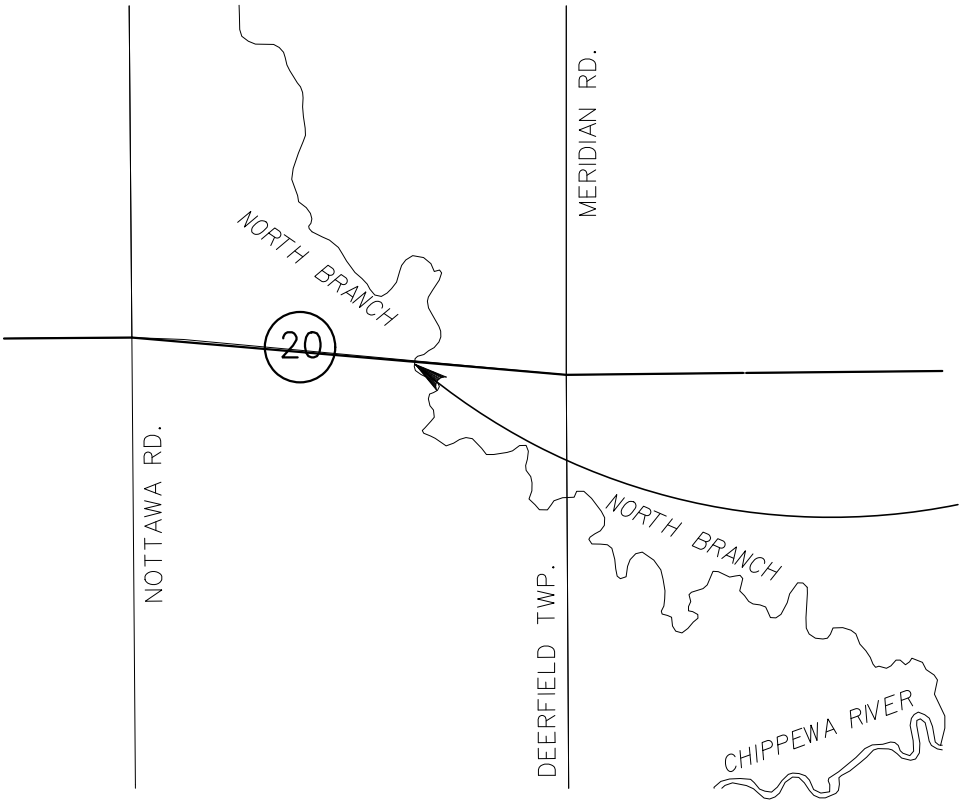
MICHIGAN DEPARTMENT OF TRANSPORTATION

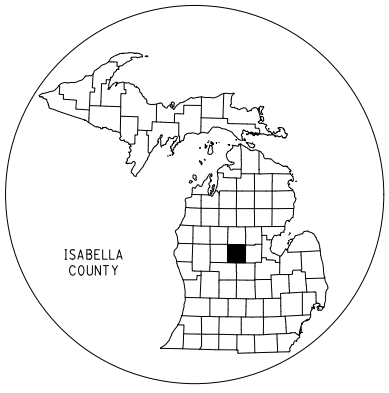
ROUTE: M-20
DEERFIELD TOWNSHIP
ISABELLA COUNTY

SECTION	CONTROL SEC	JOB NO.
1	37021	18-3701

		TRAFFIC DATA			SPEED DATA		
ROAD	YEAR	ADT	DHV	COMM	DESIGN	POSTED	LIMITS
M-20	2016	9200	1875	3%	60	55	POB TO POE



M-20
MICHIGAN PROJECT
CONTROL SECTION 37021
JOB NUMBER 18-3701
P.O.B. STA 0+00 (M.P. 11.522)
P.O.E. STA 9+03 (M.P. 11.693)



COUNTY KEY

THE IMPROVEMENTS COVERED BY THESE PLANS SHALL BE DONE IN ACCORDANCE WITH THE MICHIGAN DEPARTMENT OF TRANSPORTATION 2012 STANDARD SPECIFICATIONS FOR CONSTRUCTION. PHYSICAL ROAD NUMBER (PR#) & MILEPOST (MP) DATA ARE FROM MICHIGAN GEOGRAPHIC FRAMEWORK VERSION # 18

MILES: 0.15

CONTRACT FOR:
VARIOUS WIDTH TRENCHING FOR INSTALLATION OF CURB AND GUTTER WITH DOWNSPOUTS AND A SPILLWAY, WIDENED HMA SHOULDERS, AND GUARDRAIL RECONSTRUCT AND RELOCATION.

MDOT Michigan Department of Transportation
KIRK T. STEUDLE, P.E. - DIRECTOR

DATE: 07/24/18	TITLE SHEET	DRAWING	SHEET
DESIGN UNIT: MYERS	M-20 OVER NORTH BRANCH OF CHIPPEWA RIVER		
TSC: MT. PLEASANT			1

PROGRESS SCHEDULE

Work may begin immediately after receiving approval from MDOT. Work must be completed and billing received by **September 28, 2018**. Notice must be provided to Jason Potts at 989-737-0211 three (3) calendar days prior to beginning any work. An on-site meeting shall be scheduled before work begins to ensure understanding of plans.

JOB LOCATION

Location: Deerfield Township, in Isabella County. M-20 over the North Branch of the Chippewa River.

CS Information
CS 37021 MP 11.522 to 11.693
PR Information
PR 246401 MP 11.522 to 11.693
Location Length = 0.175 miles

DESCRIPTION OF WORK

The work shall consist of various width and various depth trenching for installation of curb and gutter and 3' to 5' widened, 2" thick HMA shoulders with 4" of Agg Base underneath, reconstructing the guardrail per the attached Special Provision, removing one down spout, placing a spillway and downspouts at the designated areas, and removing and replacing some guardrail at specified locations. Trenching for curb placement shall be done to ensure the face of curb is even with the face of guardrail. Two new downspouts, and one new spillway shall be constructed at the designated areas per Standard Plans R-32 series and R-35 series. Place W-backed guardrail at the new and existing downspouts and spillway locations, per Standard Plan R-72 series. Any existing washout areas shall be filled with embankment and slope restoration. Riprap shall be placed at each downspout or spillway outlet. Slope restoration will be placed in all of the disturbed areas as per the attached Special Provision. Place silt fence between each spillway location and the ditch to catch any sediment runoff during construction. Remove silt fence when turf is well established and approved by the Engineer.

If an adjustment in grade is required to ensure that shoulder curb and gutter elevations match, use Aggregate Base (22A).

