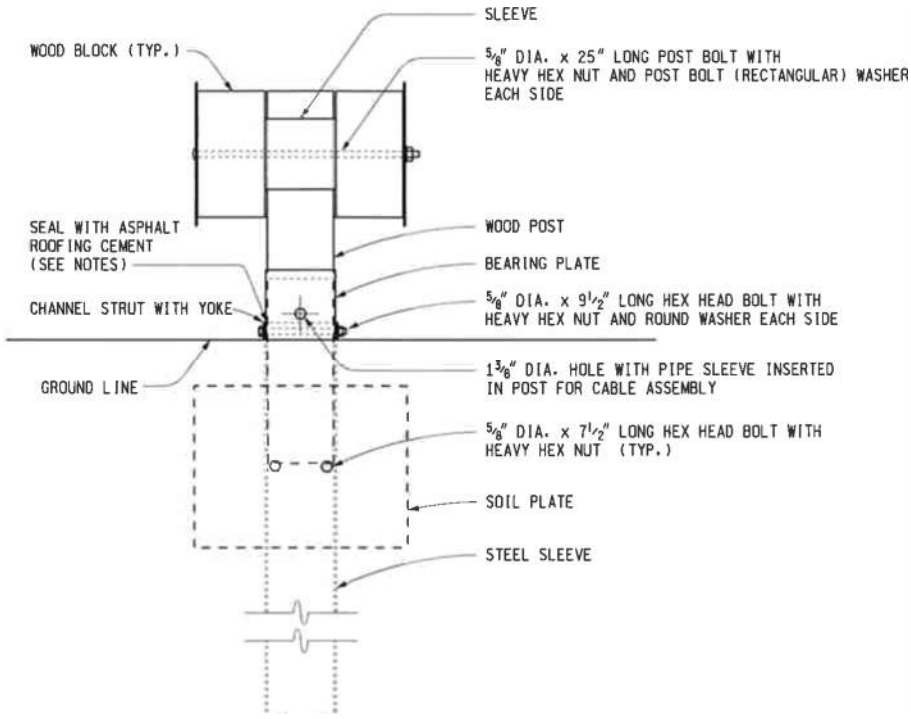
APPROVED BY: _____ DIRECTOR, BUREAU OF DEVELOPMENT

8

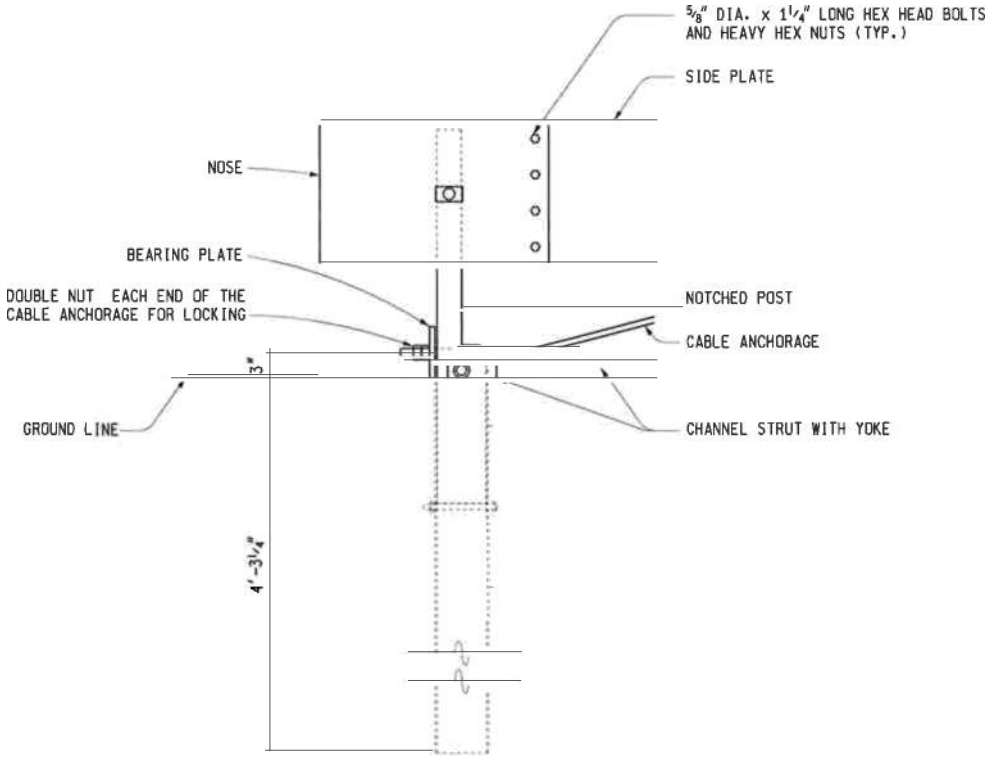


x SEE SIANOARD PŁ AN I—60—SER I ES FOR POST SPAC I I4G AGD OUARORA IL LAYOUT 70 TRAfJS I TIOR FROM OUARDRA I L • TYPE M0S-8D 70 GUARORA I L APPROACH TERMINAL • TYPE 3B

GUA RDRA IL APPROACH TERMINAL, TY PE 3B "C—A —T"



5IDE



ELEVATION

POST 1 DETA ILS

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FUR

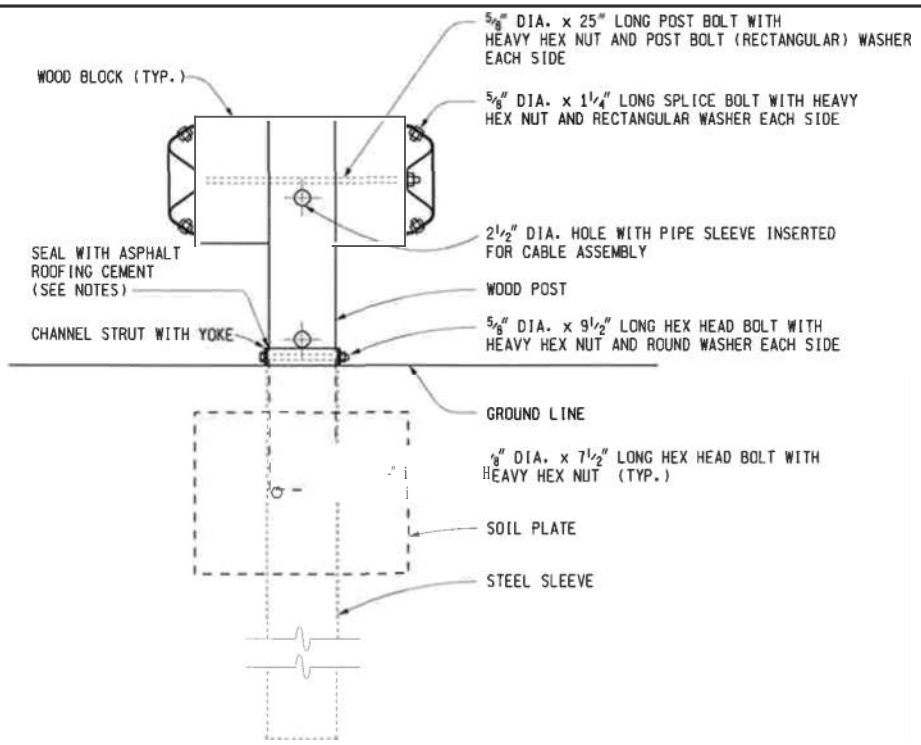
GUARDRAIL APPROACH TERMINAL, TYPE 3B $ 3T

F.H.W.A. APPROVAL

3-15-2016
RUN DATE

R-63-C

SHEET
3 OF t6



SIDE

5 TOE PLATE

CABLE AFICHORA6E

CHAHXEL STRUT ¥ITH YOKE

*•e" D I A• x 1!•j" LOFIG HEX HEAO BOLTS ACID HEAYY HEX NUTS ITYP.

SLOTTED RAI L ELE9EIJT

SPACER CHARREL ¥ITH HOLE FOR CABLE ASSEMBLY I HOLE FACES POST 2)

DOUBLE FIUT EACH EFIO OF THE CABLE ANCHORAGE FOR LOCK [BIG

GROUND LINE

ELEVATION

POST 2 DETAILS

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

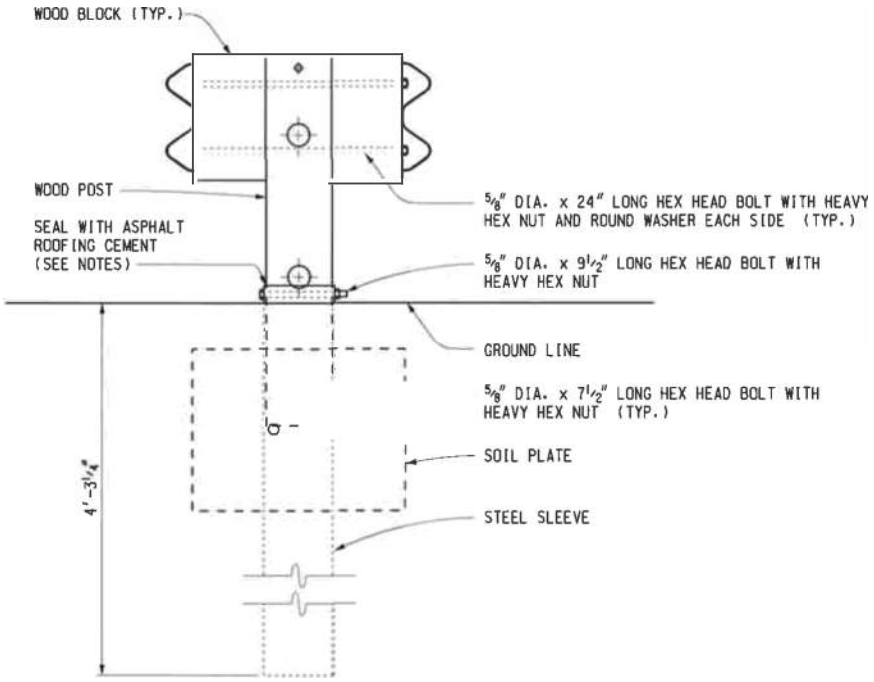
GUARDRAIL APPROACH TERM INAL, TYPE 3B $ 3T

F. 9.1. 1. 4PPR0Y1L

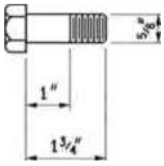
3-t5-2016
PLAN DATE

R-63-C

SHEET
4 OF t6

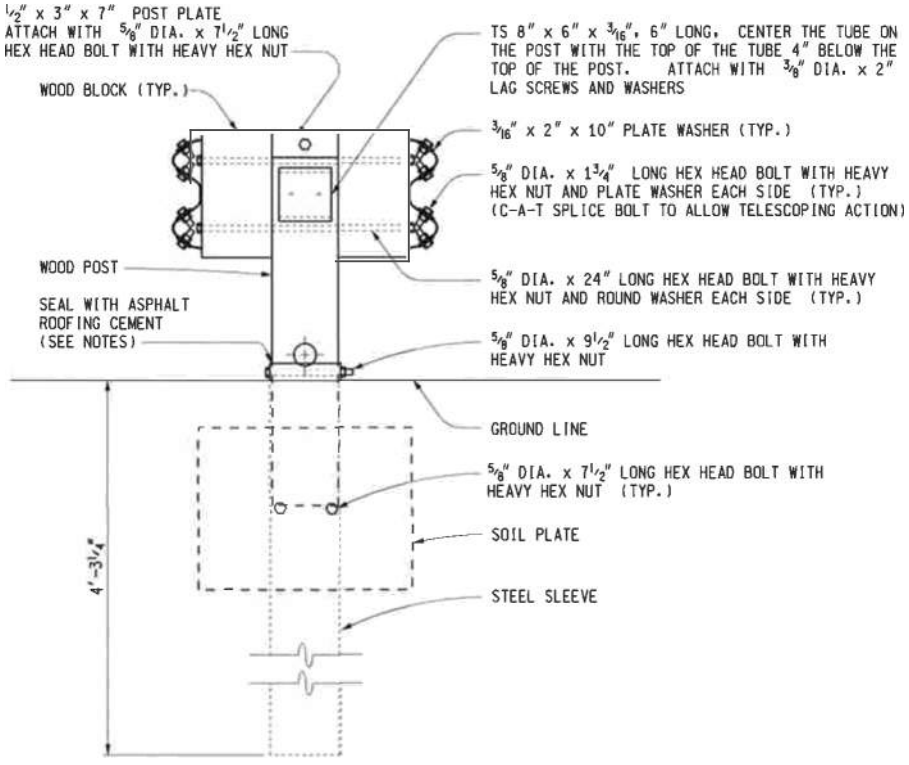


PO ST 3 AN D 5 D ET A IL



C-A-T SPLICE BOLT

C-A-T SPLICE BOLTS REOU I RED 70 ALLOW TELESCOP I XG ACT I ON



POST 4 DET A IL

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

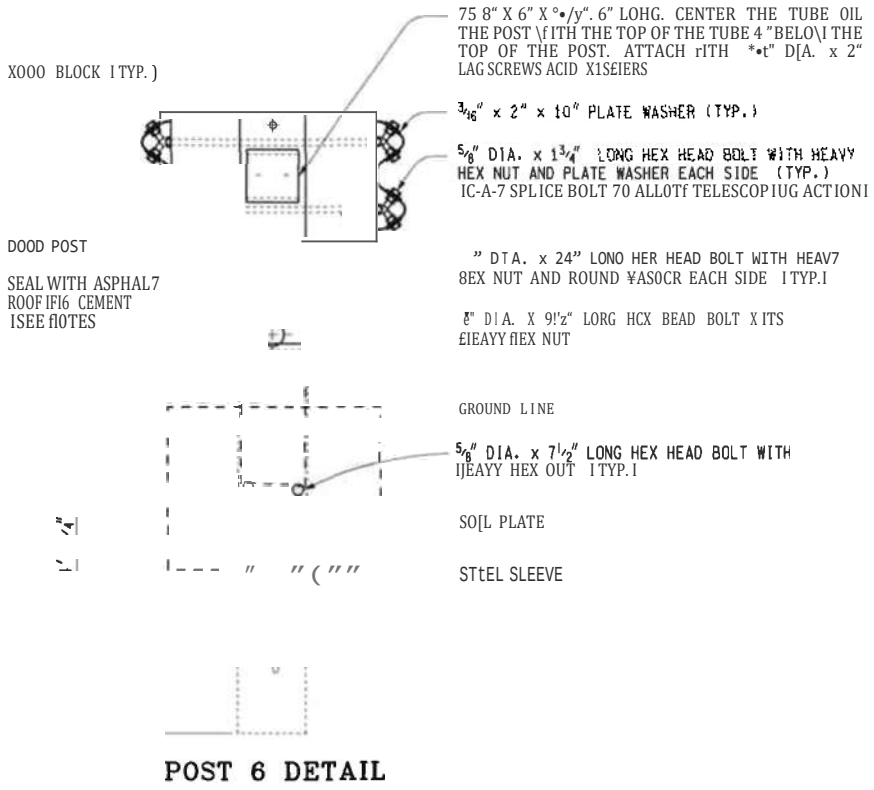
GUARDRAIL APPROACH TERMINAL, TYPE 3B $ 3T

R-63-C

SHEET 5 OF 16

3-15-2016

F.H.W.A. APPROVAL PLlli 06IE



POST 6 DETAIL

SLOTTED BEAM ELEMEFIT I TYP. 7

— *•e" DIA. x 24!'z" L0fl0 ROD ff ITH * 4uTs *4D 2 LOCK **sHCRS

IJEX FIUT I TYP. 7—

— LOCK WASHER ON INS!DE IT7P.)