ESTIMATED QUANTITIES

The quantities included in the summations below are approximate and for reference only. Contractor will be responsible for verifying quantities before bidding by site inspection and plan review. If any major discrepancies are noted, contractor must contact Collin Lorenz at (989) 274-2499.

This project is a Maintenance funded project, which means that there will be absolutely no overpayment or extras. All material, labor and mobilization shall be included in the bid.

MDOT will have the low bid reviewed and approved for funding. MDOT reserves the right to reject any bid that appears to be unqualified. Before award, MDOT may request a site and plan review meeting with the low bid contractor.

Items of Work (for information only)

Maintaining Traffic	1	LSUM
Trenching (9" deep, 2'8" wide) Saw cut Included	6	Sta
Trenching (6" deep, 3' to 5' wide) Saw cut needed	9	Sta
HMA LVSP	55	Ton
Aggregate Base, 4 inch	450	Syd
Curb and Gutter, Conc, Det B2	541	Ft
Shoulder Gutter, Conc, Det 3	1	Ea
Spillway, Conc	10	Ft
Dr Marker Post	4	Ea
Delineator Reflector, Green	4	Ea
Erosion Control, Silt Fence	75	Ft
Riprap, Plain	30	Syd
Slope Restoration, Type D	100	Syd
Embankment, CIP	45	Cyd
Culv, Downspout, 12 in	44	Ft
Reinforcement Steel, Culv and Headwall	80	Lb
Downspout Outlet Headwall	2	Ea
Downspout Header, Conc	2	Ea
Conc, Grade S2	4	Cyd
Guardrail, Salv	387.5	Ft
Guardrail, Reconst, Type B	445	Ft
Guardrail, Backed, Det G1	4	Ea
Guardrail, Type B	350	Ft
Guardrail Approach Terminal, Type 1B	1	Ea

Table 1 (For Information Only)

Stationing starts at 0+00 at east edge of existing approach at Fitch Dr. off M-20.

Station	Downspout Header (Ea)	Spillway Concrete (Ft)	Culvert Downspout 12" (Ft)	Riprap (Syd)	Comments
00+00 (north side of road)					Begin trenching 6" deep for 5' widened HMA shoulders.
01+75 (north side of road)					Begin Guardrail, Reconst, Type B.

LOG OF PROJECT

C.S. 37021
J.N. 18-3701

Station	Downspout Header (Ea)	Spillway Concrete (Ft)	Culvert Downspout 12" (Ft)	Riprap (Syd)	Comments
02+15 (north side of road)					Begin trenching 9" deep and 2'8" wide, and trenching 6" deep and 3' wide for installation of curb and gutter and widened HMA shoulders.
02+53 (north side of road)					Begin saw cutting for just 9" deep trenching 2'8" wide for installation of curb and gutter.
03+50 (north side of road)					End 9" trenching and Guardrail, Reconst, Type B, and tie new curb into existing curb on bridge approach.
04+30 (north side of road)					Begin Guardrail, Reconst, Type B and 9" trenching for installation of curb and gutter. Tie new curb into existing curb on bride approach.
04+47 (south side of road)					Begin Guardrail, Salv. Begin Installation of Guardrail, Type B and move forward to align with existing guardrail to the west.
04+54 (south side of road)					Place Guardrail, Backed, Det G1 over existing downspout.
04+66 (south side of road)					Begin trenching 9" deep and 2'8" wide for installation of curb. Tie new curb into existing curb.
05+05 (north side of road)		10		10	End 9" trenching for curb and gutter and install spillway. Begin 6" deep 5' wide trenching for HMA shoulder widening End Guardrail, Reconst, Type B.
05+66 (south side of road)	1		24	10	Place downspout with Guardrail, Backed, Det G1.
06+59 (south side of road)	1		20	10	Remove existing downspout and replace with new downspout with Guardrail, Backed, Det G1.
06+97 (south side of road)					Begin trenching 6" deep and 3' wide in addition with 9" trenching 2'8" wide for installation of curb and 3' widened HMA shoulders.

Station	Downspout Header (Ea)	Spillway Concrete (Ft)	Culvert Downspout 12" (Ft)	Riprap (Syd)	Comments
07+35 (north side of road)					End trenching 6" deep and 5' wide for widened HMA shoulders at existing driveway approach.
07+69 (north side of road)					Begin trenching 6' deep and 5' wide for continuation of 5' widened HMA shoulder.
07+97 (south side of road)					End trenching 9" deep and 2'8" wide for curb, and begin trenching 6" deep and 5' wide for installation of widened HMA shoulder. Place Guardrail Approach Terminal, Type 1B.
08+88 (north side of road)					End trenching 6" deep and 5' wide for widened HMA shoulders at existing driveway approach.
09+03 (south side of road)					End trenching 6" deep and 5' wide for widened HMA shoulder.

MAINTAINING TRAFFIC

Traffic Restrictions

Maintaining traffic will be accomplished with shoulder closures and single lane closures with flag control utilizing Maintaining Traffic Typicals M0020a, M0110a, and M0150a. Additionally, traffic shall be maintained according to Sections 104.07, 104.11, and 812 of the 2012 Standard Specifications for Construction, including any Supplemental Specifications, and as specified herein.

Sign covers shall be placed over any regulatory, warning, or construction signs that are not applicable during construction.

The Contractor shall not create any unsafe conditions within the Construction Influence Area (CIA) that form a hazard for motorists. The CIA shall extend as far as the required advanced construction signing, or any other signs pertaining to this location. Extra caution should be used when delineating the work zone overnight to protect the roadway users.

Drop-offs will not be allowed overnight. The Contractor shall bring all slopes to a 1 on 3 slope or flatter in any location within 12 feet of live traffic at the end of each work day. This work shall be included in the overall project estimate.

No work shall be performed or lane closures allowed during the Labor Day holiday period. Labor Day holiday period shall be defined as beginning on Thursday at noon until Tuesday at normal starting time.

All work shall be conducted during daytime hours only. All lanes and shoulders shall be open to traffic unless work is in progress which prohibits opening of lanes due to safety or other reasons approved by the Engineer.

Once work is initiated that includes any lane restrictions, that work shall be continuous until completed.

The storage restrictions in section 812.03.G.5 of the 2012 Standard Specifications for Construction will be strictly adhered to. The Contractor shall not park any vehicle or store any material on public recreational property.

Daily maintenance of traffic control items will not be paid for separately, but will be included in the lump sum price for the project.

GENERAL NOTES

SPECIFICATIONS FOR CONSTRUCTION
The improvements covered by these plans shall be done in accordance with the MDOT 2012 Standard Specifications for Construction.

MISS DIG/UNDERGROUND UTILITY NOTIFICATION
For the protection of underground utilities and in conformance with Public Act 174 of 2013, the Contractor shall contact MISS DIG System, Inc. by phone at 811 or 800-482-7171 or via the web at either elocate.missdig.org for single address or rte.missdig.org, a minimum of 3 business days prior to excavating, excluding weekends and holidays.

AGGREGATE BASE
Aggregate bases shall use Aggregate 22A unless otherwise specified.

SEED MIXTURE
The symbol for the permanent turf seed mixture on this project is symbol THV.

EXISTING SIGN RELOCATION
Any permanent signs requiring relocation due to Contractor operations shall be salvaged and reset by the Contractor at locations designated by the Engineer. Signs and posts damaged during the removal and storage operations shall be replaced with new signs and posts. The cost of this work shall be borne by the Contractor.

At least two weeks prior to construction to remove / relocate Michigan Logo or tourist oriented directional signs, the Contractor shall contact Mike Kovalchick, (888) 645-6467 from Michigan Logos.

RECREATIONAL PROPERTIES
The Contractor shall not park any vehicles or store any equipment on public recreational property. Access to the recreational properties must also be maintained at all times. Non compliance, even without the knowledge and approval of MDOT personnel, can result in penalties up to and including termination of the construction contractor and loss of federal funding for the project. Should there be any questions regarding this requirement, contact the MDOT Environmental Section at (517) 373-8350.

Notes Applying to Standard Plans
Where the following items are called for on the plans, they are to be constructed according to the Standard Plan or Special Detail given below opposite each item unless otherwise indicated.

Concrete Curb and Concrete Curb & Gutter..... R-30-G
Approach Curb & Gutter, Downspouts R-32-E
Concrete Shoulder Gutter and Spillway R-35-D
Guardrail Types A, B, BD, T, TD, MGS-8, MGS-8D, MGS-0 & MGS-0D *R-60-J
Guardrail Approach Terminal Types 1B and 1T……..R-61-H
W-Beam Backed Guardrail & Guardrail Long Span Installations *R-72-D
Bedding and Filling Around Pipe Culverts..... R-82-D
Outlet Headwalls..... R-85-D
Soil Erosion & Sedimentation Control Measures.....R-96-E
Seeding and Tree Planting R-100-H
Ground Driven Sign Supports for Temp Signs.....WZD-100-A*
Temporary Traffic Control Devices..... WZD-125-E*
** indicates Special Detail*

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PUBLIC UTILITIES

Control Section = 37021

Blanchard Telephone Assoc. 425 Main Street, P.O. Box 67 Blanchard, Michigan 49310 Ph: 989-561-9932(W) Attn: Duane Bronson	Telecom
Charter Communications 221 Ellis Place Mt. Pleasant, Michigan 48858 Ph: 989-621-0505(W) Attn: Bryon Carroll	Cable
CMSInter.net, LLC 108 S. Main St Crystal, Michigan 48818-5123 Ph: 989-817-4055 (W) Attn: Jeremy Sheets	Telecom
Consumers Energy 1325 Wright Avenue Alma, Michigan 48801 Ph: 989-388-8108(W) Attn: Matt Duncan	Electric
Consumers Energy 2400 Weiss Street Saginaw, Michigan 48602 Ph: 989-791-5885(W) Attn: Kyle Skrabut	Gas
DTE Energy / MichCon Gas 609 Bjornson Big Rapids, MI 49307 Ph: 231-592-3244(W) Attn: Larry Bourke	Gas

Frontier Communications 345 Pine Avenue Alma, Michigan 48801 Ph: 989-463-5497(W) Attn: Doug Hovey	Telecom
Everstream 1781 Holloway Drive Holt, MI 48842 Ph: 517-742-4116 (W) Attn: Michael Ohannesian	Telecom
Isabella County Drain Commissioner 200 North Main Street Mt. Pleasant, Michigan 48858 Ph: 989-317-4072(W) Attn: Robert Willoughby	County Drain
Merit Networks 1000 Oakbrooke Dr., Suite 200 Ann Arbor, Michigan 48104 Ph: 734-527-5767(W) Attn: Carlos Ramos	Telecom
Tri-County Electric Coop. 7973 E. Grand River Avenue Portland, Michigan 48875 Ph: 517-647-1214(W) Attn: Val Wohlscheid	Electric
Union Township 2010 S. Lincoln Road Mt. Pleasant, Michigan 48858 Ph: 989-772-4600x224(W) Attn: Kim Smith	Water
Windstream KDL 800 N. Durand Rd Corunna, MI 48817 Ph: 812-253-1553 (W) Attn: Chris Rogers	Telecom