BUCKLING RESTRAINT ROD DETAIL

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DE\/ELOPMENT STANDARD PLAN FOR

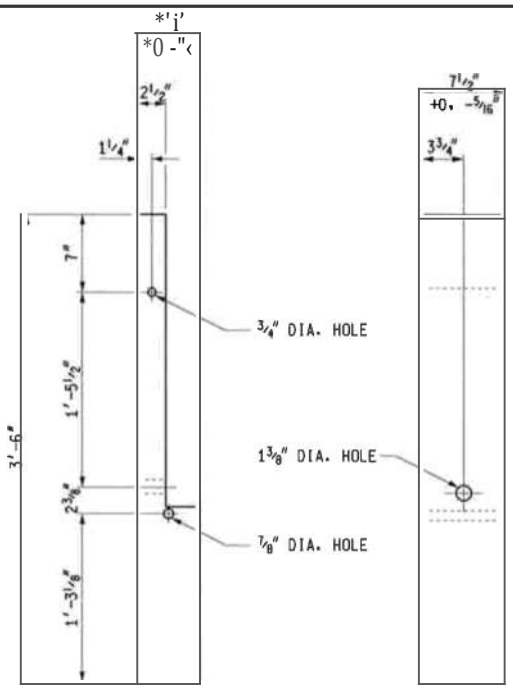
GUARDRAIL APPROACH TERRINAL, TYPE 3B & 3T

F.h•¥•£. 4PPR0¥£L

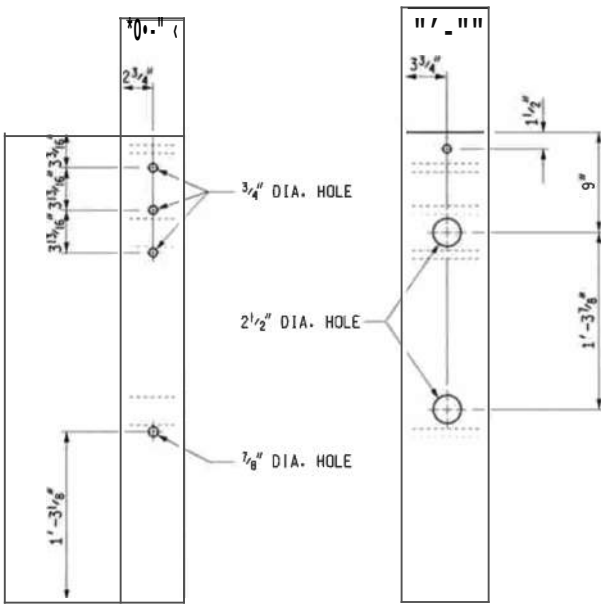
3-15-20t6
PLAN DATE

R-63–C

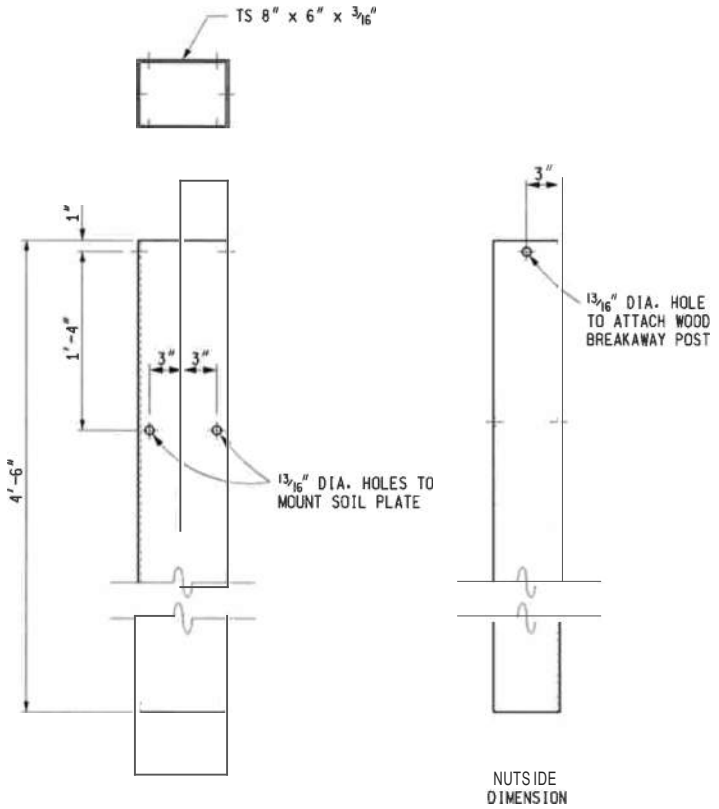
SHEET 8 OF 16



WOOD BREAKAWAY POST
(C-A-T POST 1)



WOOD BREAKAWAY POST
(C-A-T POST 2 - 6)

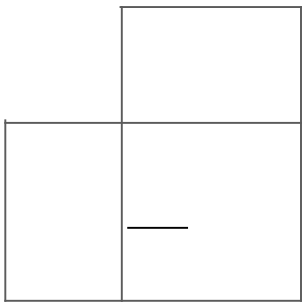


STEEL SLEEVE

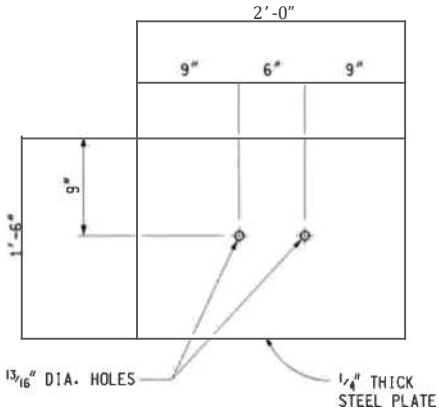
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL, TYPE 3B $ 3T

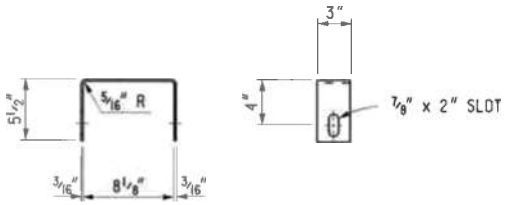
F.M.¥.4. 4PPR0Y1L | 3-15-2016 Pc*xD*TE | R-63— C | SHEET 7 OF It

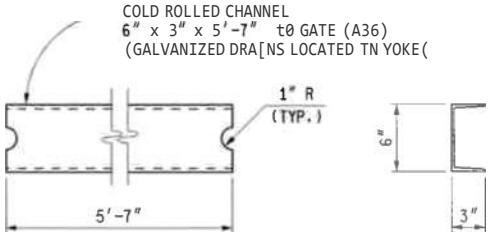


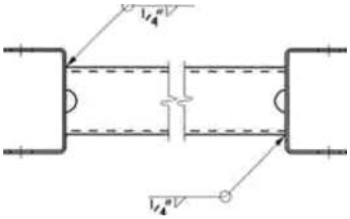
BEARING PLATE



SOIL PLATE



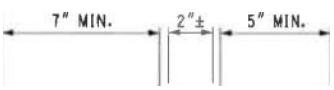




ASSEMBLY DETAIL

STRUT DETAILS
(C-A-T)

8 -0"



- #," DTA. (6x19) GALVAN[ZED
CABLE TO BE STAGE CONNEC TEO

5TAXDARD S¥A0E
F [TTtFIG AUD STUD

1 5/8" DIA.

f•, D(A.

1" D IA. TIJREAOED
EXITIRE LEFIGTH IFI.C. 7

CABLE ASSEII BLY

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DE\/ELOPMENT STAbIDARD PLAN FOR

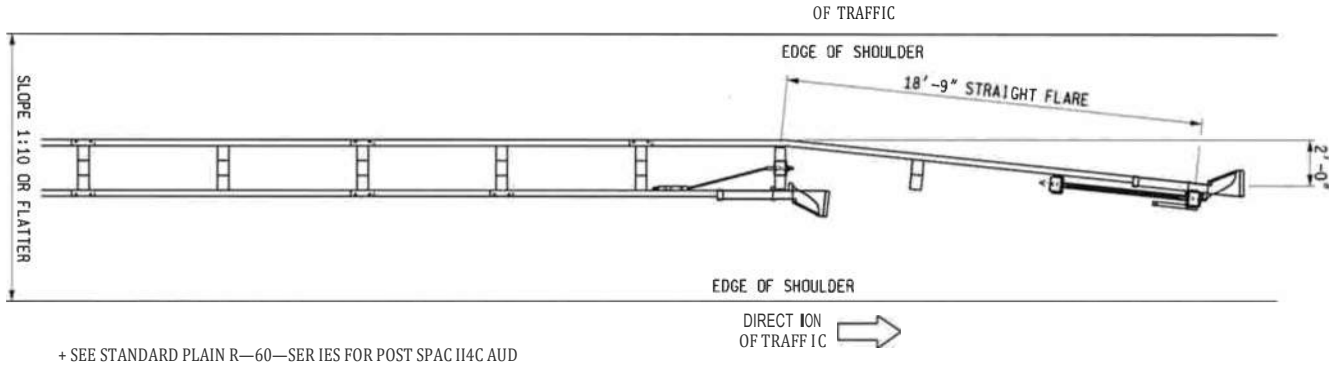
GUARDRAIL APPROACH TERMINAL, TYPE 3B $ 3T

F.h.¥.é. 4PPR0YAL

3-15-2016
PLAN DATE

R-63-C

SHEET
8 OF t6

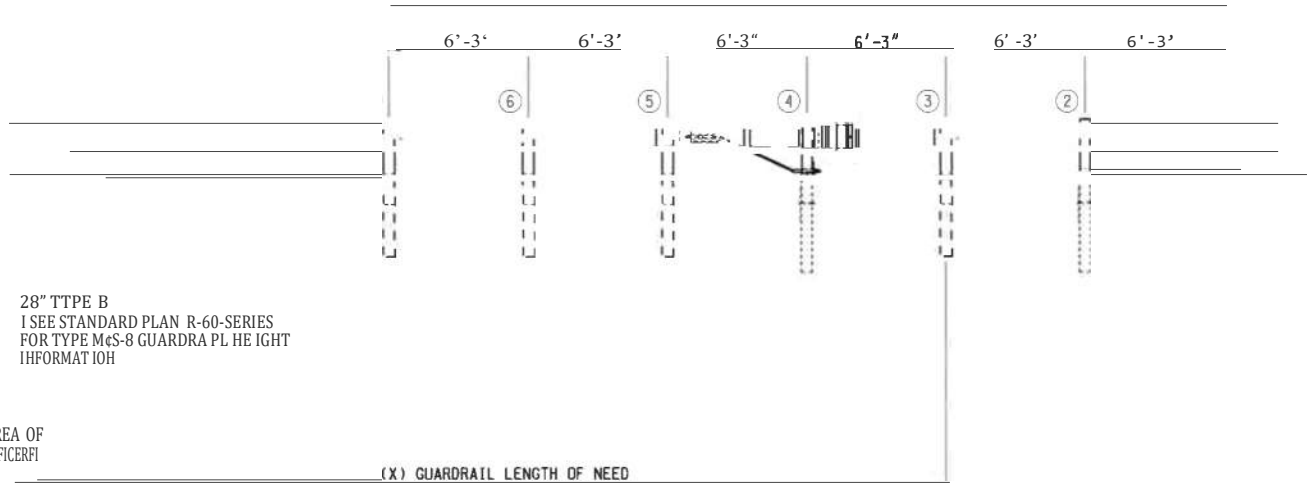


+ SEE STANDARD PLAIN R—60—SERIES FOR POST SPACING AUD GUARDRAIL LAYOUT 70 TRANSITION FROM GUARDRAIL. TYPE NCS-8D 70 GUARORAIL APPROACH TERMINAL • TYPE 3B

PLAN VIEW

GUARDRAIL› TYPE B
Cu*AOAATt. ItPE MGS-80 *

GUARORAIL APPROACH tERMIN1L ITPE 3B I FLEA I-MI)



ELEVATION

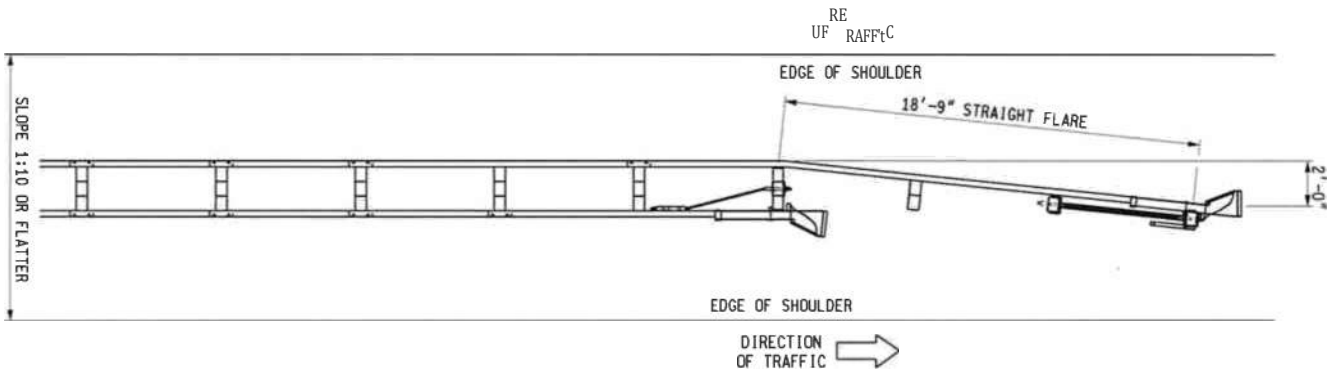
GUARDRAIL APPROACH TERMINAL, TYPE 3B

"FLEAT — MT"