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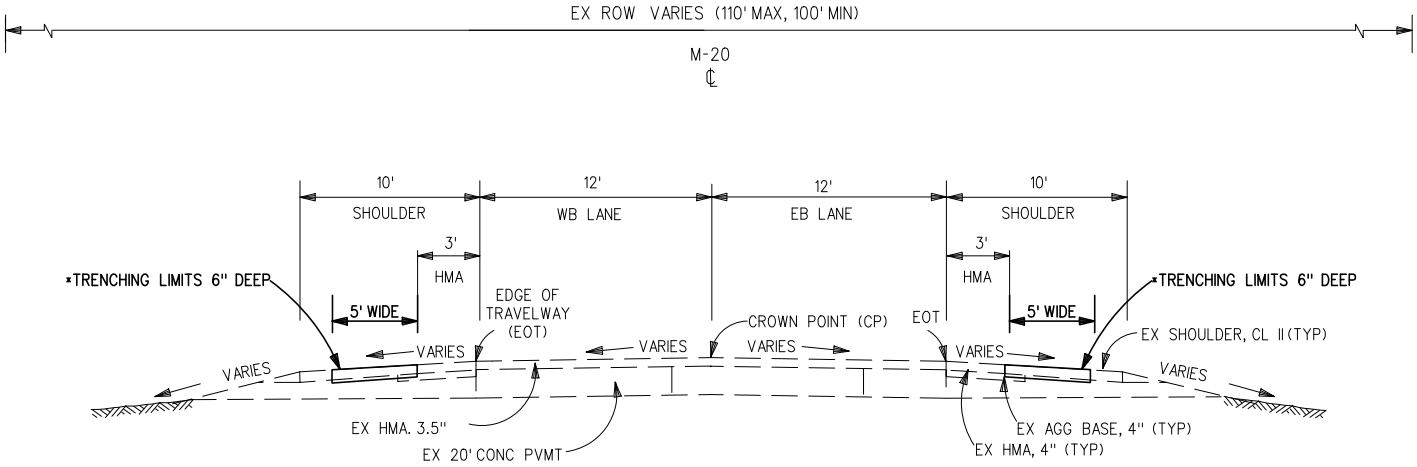
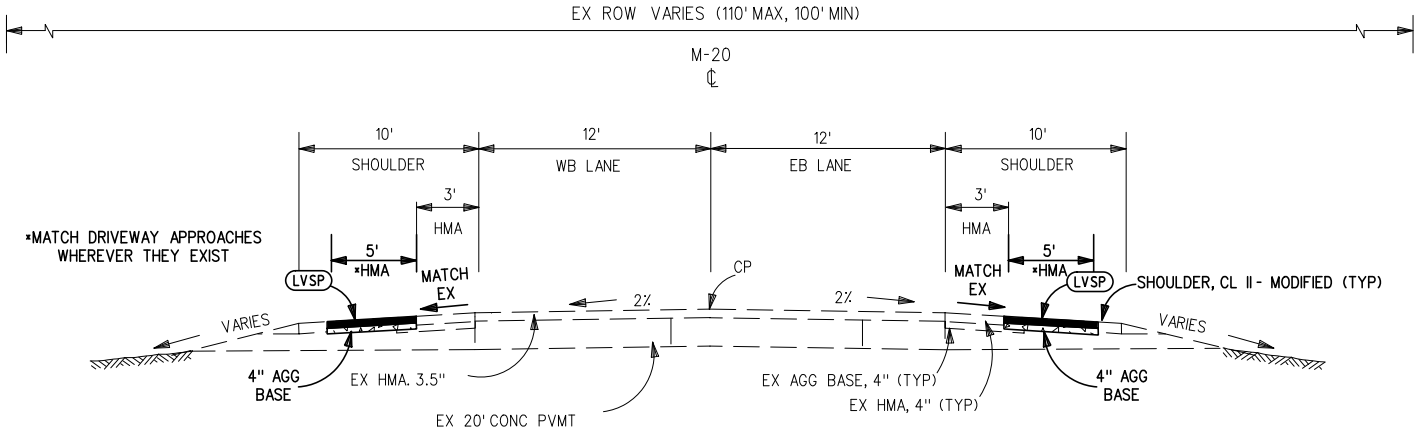
Winn Telephone Company 402 N. Mission St Mt. Pleasant, Michigan 48858 Ph: 989-953-9879 (W) Attn: Mike Fitzpatrick	Telecom
Wolverine Pipe Line Company 8075 Creekside Drive, Suite 210 Portage, Michigan 49024 Ph: 269-323-2491x124(W) Attn: Louis Kraus	Gas
Wolverine Power Supply 10125 W Watergate Road, P O Box 229 Cadillac, Michigan 49601 Ph: 231-775-5700(W) Attn: Ron Sneller	Electric



*MATCH DRIVEWAY APPROACHES WHEREVER THEY EXIST

EXISTING NORMAL SECTION

SECTION APPLIES TO:
STA 0+00 (POB) TO STA 2+15 (NW QUAD)
STA 5+05 TO STA 8+88 (NE QUAD)
STA 7+97 TO STA 9+03 (POE) (SE QUAD)



PROPOSED NORMAL SECTION

SECTION APPLIES TO:
STA 0+00 (POB) TO STA 2+15 (NW QUAD)
STA 5+05 TO STA 8+88 (NE QUAD)
STA 7+97 TO STA 9+03 (POE) (SE QUAD)

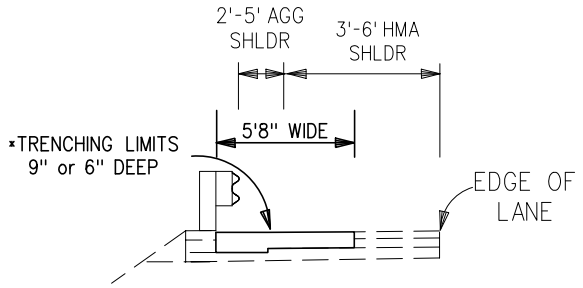
HMA APPLICATION ESTIMATE

IDENT NO.	ITEM	RATE LBS PER SYD	PERFORMANCE GRADE
LVSP	HMA, LVSP	220 lbs	PG58-28
	* BOND COAT	0.05-0.15 GAL	

*FOR INFORMATION ONLY

MDOT Michigan Department of Transportation	VERT. (FT) 0 10	DATE: 08/16/18	CS: 37021	TYPICAL CROSS SECTIONS	DRAWING	SHEET
FILE:	HORZ. (FT) 0 10	DESIGN UNIT: MYERS	JN: 18-3701	M-20 OVER NORTH BRANCH OF CHIPPEWA RIVER		11
		TSC: MT PLEASANT				

*SAW CUTTING INCLUDED IN TRENCHING WHERE APPLICABLE

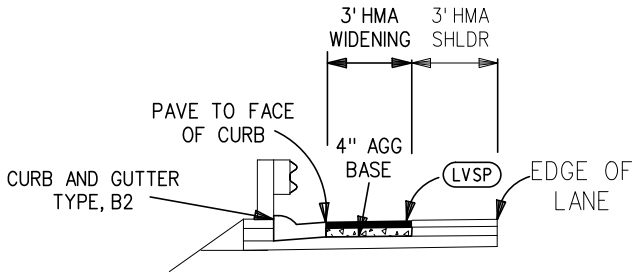


EXISTING GUARDRAIL SECTION

SECTION APPLIES TO:

WB
STA 2+15 TO STA 2+53

EB
STA 6+97 TO STA 7+97



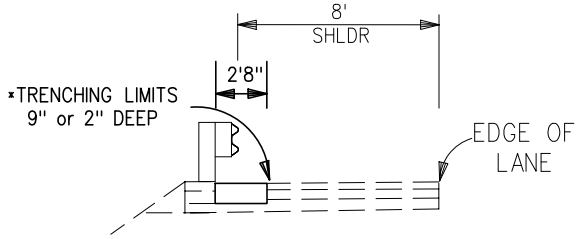
PROPOSED GUARDRAIL SECTIONS

SECTION APPLIES TO:

WB
STA 2+15 TO STA 2+53

EB
STA 6+97 TO STA 7+97

*SAW CUTTING INCLUDED IN TRENCHING WHERE APPLICABLE

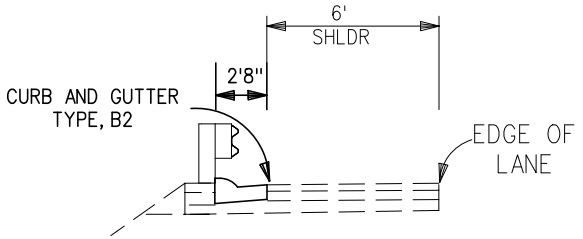


EXISTING BRIDGE SECTION

SECTION APPLIES TO:

WB
STA: 2+53 TO STA 5+05
GAP OUT STA: 3+50 TO 4+30

EB
STA: 4+66 TO STA 6+97



EXISTING BRIDGE SECTION

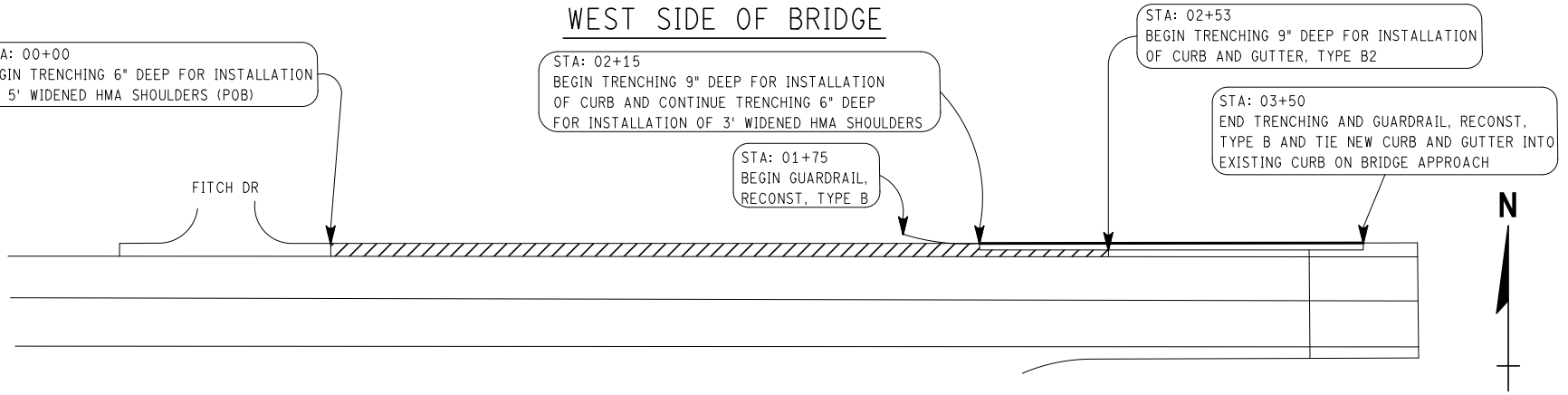
SECTION APPLIES TO:

WB
STA: 2+53 TO STA 5+05
GAP OUT STA: 3+50 TO 4+30

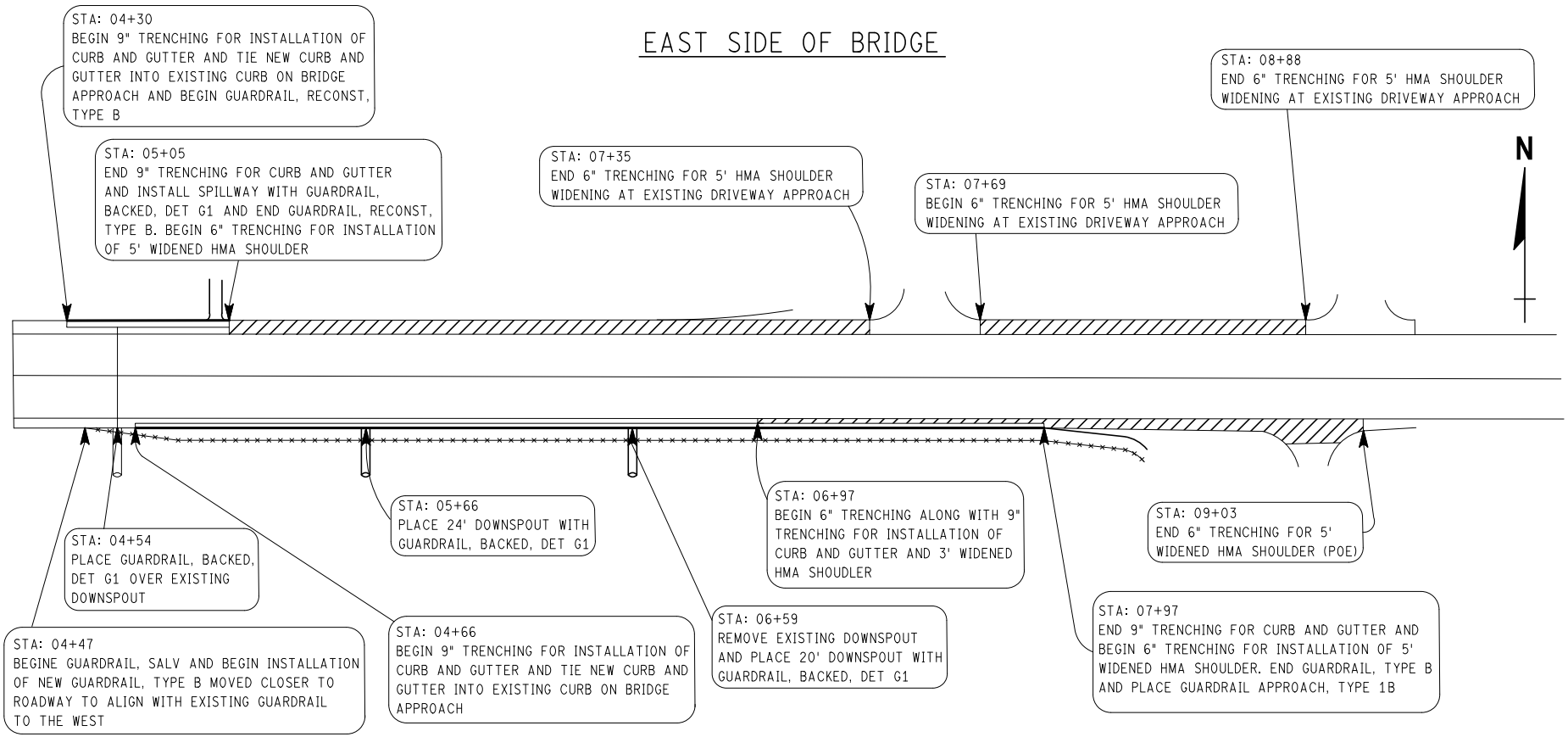
EB
STA: 4+66 TO STA 6+97

MDOT Michigan Department of Transportation FILE:	0 VERT. (FT) 10 0 HORZ. (FT) 10	DATE: 08/16/18 DESIGN UNIT: MYERS TSC: MT PLEASANT	CS: 37021 JN: 18-3701	TYPICAL CROSS SECTIONS M-20 OVER NORTH BRANCH OF CHIPPEWA RIVER	DRAWING	SHEET 12