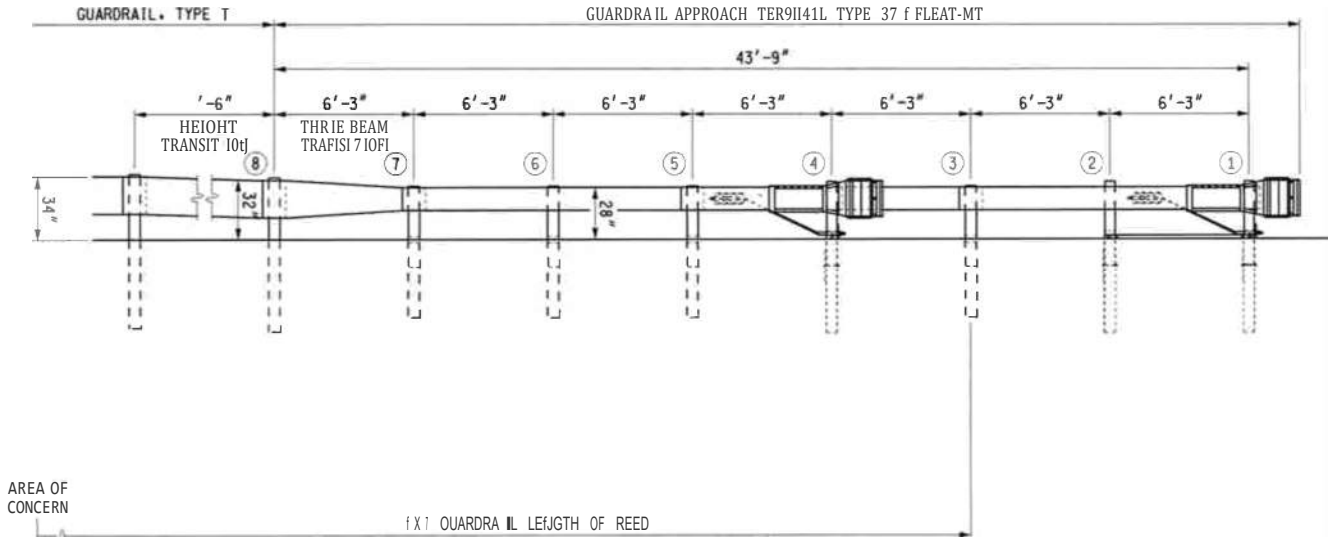
F.H.W.A. APPROVAL

3-15-2016
PLAN DATE

8



PLAN VIEW



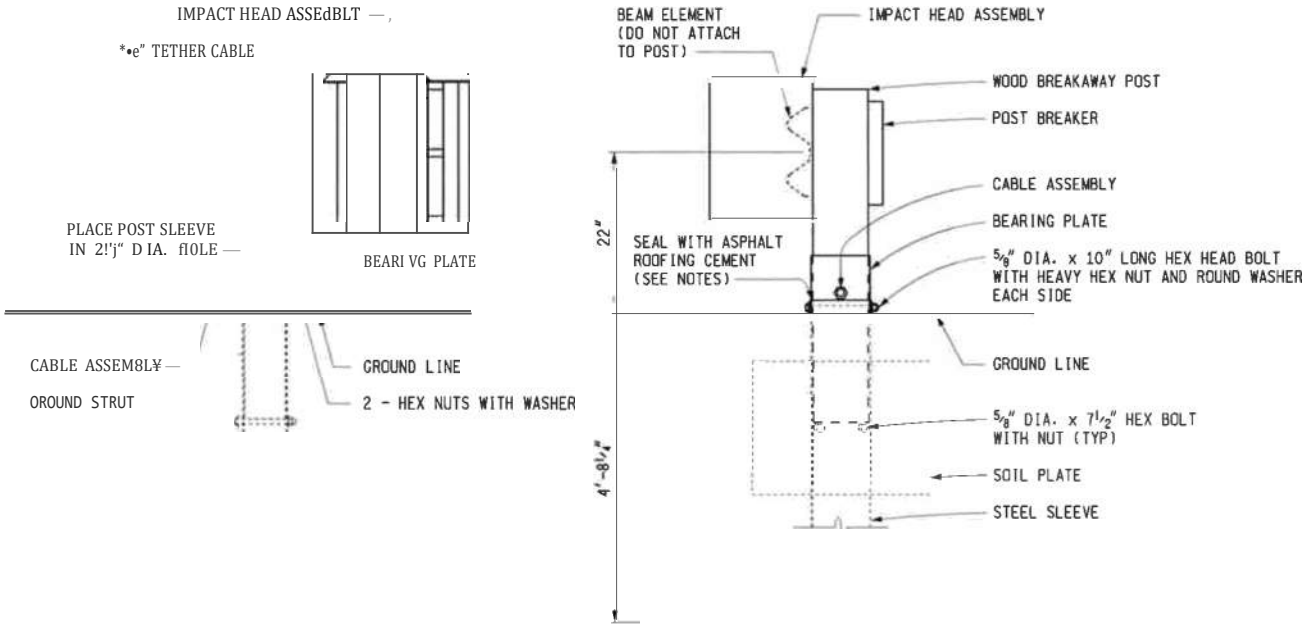
ELEVATION

GUARDRA IL A PPROACH T ER MINAL, T Y PE 3T

" FLEAT — MT "

F.H.W.A. APPROVAL

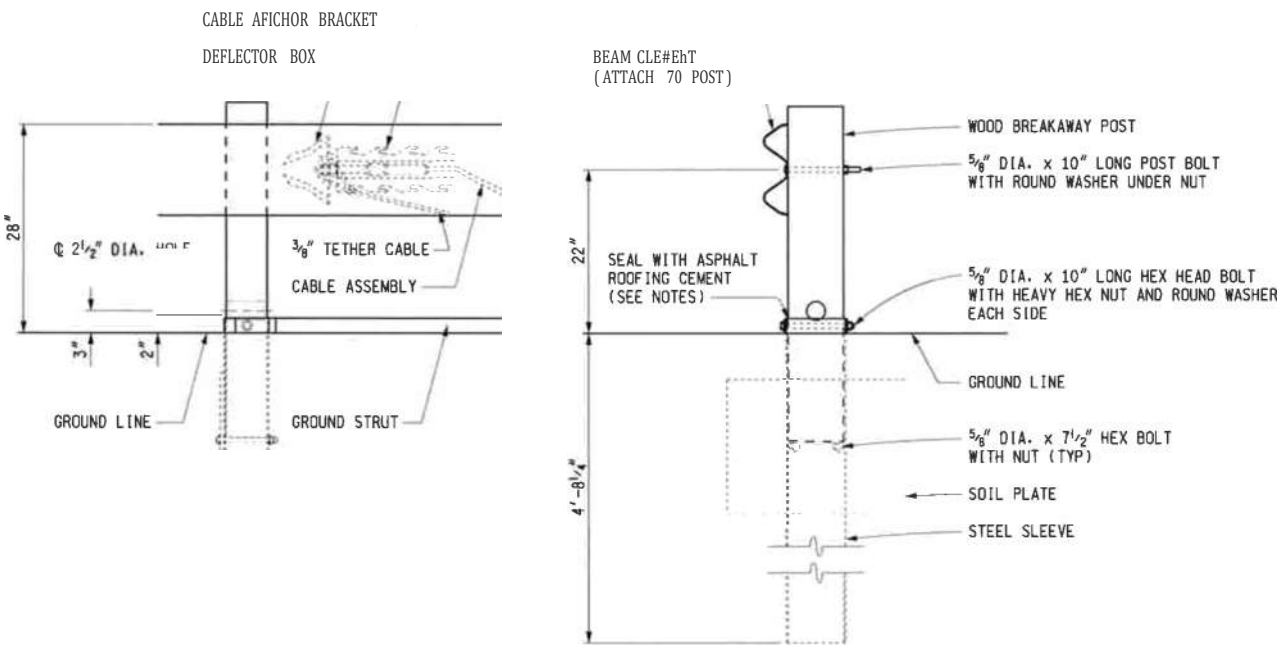
3-15-2016
PLAN DATE



ELEVATtON "SIDE

POST 1 DETAIL

(FLEAT--NT



ELEVAT10N SIDE

POST 2 DETA IL

I FLEAT-MT I

MICHIGAN DEPARTMENT OF TRANSPORTATION

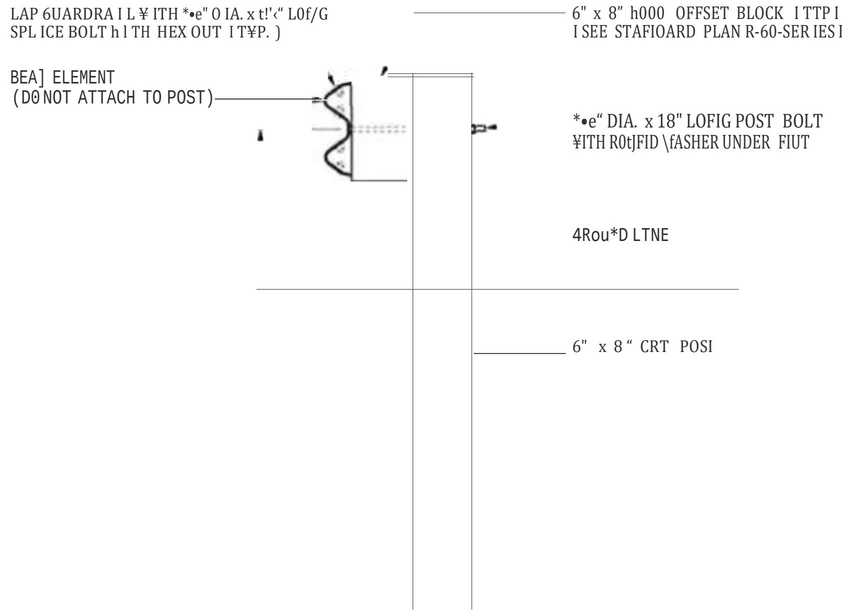
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERhlNAL, TYPE 3B & 3T

F.H.D.A. APPROVAL

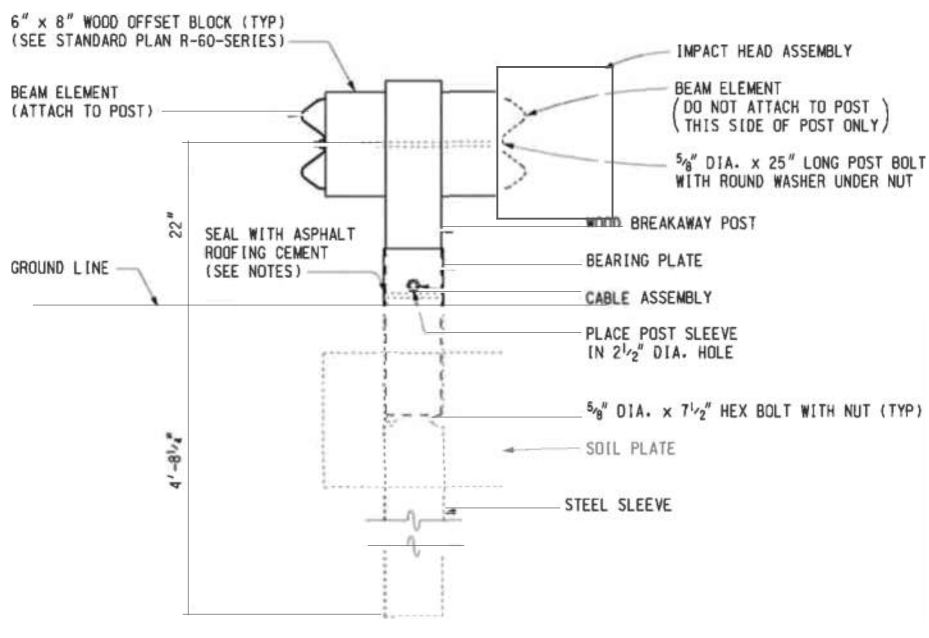
3-t5-2016
PLAN DATE

R-63—C



POST 3 DETAIL

I FLEAT-MT 7



POST 4 DETAIL

(FLEAT-¥T)

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

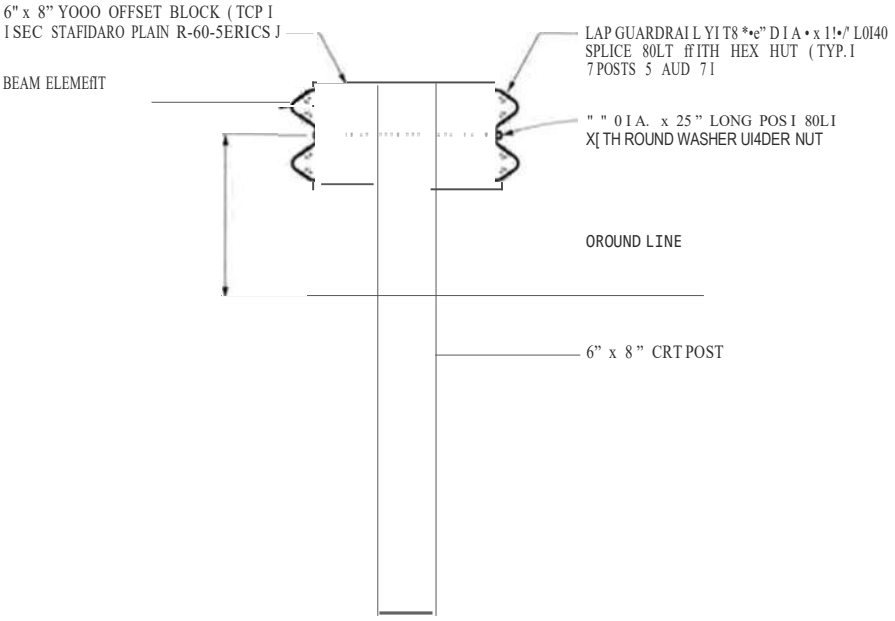
GUARDRAIL APPROACH TERMINAL, TYPE 3B 8‹ 3T

F.II.¥.4. 4I°f'fl0¥4L

3-15-2016
PLAN DATE

R-63-C

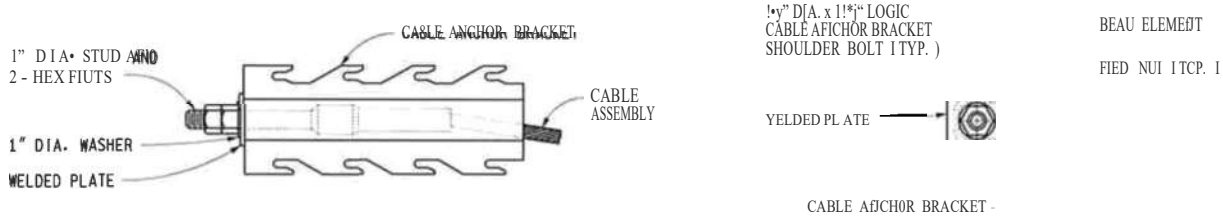
SHEET 12 OF 16



POST 5, 6 AND 7 DETA IL

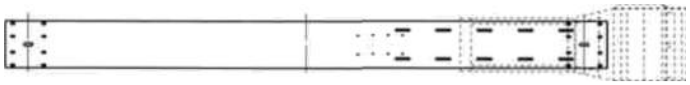
I FLEAT-MT

NOTE: POST 8 15 A STANDARD L [FIE POST



CABLE ANCHOR BRACKET DETAIL

I FLEAT-dT 7



W —BEAM GUARDRAIL END SECTION

I USE 8 ITH I IMPACT HEAD ASSEMBLY 7

NOTE: ALL fFLEAT-@T) [TEHS ILLUSTRATED WITHOUT DTNENS(ONS SMAtL BE ACC0RDT*c To THE ***uF*cTuR(R'O sPEC(FlCAT[0N].