WEST SIDE OF BRIDGE



EAST SIDE OF BRIDGE



MDOT Michigan Department of Transportation	NO SCALE	DATE: 08/08/18	CS: 37021	PLAN SHEET	DRAWING	SHEET
FILE:		DESIGN UNIT: MYERS	JN: 18-3701	M-20 OVER NORTH BRANCH OF CHIPPEWA RIVER		13
		TSC: MT PLEASANT				

MINIMUM MERGING TAPER LENGTH "L" (FEET)

OFFSET	POSTED SPEED LIMIT, MPH (PRIOR TO WORK AREA)										
FEET	25	30	35	40	45	50	55	60	65	70	
1	10	15	20	27	45	50	55	60	65	70	TAPER LENGTH "L" IN FEET
2	21	30	41	53	90	100	110	120	130	140	
3	31	45	61	80	135	150	165	180	195	210	
4	42	60	82	107	180	200	220	240	260	280	
5	52	75	102	133	225	250	275	300	325	350	
6	63	90	123	160	270	300	330	360	390	420	
7	73	105	143	187	315	350	385	420	455	490	
8	83	120	163	213	360	400	440	480	520	560	
9	94	135	184	240	405	450	495	540	585	630	
10	104	150	204	267	450	500	550	600	650	700	
11	115	165	225	293	495	550	605	660	715	770	
12	125	180	245	320	540	600	660	720	780	840	
13	135	195	266	347	585	650	715	780	845	910	
14	146	210	286	374	630	700	770	840	910	980	
15	157	225	307	400	675	750	825	900	975	1050	

THE FORMULAS FOR THE MINIMUM LENGTH OF A MERGING TAPER IN DERIVING THE "L" VALUES SHOWN IN THE ABOVE TABLES ARE AS FOLLOWS:

$$"L" = \frac{W \times S^2}{60}$$ WHERE POSTED SPEED PRIOR TO THE WORK AREA IS 40 MPH OR LESS

"L" = S x W WHERE POSTED SPEED PRIOR TO THE WORK AREA IS 45 MPH OR GREATER

L = MINIMUM LENGTH OF MERGING TAPER
S = POSTED SPEED LIMIT IN MPH PRIOR TO WORK AREA
W = WIDTH OF OFFSET

TYPES OF TAPERS	TAPER LENGTH
UPSTREAM TAPERS	
MERGING TAPER	L - MINIMUM
SHIFTING TAPER	1/2 L - MINIMUM
SHOULDER TAPER	1/3 L - MINIMUM
TWO-WAY TRAFFIC TAPER	100 ' - MAXIMUM
DOWNSTREAM TAPERS (USE IS OPTIONAL)	100 ' - MINIMUM (PER LANE)

MDOT Michigan Department of Transportation
TRAFFIC AND SAFETY
MAINTAINING TRAFFIC TYPICAL

TABLES FOR "L", "D" AND "B" VALUES

DRAWN BY: CON:AE:djf	JUNE 2006 PLAN DATE:	M0020a	SHEET 1 OF 2
CHECKED BY: BMM			
FILE: K:/DGN/TSR/STDS/ENGLISH/MNTTRF/M0020a.dgn	REV. 08/21/2006		

DISTANCE BETWEEN TRAFFIC CONTROL DEVICES "D" AND LENGTH OF LONGITUDINAL BUFFER SPACE ON "WHERE WORKERS PRESENT" SEQUENCES

"D" DISTANCES	POSTED SPEED LIMIT, MPH (PRIOR TO WORK AREA)									
	25	30	35	40	45	50	55	60	65	70
D (FEET)	250	300	350	400	450	500	550	600	650	700

GUIDELINES FOR LENGTH OF LONGITUDINAL BUFFER SPACE "B"

SPEED* MPH	LENGTH FEET
20	33
25	50
30	83
35	132
40	181
45	230
50	279
55	329
60	411
65	476
70	542

* POSTED SPEED, OFF PEAK 85TH PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED

1 BASED UPON AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) BRAKING DISTANCE PORTION OF STOPPING SIGHT DISTANCE FOR WET AND LEVEL PAVEMENTS (A POLICY ON GEOMETRIC DESIGN OF HIGHWAY AND STREETS), AASHTO. THIS AASHTO DOCUMENT ALSO RECOMMENDS ADJUSTMENTS FOR THE EFFECT OF GRADE ON STOPPING AND VARIATION FOR TRUCKS.