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

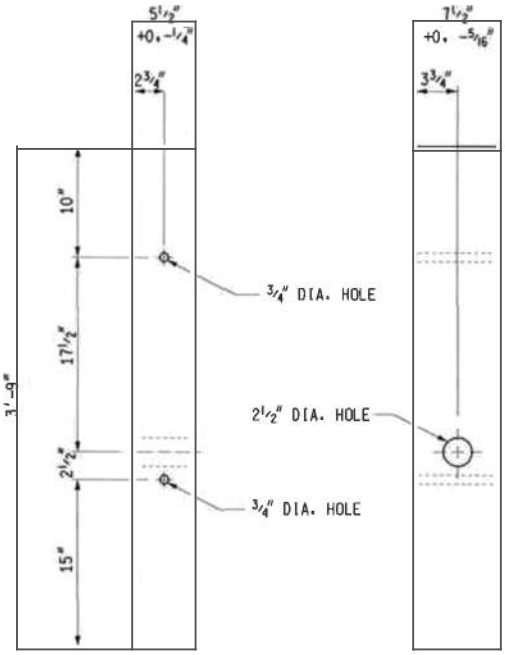
GUARDRAIL APPROACH TERMINAL, TYPE 3B $ 3T

F.fl. B.A.]PPR0YAi

3-t5-2016
PLAN DATE

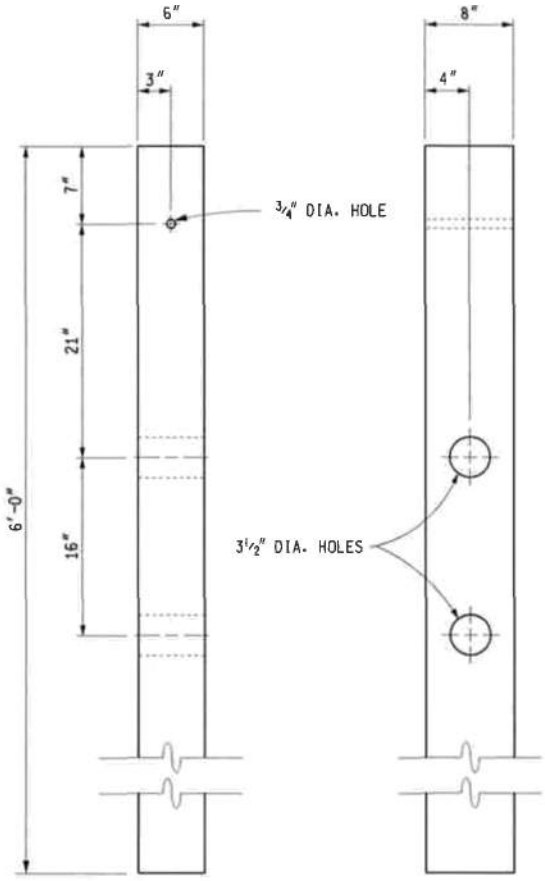
R -63-C

SHEET
13 OF 16



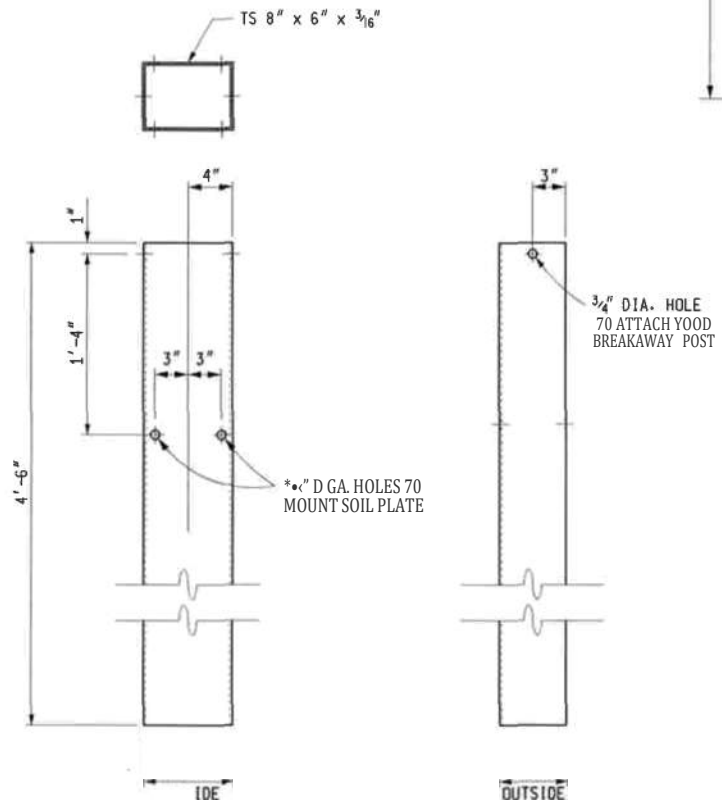
WOOD BREAKAWAY POST

I FLEAT-NT POST 1. 2. & 4)



CRT POST

(FLEAT-MT POST 3. 5. 6. A 7)



STEEL SLEEVE

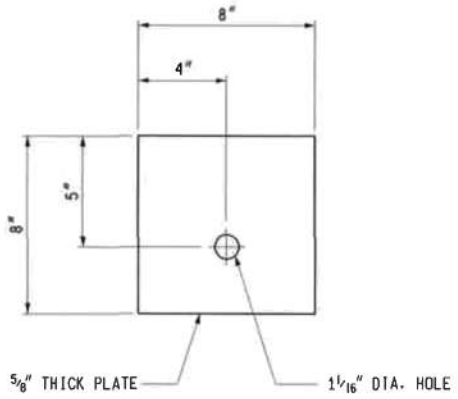
I FLEAT-MT)

MICHIGAN DEPARTMENT OF TRANSPORTATION

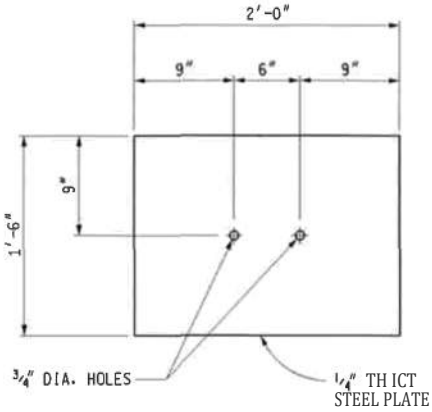
BUPEAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL, TYPE 3B 8‹ 3T

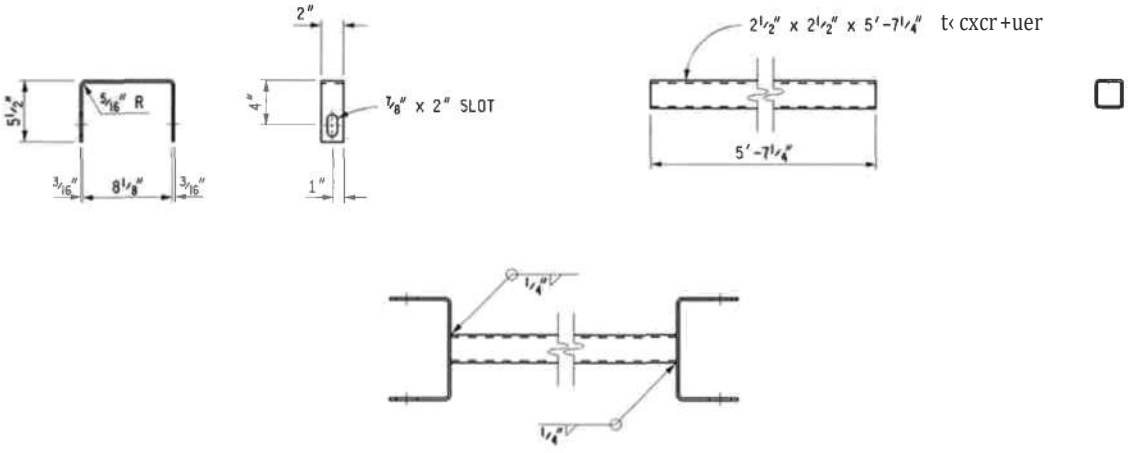
F.H.W.A. APPROVAL	3-15-2016 RUN DATE	R-63-C	SHEET ▮ OF 16



BEARING PLATE
\ FLEAT-MT



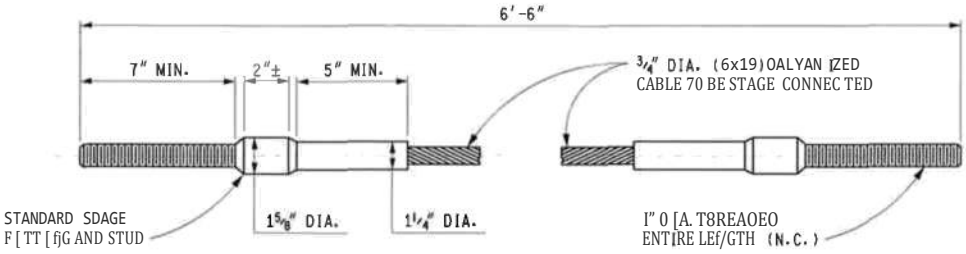
SOIL PLATE
‹ FLEAT-MT ›



A SSEbi BLY DETA IL

STRUT DETAILS

I FLEAT-LIT ›



CABLE ASSEII BLY
I FLEAT-MT I

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL, TYPE 3B 8 3T

F.8.X.4. 4PPR0Y4L	3-15-2016 PL4X 0AIE	R-63—C	SHEET 15 0F 16

NOTES:

ALL POSTS. OFFSET BL0CKS• BEAM ELEMEI4TS. AND HARDWARE I II4CLUDIFIG 80LTS. XUT5• AHD flASHERS J SHALL COHFORIJ 70 THE CURRENT STAI4DAR0 SPEC[FICAT[0I4S AUD 70 THE CURRENT STAI4DARD PLAN R-60-SER IES. tfHERE APPL(CABLE. EXCEPT AS SPECIFIED ON THU STANDARD.

ALL I:10 SL0P£S SIJALL BE 6RA0E0 70 £LASS A SLOPE T0LERAftC£ S.

FOR DCTA ILS DF GUARDRAIL PLACEMEXI. SEE STAfl0ARD PLAfl R-SG-SER[ES• AND R-59-SER IES•

AFTER THE C1BLE ASSEMBLY HAS BEEN 7 IGA TEXE0• A SECOND OUT SHALL BE IXISTALLED 50 T8AT THE CABLE YILL NOT LOOSES.

HÀR0¥ARE BET¥EEX PORT I ANO POST 6 IOPT IOU \ I ARC PROPR [EIARY ITEMS 0F TUE C-A-7 àfi0 JUST BE PURCi‹xsro Fnou xx xu»‹oR[Zoo o iSTRI BUTER.

HARDWARE BETWEEN P0[T 1 AND POST 7 (ORTION 2) ARE PROPRIETARY T TENS OF THE FLEAT-HT AND NU9T BE PURCHASED FROM AN AUTHORIZED DTSTRT BUTER.

GUARORA IL REFLECTORS ARE RIOT TO BE USEO 0d TFIE "C-A-7" OR "FLEAT-BT". PLACE RELECTORS BEGINS TNC ON STANDARD RUN OF GUARDRAIL.

USE REFLECT IYE SHEETIfI0 ACCORD IfI0 TO TUE F0LL0\I IHG TRAFF [C COfIOIT IOI4S: (I4OTE: AL TERHATE 3" BLACK AND 3" YELL0¥ STRIPES ON A 45° AI4GLE

TRAFF IC PASS IfJG 08 THE LEFT S(DE

TRAFF IC PASS IBIG 0d 80TH SIOES

TRAFFIC PASSIFIG 0d THE RIGHT SIDE

0fI THE "C-A-7". THE CURYED PORT IOk OF THE fJ0SE FAC IFIG TR4FF IC ShALL BE t0f¥'LETELY COYEREO XI TO 0 I60 [XTEfIS ITY ADXESIYE REFLECT IYE SHEET UG.

OU TUE "FLEAT-BT "• TUE PORT IOH OF ICE IMPACT IJEID ASSEMBL TES FACING TRAFFIC SHALL BE COMPLETELY COVERED ¥TTfI IJ IGH IRTEdSITT AD8ES IYE REFLECT IYE SHEET[XG.

ASPHALT R00FIfI¢ CEMEfIT SHALL BE USED 70 SEAL THE PERIMETER AREA BEThEEh THE STEEL SLEEYE ISOIL TOBE I AfID THE h00D BREAKAWAY POST.

MICHIGAN DEPARTMENT OF TRANSPORTATION

BURE/\U OF DEVELOPMENT STANDARD PLAN FOR

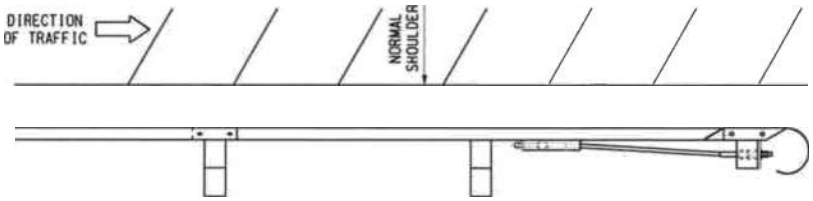
GUARDRAIL APPR0ACH TERMINAL, TYPE 3B & 3T

r.I‹. ¥. \. PPRvt L

3-15-2016
L x »xTE

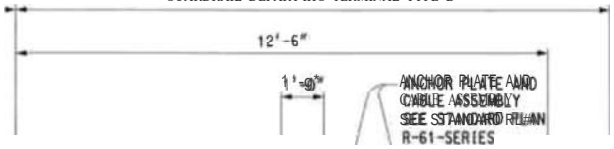
R-63 - C

SHEET
16 OF 16



GUARORA IL • TYPE B

GUARDRAIL DEPART IHG TERMINAL TYPE B



SPL TCE I TTP. I

GROUHD L THE

LINE POST FaR cuARDRA IL. TYPE B

$ 27, D[A. HOLE—

'- GOOD POSTS SHALL BE USEO OH LAST **T10** POSTS 16“ x 8“ x 7’-0“›

NOTE: OMIT OFFSET BLOCK Oft LAST POST

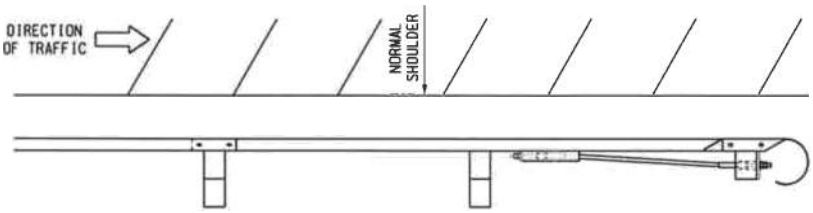
TERMINAL END OHOE, TYPE B

HOT—0IP Z I UC COATED NAILS I SEE HOTES I

BEARTNC PLATE

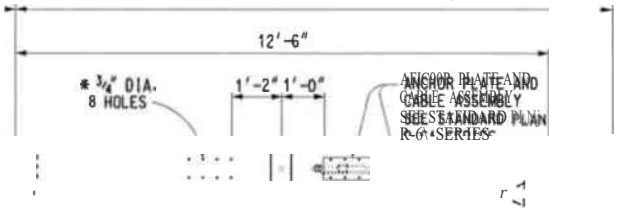
PLACE POST SLEEVE TN HOLE

GUARDRAIL DEPARTING TERMINAL TYPE B



6UARDRA IL • TYPE 7

GUARORA IL DEPART II4G TERMIfIAL TTPE 7



CROUHD L IHE

LINE POST FOR GUARDRAIL TYPE 7

$ 2!•j“ DIA. HOLE

- YOOD POSTS SHALL BE USED OSI LAST TWO POSTS _____ 16” x 8” x ?‘ -0“ › —

FIOTE: OMIT DFFSET BLOCK OSI LAST POST

TtRN[NAL ENO SMOE. TTPE T

HOT-0 [P Z IHt COATED HA ILS I SEE NOTES I

BEAR UG PLATE

PLACE POST SLEEVE [N HOLE

c AH OPTIONAL SET OF AFICHOR PLATE HOLES X ILL 8E ALLOWED 50 THAT THE 8EAM ELEFEFIT MAY BE USED FOR E I TIER LEFT OR RIGHT EFIO INGS. AHCHOR PLATE SB ALL BE PLACED 0H UPPER CDRRUGAT IOT OHLY.