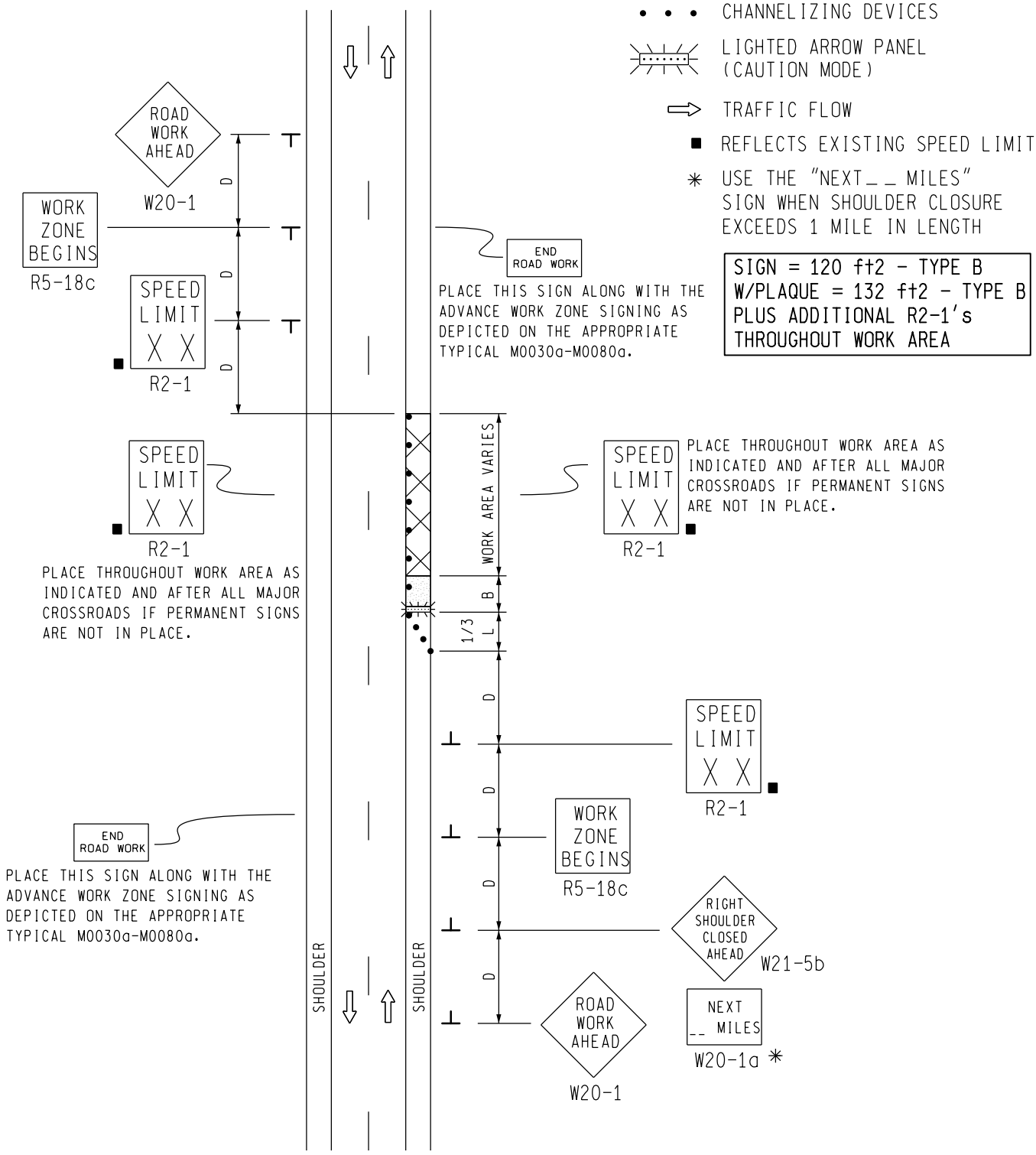
MDOT Michigan Department of Transportation

TRAFFIC AND SAFETY

MAINTAINING TRAFFIC TYPICAL

TABLES FOR "L", "D" AND "B" VALUES

DRAWN BY: CON:AE:djf	JUNE 2006	M0020a	SHEET 2 OF 2
CHECKED BY: BMM	PLAN DATE:		
FILE: K:/DGN/TSR/STDS/ENGLISH/MNTTRF/M0020a.dgn	REV. 08/21/2006		



NOT TO SCALE

MDOT Michigan Department of Transportation

TRAFFIC AND SAFETY

MAINTAINING TRAFFIC TYPICAL

TYPICAL TEMPORARY TRAFFIC CONTROL FOR A SHOULDER CLOSURE ON A TWO LANE TWO-WAY ROADWAY NO SPEED REDUCTION

DRAWN BY: CON:AE:djf	OCTOBER 2011	M0110a	SHEET 1 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		

FILE: PW RD/TS/Typicals/Signs/MT NON FWY/M0110a.dgn REV. 10/04/2011

NOTES

1. D = DISTANCE BETWEEN TRAFFIC CONTROL DEVICES
   1/3 L = MINIMUM LENGTH OF TAPER
   B = LENGTH OF LONGITUDINAL BUFFER
   SEE M0020a FOR "D," "L," AND "B" VALUES

2. ALL NON-APPLICABLE SIGNING WITHIN THE CIA SHALL BE MODIFIED TO FIT CONDITIONS, COVERED OR REMOVED.

3. DISTANCES BETWEEN SIGNS, THE VALUES FOR WHICH ARE SHOWN IN TABLE D, ARE APPROXIMATE AND MAY NEED ADJUSTING AS DIRECTED BY THE ENGINEER.

3A. THE "WORK ZONE BEGINS" (R5-18c) SIGN SHALL BE USED ONLY IN THE INITIAL SIGNING SEQUENCE IN THE WORK ZONE. SUBSEQUENT SEQUENCES IN THE SAME WORK ZONE SHALL OMIT THIS SIGN AND THE QUANTITIES SHALL BE ADJUSTED APPROPRIATELY.

4E. THE MAXIMUM RECOMMENDED DISTANCE(S) BETWEEN CHANNELIZING DEVICES SHOULD BE EQUAL IN FEET TO THE POSTED SPEED IN MILES PER HOUR ON TAPER(S) AND TWICE THE POSTED SPEED IN THE PARALLEL AREA(S).

5. FOR OVERNIGHT CLOSURES, TYPE III BARRICADES SHALL BE LIGHTED.

6. WHEN CALLED FOR IN THE FHWA ACCEPTANCE LETTER FOR THE SIGN SYSTEM SELECTED, THE TYPE A WARNING FLASHER, SHOWN ON THE WARNING SIGNS, SHALL BE POSITIONED ON THE SIDE OF THE SIGN NEAREST THE ROADWAY.

7. ALL TEMPORARY SIGNS, TYPE III BARRICADES, THEIR SUPPORT SYSTEMS AND LIGHTING REQUIREMENTS SHALL MEET NCHRP 350 CRASHWORTHLY REQUIREMENTS STIPULATED IN THE CURRENT EDITION OF THE MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, THE CURRENT EDITION OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION, THE STANDARD PLANS AND APPLICABLE SPECIAL PROVISIONS. ONLY DESIGNS AND MATERIALS APPROVED BY MDOT WILL BE ALLOWED.

8. WHEN BUFFER AREAS ARE ESTABLISHED, THERE SHALL BE NO EQUIPMENT OR MATERIALS STORED OR WORK CONDUCTED IN THE BUFFER AREA.

29A. THE TYPE OF REFLECTIVE SHEETING USED FOR THE W20-1a PLAQUE SHALL BE THE SAME AS THE TYPE USED FOR THE PARENT SIGN.