GUARDRAIL DEPARTING TERIfINAL TYPE T

MDOT Michigan Department of Transportation

PREPARED

OES!GN DIV!ST ON

gggg gy: B.L.T.

CHECKED BY: W.K.P.

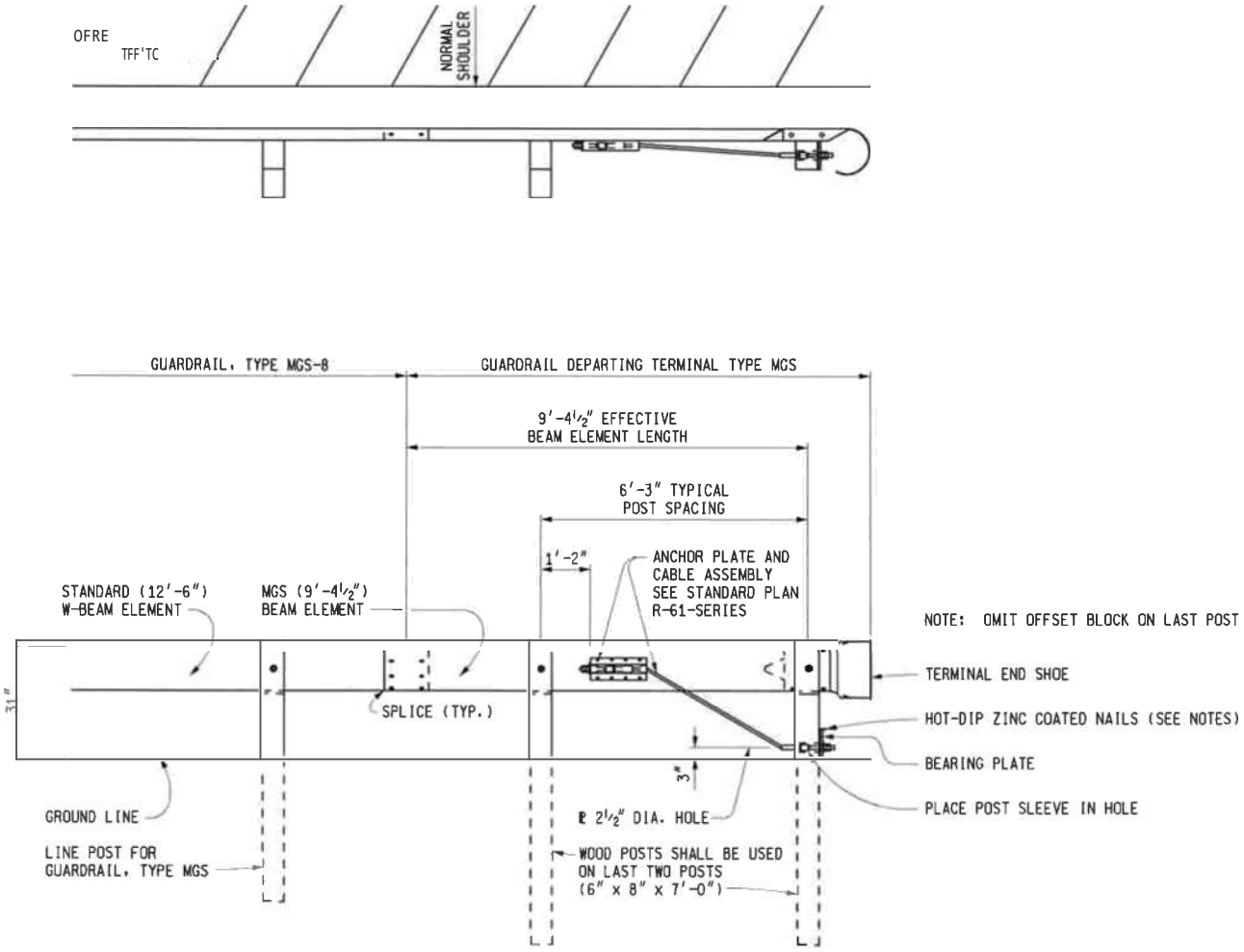
DEPARTMENT DIRECTOR
Kirk T Steudle

WPfl0YE0 81: _____
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL DEPARTING TERMINAL TYPES B, T, $ MGS

F. IJ. X.X. 4PPR0YXL	4-27-20t6 PUB D4IE	R-66-E	SHEtT 1 OF



GUARDRAIL DEPARTING TERMINAL TYPE MGS

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF OEVELOPMENT STANDARD PLAN FOR

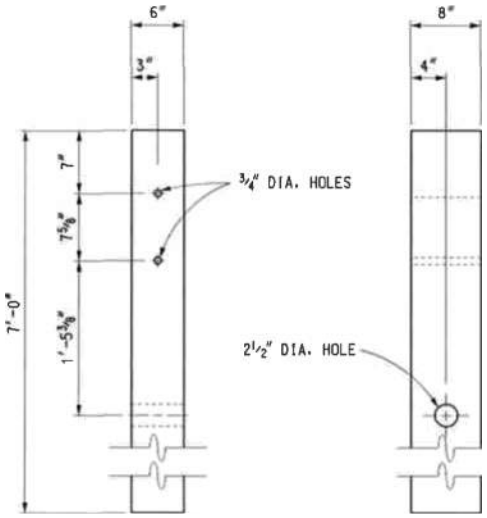
GUARDRAIL DEPARTING TERMINAL TYPES B, T, $ MGS

F.h.¥.A. 4PPR0YXL

4-27-2016
PLAN DATE

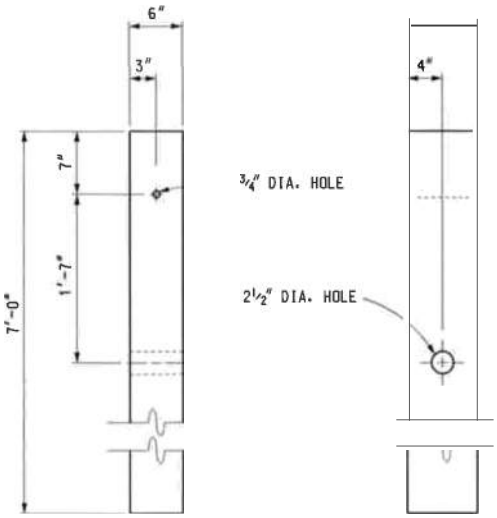
R-66-E

SHERT
2 OF 4



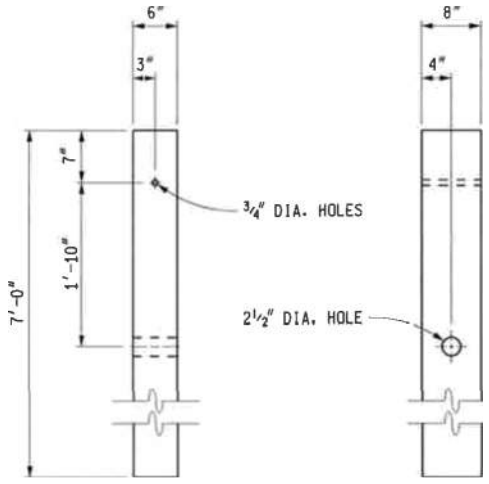
WOOD POST DETAIL

I FOR LAST POST• GUARDRAIL DEPART IHG TERMINAL TYPE 7 7



WOOD POST DETAIL

\ FOR LAST POST. GIJARDRA IL DEPART IHG TERMIfiAL TYPE B I



W OOD PO ST DET A I L

f FOR LAST POST• 6UAR0RA IL OEPART ING TERMINAL TTPE tJGS 7

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVE LOPMENT STANDARD PLAN FOR

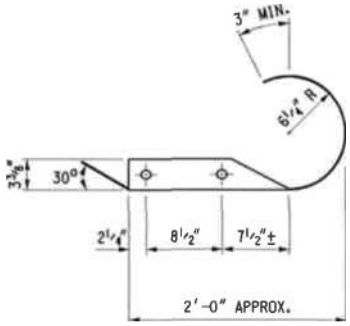
GUARDRAIL DEPARTING TERMINAL TYPES B, T, $ MGS

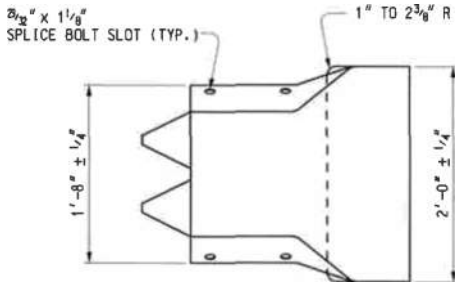
F. 8.¥. L 4PP90Y£L

4 -27-2016
PL+0 DATE

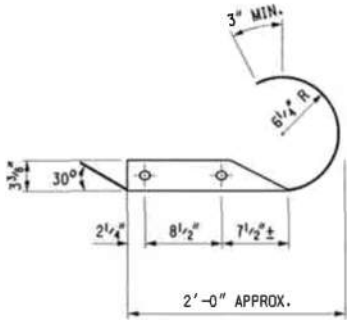
R -66 -E

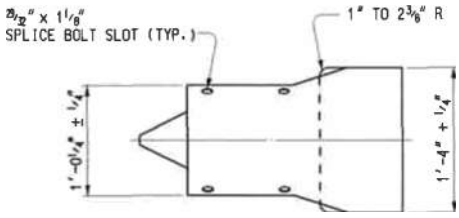
SHEET
3 OF 4



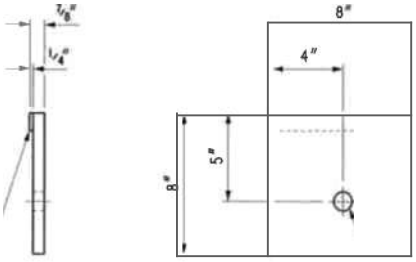


T ERMINAL END SHOE, TYPE T





TERMINAL END SHOE,
T YPE B OR T Y PE MGS



1/4" THICK x 1" x 8" STEEL PLATE
TACK WELDED TO 5/8" THICK STEEL PLATE

1 ! /y" 0I A• ft0LE

BEARING PLATE

POST SLEEYE

h0TES:

ALL POSTS • OFFSET BLOCKS • BEAM ELEME X TS AHD HAROflARE I INCLUD I ft6 B0LTs, 4uTs. **D WASHERS) SHALL CONFORM TO THE CURRENT STANDARD SPECl fT C*Tlo4s AND TO THE cuRRENT STANDARD PLAN R-60-SERIES. WHERE APPLICABLE. EMCEPT AS SPECTF TED ON THIS STANDARD.

ALL 1:10 SLOPES SHALL BE ORADED TO CLASS A SLOPE TOLERANCES.

FOR DETA I LS OF GUARORA I L PL ACEI€ NT • SEE STAflDAR0 PLAN R—59-SERIES •

AFTER TUE CABLE ASSEMBLY II AS BEEfl 7 Ufl TEfJED. A $EC0fl0 OUT SHALL BE IINSTALL ED OIL EACfl EfID OF TUE CABLE SO THAT TfIE CABLE 8 ILL fJ0T L00SEfj •

T¥0 H0T--0 IP ZINC c0ATE0 I4AILS SHALL BE DR IYEf/ TNTO THE tf00D POST AT THE TOP OF THE BE4R IN0 PLATE 70 KEEP THE 8EARIH0 PLATE FROM R0TAT I8G.

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

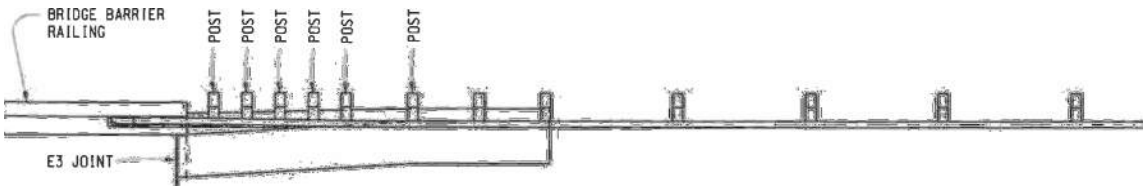
GUARDRAIL DEPARTING TERMIN AL TYPES B, T, 8‹ MGS

F.lt• ¥• L 1PP90¥£L

4-27-2016
PL£k 04TE

R-66-E

SHEET
4 0F 4



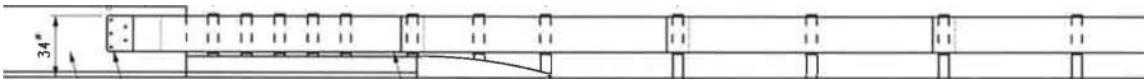
PLAN V IET

GUxfl0RA IL AfiCHORAGE BRIOGE. OETAI L 7-1 I SEE NOTES. SHEET 7 OF 7

OIJARDRA PL • TYPE 7
6'-3" TYP ICAL POST SPACUG
GIJARDRA IL • TYPE MGS-8 +

10'-T'•*
1'-6¾" 3'-l'•j POST SPACUG 6'-3"
_3'--6"_t5 POST SPACIBIG POST SPAC IxG
\4 SPACES / "" 13 SPACES I

c SEE STANDARD PLAIN R-60—SER IES FOR POSI SPAC I fj6 ACID GUARDRAIL LANOUT 70 TRAITS I IIOH FROM GIJARDRA IL TYPE MGS—8 70 GIJARDRA IL AfJCfJORAGE BR IOGE DETAILS 7-I • I-4 & 7-6



TIER IE BEAM TERMINAL C0X8ECTOR TER IE BEAM EXPAFIS I OU SECT IOT

BR I 06E BARR I ER RA I L IN6

34 " TYPE 7
\ SEE STAFIDARD PLAFI R-60-SER IES FOR TYPE M0S-8 ¢UARDRA IL HE IGHT IFIF ORMAT IOL 7

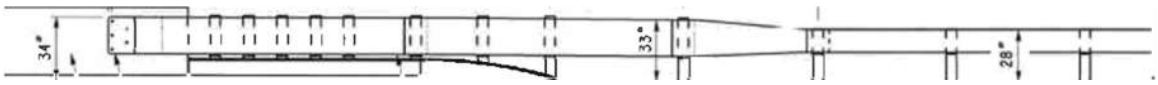
ELEVAT ION VIEW
170 BE USED WITH GUARDIA IL TYPE T & IYPE N6S-8 J

GUARORA IL ANCHORAGE • BR IOGE • OETA I L 7-2 I SEE NOTES. SfcEET I OF / I

cuxRoRA IL. TTFE e
6'-j" TYP ICAL POST SPAC CNG

THRIE BEAM "
TRANSITIOSI

10'-7½"
3'-6" 15" POST SPACING 3'-1½" POST SPACING 6'-3" POST SPACING
14 SPACES 1 13 SPACE$ I 12 SPACES 7



TIJR I E BEAM TERMINAL C0X#ECTOR TfiR I E BE AU EXPAf/S ION SECT I0fl

BR I OGE B1RR IER RAI LIf/G

ELEVA T ION VIEW
170 BE USEO ¥1 TU GUARDRAIL. TYPE B I

DETAILS FOR CONNECTING GUARDRAIL TO BRIDGE BARRIER RAILINGS, TYPE 4, 2-TUBE, 4-TUBE, AESTHET IC PARAPET TUBE, OR 3 TUBE WITH PICKETS

I XITHOIJT £XPAhS I OU AT BACIt ¥ALL)

MDOT Michigan Department of Transportation

PREPARED

DES I 6f/ D I ¥ IS I 0fl

DRAWN BY:

CHECKED BY:

"+*°*+ *!***++*
Kirk 7 Sleudle

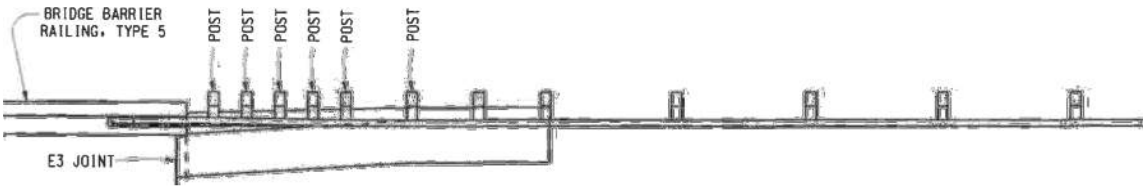
APPROVED BY:
DIRECTOR, BUREAU OF FIELD SERVICES

4f£E0¥E0 BT:
D I fi£tl08' 808£lfl OF 0£Y£L0PI£til

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL ANCHORAGE, BRIDGE, DETA ILS

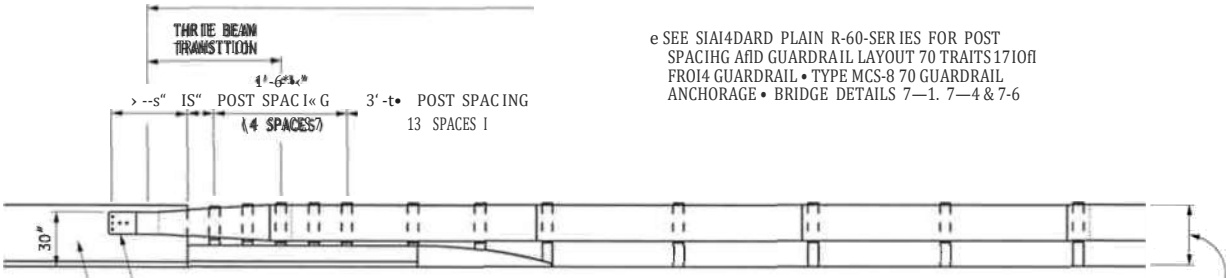
F.8•¥•A• 4f'PRO¥XL	8-9-2017 PLAN DATE	R-6'7—G	SHEET t OF



PLAN VIEW

gOARDRAIL AFICHORA8E, BRIOGE. DET A PL T-4
I SEE NOTES. SHEET 7 OF 7)

¢UAR0£IA IL. TTPE 7
6 —3" TYP ICAL POST SPAC IHG
¢UAR0RA IL • TYPE tJ6S-B ¥



e SEE SIAI4DARD PLAIN R-60-SER IES FOR POST SPACIHG AfID GUARDRAIL LAYOUT 70 TRAITS171OfI FROI4 GUARDRAIL • TYPE MCS-8 70 GUARDRAIL ANCHORAGE • BRIDGE DETAILS 7—1. 7—4 & 7-6

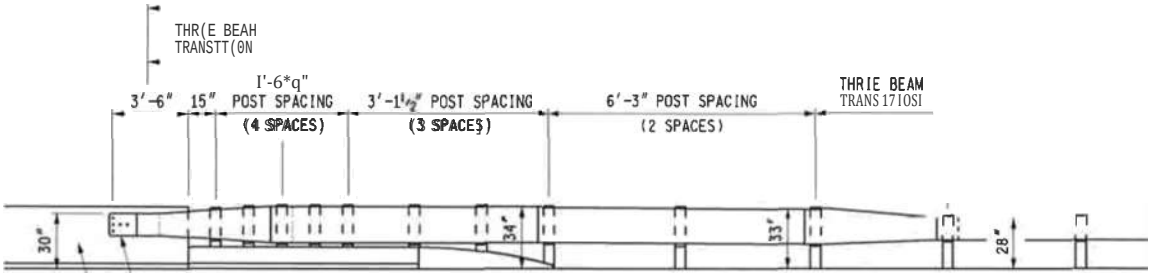
BR ID6E BARRIER RA IL UG. TTPE 5

34" TYPE 7
(SEE STANDARD PLAIN R-60-SER IES FOR TTPE Miss-« cuxRoRAIL HE ac«i
T XFaRMAT IOHI

ELE'\/ AT lON Y lER
f 70 BE USEO YITH GUARDAI IL TTPE 7 & TYPE N6S-8 7

GUARDRAIL AFICHORAGE • BR IDGE • DETAIL 7-3 (SEE FIOTES • SHEET 7 OF 7 I

GUAR0RA1L. TYPE B
G'-3' TYPTC*L POST SPAC1MG



SPEC[AL EHD SHOE

BR IDGE 8ARR IER RA[LIFIG. TYPE 5

ELEVA T ION VIEW
I TO BE USEO ¥1 TAI GUARDRA IL. TTPE B\

DETAILS FOR CONNECTING GUARDRAIL TO BRIDGE BARRIER RAILINGS, TYPE 5

I ¥1 THOIJT EXP AFIS IOT AT BA K f/1LL7

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

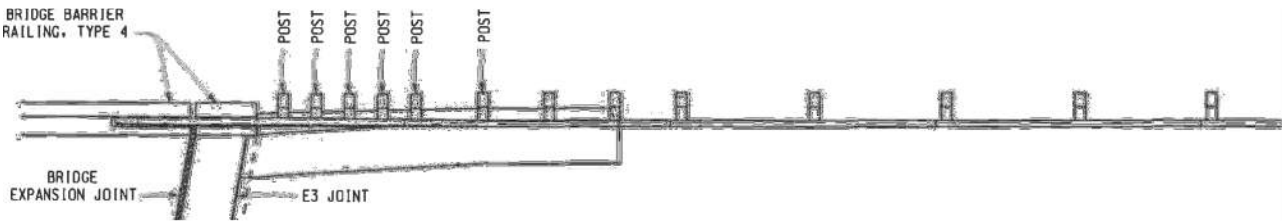
GUARDRAIL ANCHORAGE, BRIDGE, DETAILS

.IJ. ¥. A. APPRgY/\L

8-9-201T
PIN0*II

R-67—G

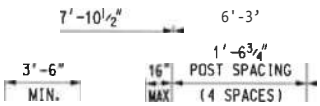
SHEET
2 OF 7



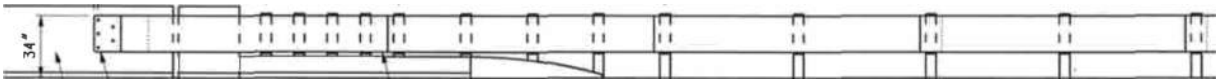
PLAN **VIEW**

GUARORA IL ANCHORAGE BRI OGE. DETA IL 7-1 ISEE NOTES, SHEET 7 OF 7 I

GUARDRAIL • TYPE 7
6'-3" T7P ICAL POST SPAC lH¢
6UAR0RA L. TYPE M65-B +



c SEE STANDARD PLAN R-60-SER 1ES FOR POST SPAC IIJG ACID GUÀRDRA I L LAYOUT 70 TR/\FIS IT I0# FROM GUÀRDRA IL • TYPE M6S-8 70 GUÀRDRÀ IL ANCHORAGE. BR IOGE DETAILS 7-1. 7-4 & 7-6



TER IE BEAM TERMINAL COFIHECTOR THRIE 8EAM EXPANS IOT SECTION

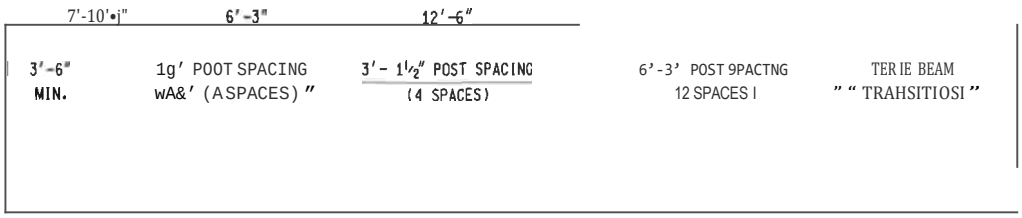
BRI06E BARRIER RAI L IBIG. TYPE 4

34" TYPE T
\ SEE STéHDARD PLAN R—60-SERIES
FoR nor ucs—s sUAR0RA IL rE icft T
INFORHATION7

ELEVAT ION V IEW
170 BE IJSEO YY TH G8ARDRA IL • TYPE 7 & TYPE ƀICS-g]

OUARDRA TL ANCH0RAfiE. BR[D0E• DETATL T-5 (SEE N0TES• SHEET 7 OF 7)

GuARDRA IL. TYPE B
"6'-I" TYPICAL POST SPACIhG



TER IE BEAM TERMINAL CONNECTOR TER IE BEAR EXPAFIS IOT SECT IOH

BR I DGE BARR I ER RA i L ING . TYPE 4

ELEVA TION V IEIY
170 gE tJSE0 YT TI-I GUARORA IL TTPE B \

DETAILS FOR CONNECTING GUARDRA IL TO
BRIDGE BARRIER RAILINGS, TYPE 4, 2-TUBE, 4 -TUBE,
AESTHETIC PARAPET TUBE. OR 3 TUBE WITH PICKETS

I ¥[TH EXPAftS ION AT BACKBALL

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL ANCHORAGE, BRIDGE, DETAILS

F.X. ¥. 4. 4PPR0Y1L

8-9—2017
PLAN DATE

R-67—G

HOTE: FILLER IYALL END BLOCK MAY BE OMITTED MJEn F I RTT AFICHORAGE POST CALI BE INSTALLED FULL DEPTH I'—3" FROM BRIDBE P IER.

APPROACH POST SPACING REQUIREMENTS				
0ISTAfiCE FROM AXCXOR e0LTS 70 FIRST POST	7'-11¾"	9'-6½"	11'-1¼"	12'-8"
hUH8ER OF I'-6 t POST SPACINGS				
hUB8ER OF 3 -t / POST SPAEIh0S	4	3	3	4

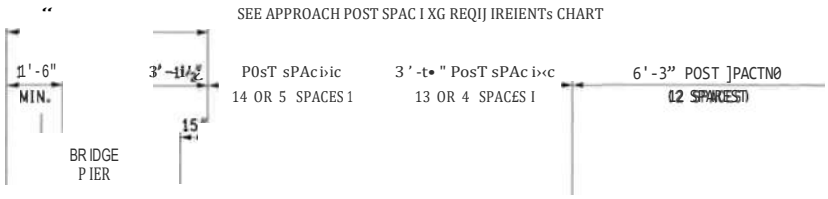
II4STALL BOLTS THROUGH F ILLER CALL 7 SEE CHART FOR BOLT RE05 IRELEljT5 FOR COXxECTI /JG GUARDRAIL 70 BR IOGE RA IL IHGS AND F ILLER \fALLS. SHEET 5 OF 7)

¥ SEE STANDARD PLAIN R-60-SCR IES FOR POST SPAC I BIG ACID 6UARDRA IL LAYOUT 70 TRANS 17 IOH FRON GUARDRAIL • TYPE INGS-B 70 GUARORA IL ANCHORAGE • BRIDGE DETAILS 7-1. 7-4 & 7-6

PLAN V1EW

GUARIRÀ IL AkCHORAGE • BR I OGE • DETA IL 7-6 f SEE XOTES • 5ftEET 7 OF 71

OUARDRAK. T7PE T
6'-3" TYPTCAL POST 9PAC TNc
GIJARORA IL • TYPE MGM-8 +



THRIE BEAM / TERM I VIAL CO8HECTOR

F I RSS POST

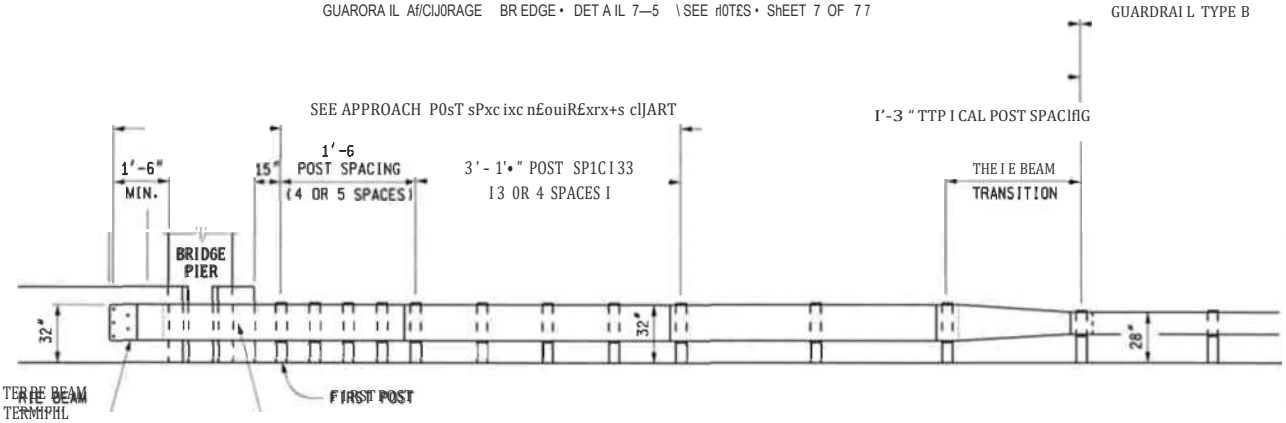
Neo ••‹" D I A. x i‹" POST BOLTS ¥ ITU POST BOLT 4A5XERS OF FR0ftT Af/0 ROUNO ¥ASfIERS ON 8A£K I BOLIS ARE RIOT REQIJ I RED FOR F ILLER ¥ALL Ef/0 BLOCKS LESS IlJAft 3'-0" LONG I

34" TYPE 7
f SEE STAdOARD PLAN R-60-SER I Es FOR TYPE klGS-8 GUARDRA I L HE I CUT IfJF0RMAT l0fJ 7

ELEVA T ION VIEW
110 8E US£0 8 I IH 0bAR0R é I L IIPE 1 $ IIPE I4C›S-0 I

GUARORA IL Af/ClJ0RAGE BR EDGE • DET A IL 7—5 \SEE r10T£S • ShEET 7 OF 77

GUARDRAI L TYPE B



TERBE BEAM TERMIPHL COFIFIECTOR

ghEh F TLLER CALL END BLOCK IS 3'-0" 0R LOFIGER • BOLT BEAM ELEMEFIT AS SHOXFI ABOVE.

ELEVA T ION YIEW
‹To BE USED ¥iTx cu1RDRAIL. TYPE e›

DETAILS FOR CONNECTING GUARDRAIL TO FILLER WALLS

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL ANCHORAGE, BRIDGE, DETA ILS

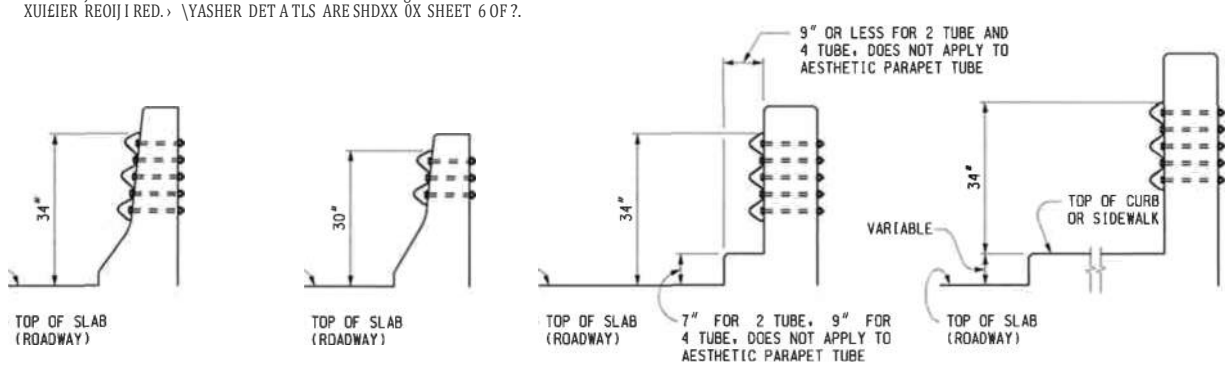
F.II.¥.A. 4FPft0¥éL

8-9-2017
PLAN DATE

R-67-G

SHEET 4 OF 7

H[GH STRENGTH *•]" OIA. HEX READ BOLT AND FIUTS SHALL BE USED TO CO14I4ECT GUARDRATL TO BRIDGE RAIL INGS WITH ROdHO If ASHERS 0X FRONT ACID SOIJARE XAS9ERS OH BACK. I SEE CHART BEL0g FOR LEFIGTHS AnD XUI£IER REOIJ I RED. › \YASHER DET A TLS ARE SHDXX 0X SHEET 6 OF ?.



BRIDGE BARRIER RA ILING TY PE 4

BRIDGE BARRIER RA ILING TYPE 5

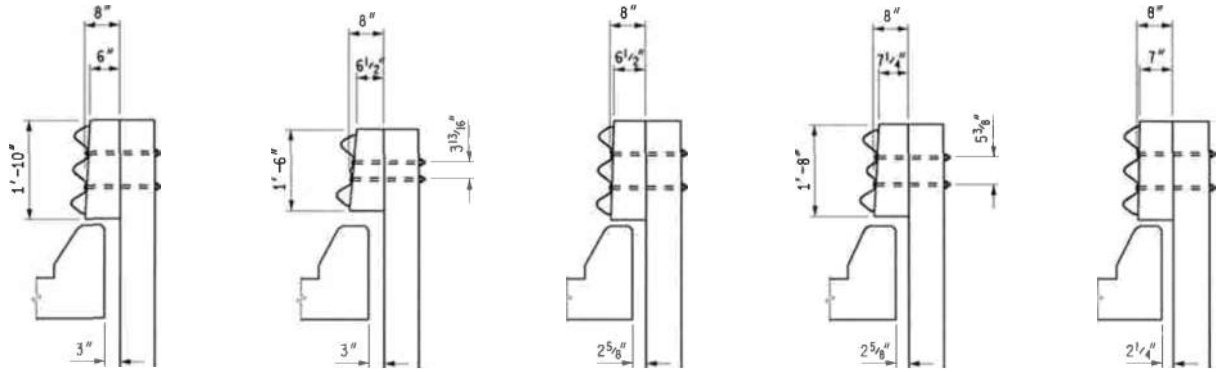
BRIDGE RA ILING, 2 T UBE, 4 T UBE, Oil A ESTHET IC PARA PET TUBE

(¥ lTlJüdT S lüE\fALK OR BRUSfJ BLOCK7

BRIDGE RA ILING , 4 T UBE OR A ESTHETIC PARA PET TUBE

7X ITR 5IDEXALK

SECTIONS AT BRIDGE RAILINGS



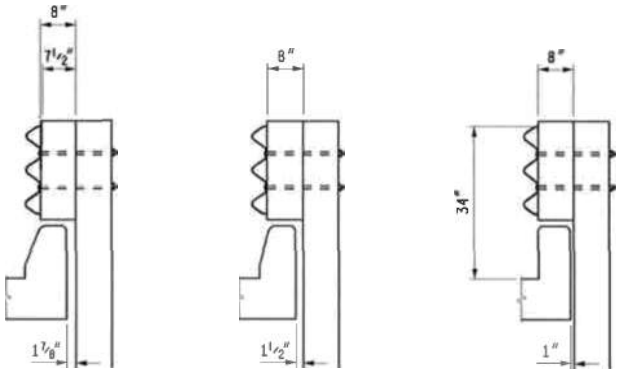
POST 1 FOR BRIDGE BARRIER RA ILING, T Y PE 4

POST 1 FOR BRIDGE BARRIER RAíL1NG, TYPE 5

POST 2 FOR BRI DGE BARRIER RAtLING, TYPE 4

POST 2 FOR BRIDGE BARRIER RA ILING, TYPE 5

POST 3



POST 4

POST 5

POST 6

BOLT REQU IREMENTS FOR CONNECTING GUARDRA IL TO BRIDGE RAILINGS t‹ FILLER 9ALLS

BRIOGE RAILI MIG	BOLT LEfIGIfl	MIFIIIAJM THREAD LEFI6TH	NUMBER REOUIRED
TYPE 4	12'•z"	I"	5
TYPE 5	It!•j"	4"	4
2 TUBE	¥ALL THICENESS + 2"	2"	5
4 TUBE	YALL THICKfJESS + 2"	2"	5
AESTHETIC PARAPET	CALL THICKNESS + 2"	2"	5
a+ FILLCR ¥ALL	¥ALL THIClNCSS + I"	I"	5

SHORTER BOLT LENGTHS NAY BE USED PR0V)DED TME BOLT EXTENDS *•,' BE¥0ND THE NUT WHEN T TOHTENEO.

e+ THE USE OF *'y" D IA. ADHESIVE ANCHORED BOLTS EMBEDDED 8" TO ATTACH GUARDRA IL 70 F ILLER ¥ALLS BILL BE ALLOWED. INSTEAD OF BOLT ING THR0IJc9 THE FILLER CALL • ID THE FOLLOW lkG LOCAT IOFIS:

t. AT OR flEAR IHE J ü fftT L I UE ¥HEfJ A F ILLER ¥ALL IS A ü IFFERENT TU ICKf/ESS THAN TIJE F ILLER CALL EXTEXS10f/.

2. Id EX[STING F ILLER BALLS TH ICKER THAT 1'-6".

3. 8HEFI COND IT IONS PROIJIB IT THE USE OF BOLTS.

GUARDRAIL POST SECTIONS FOR GUARDRAIL ANCHORA GE, BRIDGE

NOTE: AOIJES I VE AfiCfJ0RS SU ALL 8E SELECTED FROM TUE OIJAL OF IED PR00dCTS L I ST OF TUE MATER I ALS SAMPL I UG GU [0E•

NOTE:
POST AHO 8L0CK SECTIONS FOR THE 2 TUBE • 4 TUBE • Afi10 AESTHET FC PARAPET TUBE BR I DGE RAIL INGS SHALL BE THE 5AF£ AS THAT SH0\‹H Ofj POST 6. POST SPAC THG SHALL BE AS SHO4IJ IN ELEVAT IOFI Y IC¥S.

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

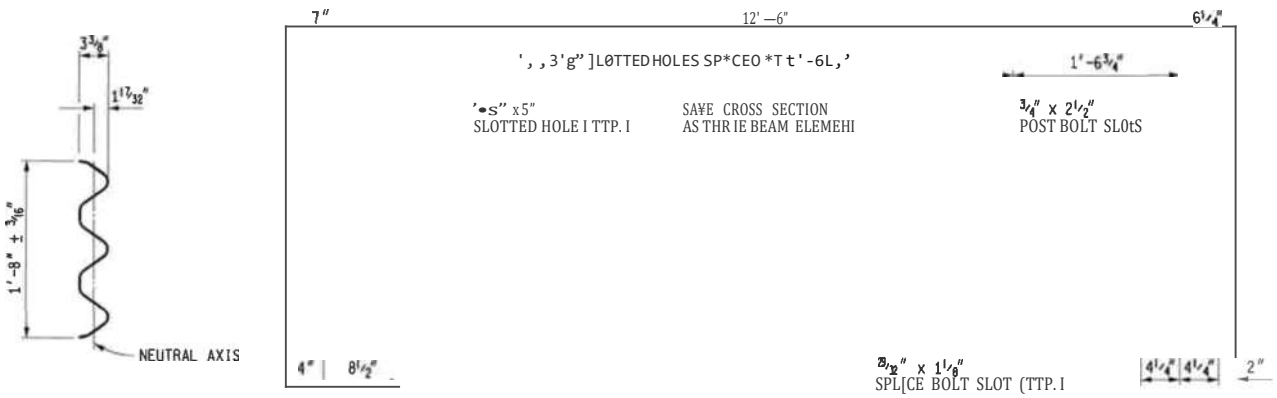
GUARDRAIL ANCHORAGE, BRIDGE, DETAILS

F.H.W.A. APPROVAL

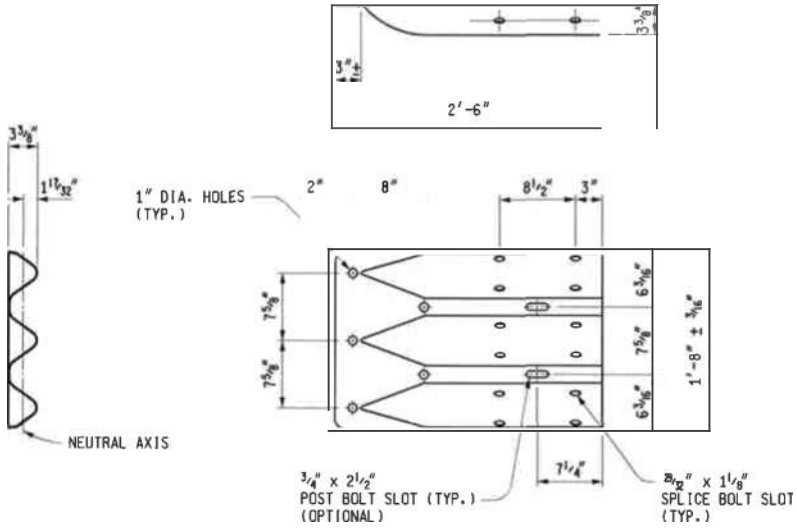
89-2017
PLt# OATE

R-67—G

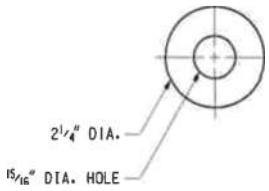
SHEE7
5 OF 7



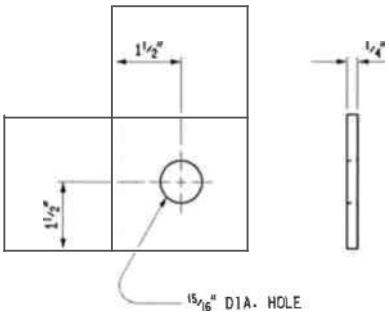
THRIE **BEA II EXPANSION SECTION**



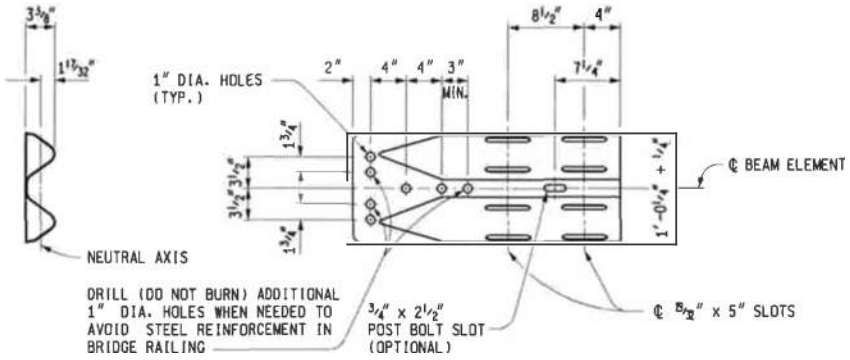
THRIE BEAM TERHINAL CONNECTOR



ROUND WASHER FOR
7/g" DIA. BOLTS



SQUARE WASHER FOR
é" DIA. BOLTS



SPECIAL END SHOE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRA IL ANCHORAGE, BRIDGE, DETAILS

F.M.¥.é. £PPR0Y£L

89-20t7
PL+t 3+TE

R-67—G

SHEET
6 OF 7

NOTES:

ALL POSTS • OFFSET BLOCKS • 8EAkI ELEMEI4TS • REFLECTORS • AND HAR0XAftE • I I f/CLIJD THG 80LTS • flUIS• AUD ¥ASftERS I SIJALL C0ΠF0RM 70 TUE CIJRREfJT STAftDARO SPECIF ICAII0f/5 AND 70 THE CURREfJT 5IAfJDARD PLAIN R-60-SER [ES. WHERE APPL ICABLE. EXCEPT AS SPECIF [ED 0N TIJTS STANDARD •

ALL POSTS USED TO CONSTRUCT GUARDRAIL ANCHORAGE. BRTDGE SHALL 8£ 7′ --0″ LONG.

TUE T£IR IE BEAM TERMINAL C0NkECT0R Afl0 SPEC IAL Efl0 SfJ0E SIJALL BE IUE SAME 9AIER VAL AS ADJACENT RUN OF GUARORA I L• EXCEPT THAT THEY SHALL I40T BE L IGHT£R THAN 10 GAGE 10. 138 ″) .

SECT I0ΠS OF THE T8RIE BEAM ELEMEΠT REOUIREO 70 BE TYISTEO FOR USE IN ANCHORAGE SHALL BE F TELD BEIJT.

GUARDRAIL BEAM ELEMENTS SHALL BE LAPPED IN THE 0 IRECT I0H OF TRAFFIC. EXCEPT FOR THE T8RIE BEAM TERMII4AL CONNECTOR ¥HICH MAY BE LAPPED IN EITHER DIRECT FOB.

5IAf/0ARD SPLICE BOLTS SIJALL BE USEO 8HEfJ SPL ICING TΠE TΠRIE BEAM TERMINAL C0ΠJf/ECTOR 70 TUE TfJRIE BEAM EXPANSI0f/ SECTION AND WHEN SPL T C TNG THE SPEC[AL END SHOE TO THE TRANS T TT ON SECTION. THE SPLTCE BOLT XuT sF*LL BE INSTALLED F TN0ER-T[CHT AND SHALL FULLY EhGAGE THE SPL ICE BOLT h I TH A M [h [MUM OF ONE THREAD EXTEND IfJ0 BEYOND THE fl0T TH IS SHALL BE FOLLOWED UP BY UPSETTING THE F TRST THREAD ON THE OUTSIDE OF THE NUT DT TH A crxir8 Puxcf‹ OR COLD Col I SEL . SO THAT IT If ILL RIOT L00SEI4.

SEE THE CURRENT STANDARD PLAN R-32-SERIES FOR APPROACH CURB AND MUTTER AND OODNSPOUT HEADCR.

6UARDRA IL ANCHORAGE. BR I DGE • DETAILS 7-1 • 7-2 ‹ 7-5 • AND 7-6 REOU TRE THAT THE THRIE BEAM TERHIFIAL COI4NEC TOR BE ATTACHED 70 ThE @j″ x 5″ LONG SLOTTED HOLES [R THE THRIE BE Ad EXPAI4S[Ofl SECT t0N •

SEE APPROPR I ATE PLAFIS 70 0ETERM[FIE 1HET8ER 6UAR0RA PL AFICHORAGE • BR [D6E SPAI4S A BRIDGE EXPAFIS I0FI J0II4T.

SEE THE CURRENT STAMOARD PLAN R-55-SERIEO FOR F[LLER DALLS AND F I LLER CALL Efl0 BLOCK •

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL ANCHORAGE, BRIDGE, DETA ILS

F.H.F.A. ARPROYAL

8-9-2017
RUN DATE

R-67-G

SHEET
7 OF 7

CITY OF ANN ARBOR
PREVAILING WAGE DECLARATION OF COMPLIANCE

The "wage and employment requirements" of Section 1:320 of Chapter 14 of Title I of the Ann Arbor City Code mandates that the city not enter any contract, understanding or other arrangement for a public improvement for or on behalf of the city unless the contract provides that all craftsmen, mechanics and laborers employed directly on the site in connection with said improvements, including said employees of subcontractors, shall receive the prevailing wage for the corresponding classes of craftsmen, mechanics and laborers, as determined by statistics for the Ann Arbor area compiled by the United States Department of Labor. Where the contract and the Ann Arbor City Code are silent as to definitions of terms required in determining contract compliance with regard to prevailing wages, the definitions provided in the Davis-Bacon Act as amended (40 U.S.C. 278-a to 276-a-7) for the terms shall be used. Further, to the extent that any employees of the contractor providing services under this contract are not part of the class of craftsmen, mechanics and laborers who receive a prevailing wage in conformance with section 1:320 of Chapter 14 of Title I of the Code of the City of Ann Arbor, employees shall be paid a prescribed minimum level of compensation (i.e. Living Wage) for the time those employees perform work on the contract in conformance with section 1:815 of Chapter 23 of Title I of the Code of the City of Ann Arbor.

At the request of the city, any contractor or subcontractor shall provide satisfactory proof of compliance with this provision.

The Contractor agrees:

(a) To pay each of its employees whose wage level is required to comply with federal, state or local prevailing wage law, for work covered or funded by this contract with the City,

(b) To require each subcontractor performing work covered or funded by this contract with the City to pay each of its employees the applicable prescribed wage level under the conditions stated in subsection (a) or (b) above.

(c) To provide to the City payroll records or other documentation within ten (10) business days from the receipt of a request by the City.

(d) To permit access to work sites to City representatives for the purposes of monitoring compliance, and investigating complaints or non-compliance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services in accordance with the terms of the wage and employment provisions of the Chapter 14 of the Ann Arbor City Code. The undersigned certifies that he/she has read and is familiar with the terms of Section 1:320 of Chapter 14 of the Ann Arbor City Code and by executing this Declaration of Compliance obligates his/her employer and any subcontractor employed by it to perform work on the contract to the wage and employment requirements stated herein. The undersigned further acknowledges and agrees that if it is found to be in violation of the wage and employment requirements of Section 1:320 of the Chapter 14 of the Ann Arbor City Code it shall has be deemed a material breach of the terms of the contract and grounds for termination of same by the City.

_____
Company Name

_____
Signature of Authorized Representative Date

_____
Print Name and Title

_____
Address, City, State, Zip

_____
Phone/Email address

Questions about this form? Contact Procurement Office City of Ann Arbor Phone: 734/794-6500

CITY OF ANN ARBOR
LIVING WAGE ORDINANCE DECLARATION OF COMPLIANCE

The Ann Arbor Living Wage Ordinance (Section 1:811-1:821 of Chapter 23 of Title I of the Code) requires that an employer who is (a) a contractor providing services to or for the City for a value greater than $10,000 for any twelve-month contract term, or (b) a recipient of federal, state, or local grant funding administered by the City for a value greater than $10,000, or (c) a recipient of financial assistance awarded by the City for a value greater than $10,000, shall pay its employees a prescribed minimum level of compensation (i.e., Living Wage) for the time those employees perform work on the contract or in connection with the grant or financial assistance. The Living Wage must be paid to these employees for the length of the contract/program.

Companies employing fewer than 5 persons and non-profits employing fewer than 10 persons are exempt from compliance with the Living Wage Ordinance. If this exemption applies to your company/non-profit agency please check here [___] *No. of employees*___

The Contractor or Grantee agrees:

(a) To pay each of its employees whose wage level is not required to comply with federal, state or local prevailing wage law, for work covered or funded by a contract with or grant from the City, no less than the Living Wage. The current Living Wage is defined as $13.22/hour for those employers that provide employee health care (as defined in the Ordinance at Section 1:815 Sec. 1 (a)), or no less than $14.75/hour for those employers that do not provide health care. The Contractor or Grantor understands that the Living Wage is adjusted and established annually on April 30 in accordance with the Ordinance and covered employers shall be required to pay the adjusted amount thereafter to be in compliance with Section 1:815(3).

Check the applicable box below which applies to your workforce

[___] Employees who are assigned to any covered City contract/grant will be paid at or above the applicable living wage without health benefits

[___] Employees who are assigned to any covered City contract/grant will be paid at or above the applicable living wage with health benefits

(a) To post a notice approved by the City regarding the applicability of the Living Wage Ordinance in every work place or other location in which employees or other persons contracting for employment are working.

(b) To provide to the City payroll records or other documentation within ten (10) business days from the receipt of a request by the City.

(c) To permit access to work sites to City representatives for the purposes of monitoring compliance, and investigating complaints or non-compliance.

(d) To take no action that would reduce the compensation, wages, fringe benefits, or leave available to any employee covered by the Living Wage Ordinance or any person contracted for employment and covered by the Living Wage Ordinance in order to pay the living wage required by the Living Wage Ordinance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services or agrees to accept financial assistance in accordance with the terms of the Living Wage Ordinance. The undersigned certifies that he/she has read and is familiar with the terms of the Living Wage Ordinance, obligates the Employer/Grantee to those terms and acknowledges that if his/her employer is found to be in violation of Ordinance it may be subject to civil penalties and termination of the awarded contract or grant of financial assistance.

Company Name	Street Address
Signature of Authorized Representative Date	City, State, Zip
Print Name and Title	Phone/Email address

CITY OF ANN ARBOR
LIVING WAGE ORDINANCE

RATE EFFECTIVE APRIL 30, 2018 - ENDING APRIL 29, 2019

$13.22 per hour

If the employer provides health care benefits*****

$14.75 per hour

If the employer does **NOT** provide health care benefits*****

Employers providing services to or for the City of Ann Arbor or recipients of grants or financial assistance from the City of Ann Arbor for a value of more than $10,000 in a twelve-month period of time must pay those employees performing work on a City of Ann Arbor contract or grant, the above living wage.

ENFORCEMENT

The City of Ann Arbor may recover back wages either administratively or through court action for the employees that have been underpaid in violation of the law. Persons denied payment of the living wage have the right to bring a civil action for damages in addition to any action taken by the City.

Violation of this Ordinance is punishable by fines of not more than $500/violation plus costs, with each day being considered a separate violation. Additionally, the City of Ann Arbor has the right to modify, terminate, cancel or suspend a contract in the event of a violation of the Ordinance.

***** Health Care benefits include those paid for by the employer or making an employer contribution toward the purchase of health care. The employee contribution must not exceed $.50 an hour for an average work week; and the employer cost or contribution must equal no less than $1/hr for the average work week.

The Law Requires Employers to Display This Poster Where Employees Can Readily See It.

For Additional Information or to File a Complaint Contact:
Colin Spencer at 734/794-6500 or cspencer@a2gov.org

Revised 2/1/2018

Vendor Conflict of Interest Disclosure Form

All vendors interested in conducting business with the City of Ann Arbor must complete and return the Vendor Conflict of Interest Disclosure Form in order to be eligible to be awarded a contract. Please note that all vendors are subject to comply with the City of Ann Arbor's conflict of interest policies as stated within the certification section below.

If a vendor has a relationship with a City of Ann Arbor official or employee, an immediate family member of a City of Ann Arbor official or employee, the vendor shall disclose the information required below.

1. No City official or employee or City employee's immediate family member has an ownership interest in vendor's company or is deriving personal financial gain from this contract.
2. No retired or separated City official or employee who has been retired or separated from the City for less than one (1) year has an ownership interest in vendor's Company.
3. No City employee is contemporaneously employed or prospectively to be employed with the vendor.
4. Vendor hereby declares it has not and will not provide gifts or hospitality of any dollar value or any other gratuities to any City employee or elected official to obtain or maintain a contract.
5. Please note any exceptions below:

Conflict of Interest Disclosure*	
Name of City of Ann Arbor employees, elected officials or immediate family members with whom there may be a potential conflict of interest.	( ) Relationship to employee ( ) Interest in vendor's company ( ) Other (please describe in box below)

*Disclosing a potential conflict of interest does not disqualify vendors. In the event vendors do not disclose potential conflicts of interest and they are detected by the City, vendor will be exempt from doing business with the City.

I certify that this Conflict of Interest Disclosure has been examined by me and that its contents are true and correct to my knowledge and belief and I have the authority to so certify on behalf of the Vendor by my signature below:		
Vendor Name	**Vendor Phone Number**	
Signature of Vendor Authorized Representative	**Date**	**Printed Name of Vendor Authorized Representative**

Questions about this form? Contact Procurement Office City of Ann Arbor Phone: 734/794-6500, procurement@a2gov.org

CITY OF ANN ARBOR
DECLARATION OF COMPLIANCE

Non-Discrimination Ordinance

The "non discrimination by city contractors" provision of the City of Ann Arbor Non-Discrimination Ordinance (Ann Arbor City Code Chapter 112, Section 9:158) requires all contractors proposing to do business with the City to treat employees in a manner which provides equal employment opportunity and does not discriminate against any of their employees, any City employee working with them, or any applicant for employment on the basis of actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight. It also requires that the contractors include a similar provision in all subcontracts that they execute for City work or programs.

In addition the City Non-Discrimination Ordinance requires that all contractors proposing to do business with the City of Ann Arbor must satisfy the contract compliance administrative policy adopted by the City Administrator. A copy of that policy may be obtained from the Purchasing Manager

The Contractor agrees:

(a) To comply with the terms of the City of Ann Arbor's Non-Discrimination Ordinance and contract compliance administrative policy, including but not limited to an acceptable affirmative action program if applicable.

(b) To post the City of Ann Arbor's Non-Discrimination Ordinance Notice in every work place or other location in which employees or other persons are contracted to provide services under a contract with the City.

(c) To provide documentation within the specified time frame in connection with any workforce verification, compliance review or complaint investigation.

(d) To permit access to employees and work sites to City representatives for the purposes of monitoring compliance, or investigating complaints of non-compliance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services in accordance with the terms of the Ann Arbor Non-Discrimination Ordinance. The undersigned certifies that he/she has read and is familiar with the terms of the Non-Discrimination Ordinance, obligates the Contractor to those terms and acknowledges that if his/her employer is found to be in violation of Ordinance it may be subject to civil penalties and termination of the awarded contract.

_____
Company Name

_____
Signature of Authorized Representative Date

_____
Print Name and Title

_____
Address, City, State, Zip

_____
Phone/Email Address

Questions about the Notice or the City Administrative Policy, Please contact:
Procurement Office of the City of Ann Arbor
(734) 794-6500

CITY OF ANN ARBOR NON-DISCRIMINATION ORDINANCE

Relevant provisions of Chapter 112, Nondiscrimination, of the Ann Arbor City Code are included below. You can review the entire ordinance at www.a2gov.org/humanrights.

Intent: It is the intent of the city that no individual be denied equal protection of the laws; nor shall any individual be denied the enjoyment of his or her civil or political rights or be discriminated against because of actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight.

Discriminatory Employment Practices: No person shall discriminate in the hire, employment, compensation, work classifications, conditions or terms, promotion or demotion, or termination of employment of any individual. No person shall discriminate in limiting membership, conditions of membership or termination of membership in any labor union or apprenticeship program.

Discriminatory Effects: No person shall adopt, enforce or employ any policy or requirement which has the effect of creating unequal opportunities according to actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight for an individual to obtain housing, employment or public accommodation, except for a bona fide business necessity. Such a necessity does not arise due to a mere inconvenience or because of suspected objection to such a person by neighbors, customers or other persons.

Nondiscrimination by City Contractors: All contractors proposing to do business with the City of Ann Arbor shall satisfy the contract compliance administrative policy adopted by the City Administrator in accordance with the guidelines of this section. All city contractors shall ensure that applicants are employed and that employees are treated during employment in a manner which provides equal employment opportunity and tends to eliminate inequality based upon any classification protected by this chapter. All contractors shall agree not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of any applicable protected classification. All contractors shall be required to post a copy of Ann Arbor's Non-Discrimination Ordinance at all work locations where its employees provide services under a contract with the city.

Complaint Procedure: If any individual believes there has been a violation of this chapter, he/she may file a complaint with the City's Human Rights Commission. The complaint must be filed within 180 calendar days from the date of the individual's knowledge of the allegedly discriminatory action or 180 calendar days from the date when the individual should have known of the allegedly discriminatory action. A complaint that is not filed within this timeframe cannot be considered by the Human Rights Commission. To file a complaint, first complete the complaint form, which is available at www.a2gov.org/humanrights. Then submit it to the Human Rights Commission by e-mail (hrc@a2gov.org), by mail (Ann Arbor Human Rights Commission, PO Box 8647, Ann Arbor, MI 48107), or in person (City Clerk's Office). For further information, please call the commission at 734-794-6141 or e-mail the commission at hrc@a2gov.org.

Private Actions For Damages or Injunctive Relief: To the extent allowed by law, an individual who is the victim of discriminatory action in violation of this chapter may bring a civil action for appropriate injunctive relief or damages or both against the person(s) who acted in violation of this chapter.

THIS IS AN OFFICIAL GOVERNMENT NOTICE AND
MUST BE DISPLAYED WHERE EMPLOYEES CAN READILY SEE IT.

Michigan Department
Of Transportation
CP-347 (04/10)

MICHIGAN DEPARTMENT OF TRANSPORTATION

CERTIFIED PAYROLL

COMPLETION OF CERTIFIED PAYROLL FORM FULFILLS THE MINIMUM MDOT PREVAILING WAGE REQUIREMENTS

(1) NAME OF CONTRACTOR / SUBCONTRACTOR (CIRCLE ONE) (2) ADDRESS

(3) PAYROLL NO. (4) FOR WEEK ENDING (5) PROJECT AND LOCATION (6) CONTRACT ID

(a) EMPLOYEE INFORMATION	(b) WORK CLASSIFICATION	(c) Hour Type	(d) DAY AND DATE / HOURS WORKED ON PROJECT							(e) TOTAL HOURS ON PROJECT	(f) PROJECT RATE OF PAY	(g) PROJECT RATE OF FRINGE PAY	(h) GROSS PROJECT EARNED / GROSS WEEKLY EARNED	(i) TOTAL WEEKLY HOURS WORKED ALL JOBS	(j) DEDUCTIONS FICA	FEDERAL	STATE		OTHER	TOTAL DEDUCT	(k) TOTAL WEEKLY WAGES PAID FOR ALL JOBS
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											

Date _____

I, _____ _____
(Name of Signatory Party) (Title)

do hereby state:

(1) That I pay or supervise the payment of the persons employed by

_____ on the
(Contractor or Subcontractor)

_____; that during the payroll period commencing on the
(Building or Work)

_____ day of _____, _____, and ending the _____ day of _____, _____,

all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said

_____ from the full
(Contractor or Subcontractor)

weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948, 63 Start. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:

_____

_____

_____

_____

(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:

(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

☐ – in addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

☐ – Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

NAME AND TITLE	SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE 31 OF THE UNITED STATES CODE.