SIGN SIZES

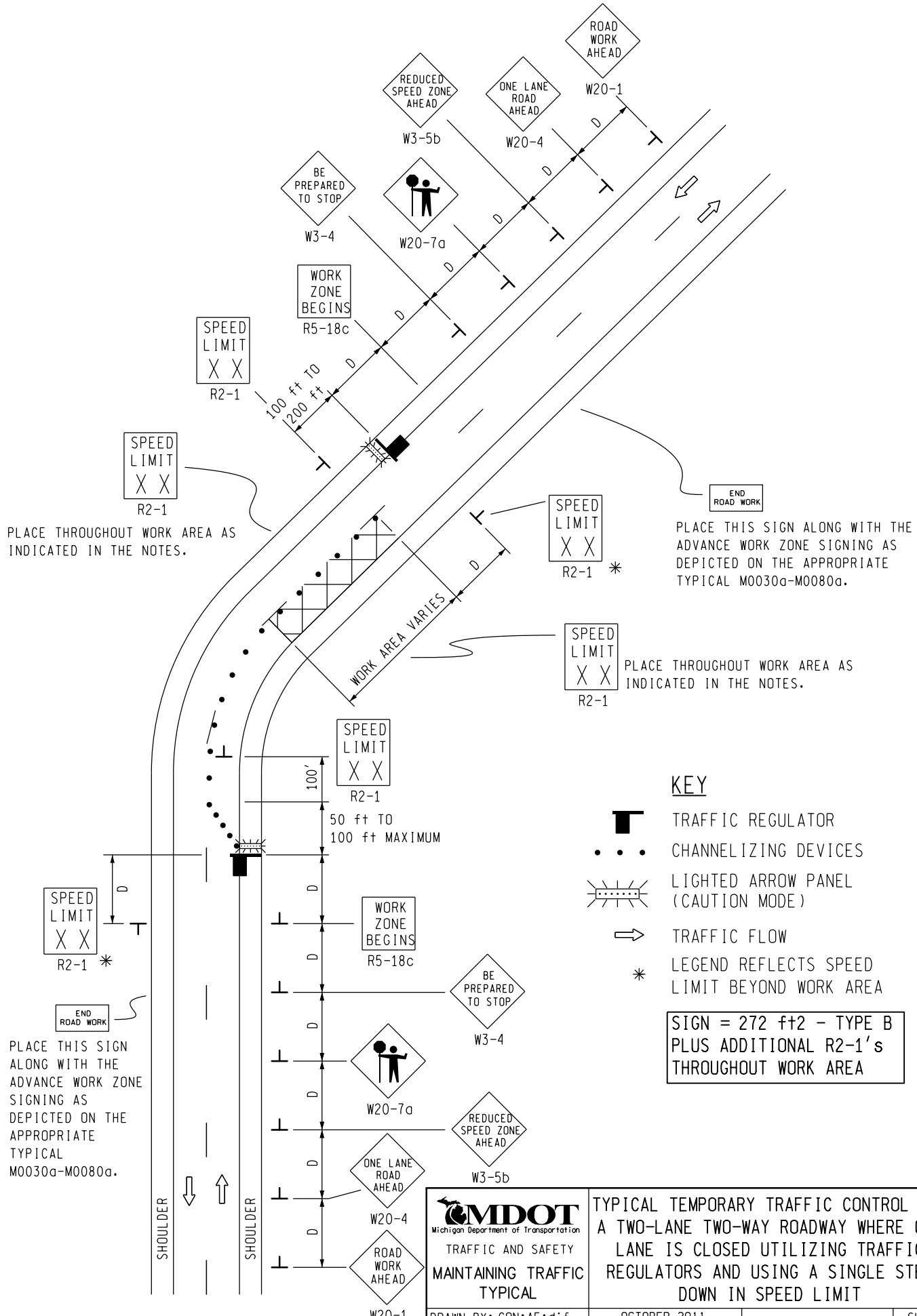
DIAMOND WARNING	- 48" x 48"
W20-1a PLAQUE	- 48" x 36"
R2-1 REGULATORY	- 48" x 60"
R5-18c REGULATORY	- 48" x 48"

NOT TO SCALE

MDOT Michigan Department of Transportation
TRAFFIC AND SAFETY
MAINTAINING TRAFFIC TYPICAL

TYPICAL TEMPORARY TRAFFIC CONTROL FOR A SHOULDER CLOSURE ON A TWO LANE TWO-WAY ROADWAY NO SPEED REDUCTION

DRAWN BY: CON:AE:djf	OCTOBER 2011	M0110a	SHEET 2 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		
FILE: PW RD/TS/Typicals/Signs/MT NON FWY/M0110a.dgn REV. 10/04/2011			



MDOT Michigan Department of Transportation

TRAFFIC AND SAFETY

MAINTAINING TRAFFIC TYPICAL

TYPICAL TEMPORARY TRAFFIC CONTROL FOR A TWO-LANE TWO-WAY ROADWAY WHERE ONE LANE IS CLOSED UTILIZING TRAFFIC REGULATORS AND USING A SINGLE STEP DOWN IN SPEED LIMIT

DRAWN BY: CON:AE:djf	OCTOBER 2011	M0150a	SHEET 1 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		
FILE: PW RD/TS/Typicals/Signs/MT NON FWY/M0150a.dgn REV.	10/04/2011		

NOTES

1H. D = DISTANCE BETWEEN TRAFFIC CONTROL DEVICES AND LENGTH OF LONGITUDINAL BUFFERS SEE M0020a FOR "D" VALUES.

2. ALL NON-APPLICABLE SIGNING WITHIN THE CIA SHALL BE MODIFIED TO FIT CONDITIONS, COVERED OR REMOVED.

3. DISTANCES BETWEEN SIGNS, THE VALUES FOR WHICH ARE SHOWN IN TABLE D, ARE APPROXIMATE AND MAY NEED ADJUSTING AS DIRECTED BY THE ENGINEER.

3A. THE "WORK ZONE BEGINS" (R5-18c) SIGN SHALL BE USED ONLY IN THE INITIAL SIGNING SEQUENCE IN THE WORK ZONE. SUBSEQUENT SEQUENCES IN THE SAME WORK ZONE SHALL OMIT THIS SIGN AND THE QUANTITIES SHALL BE ADJUSTED APPROPRIATELY.

4A. THE MAXIMUM RECOMMENDED DISTANCE(S) BETWEEN CHANNELIZING DEVICES IN THE TAPER AREA(S) SHOULD BE 15 FEET AND SHOULD BE EQUAL IN FEET TO TWICE THE POSTED SPEED IN MILES PER HOUR IN THE PARALLEL AREA(S).

5. FOR OVERNIGHT CLOSURES, TYPE III BARRICADES SHALL BE LIGHTED.

6. WHEN CALLED FOR IN THE FHWA ACCEPTANCE LETTER FOR THE SIGN SYSTEM SELECTED, THE TYPE A WARNING FLASHER, SHOWN ON THE WARNING SIGNS, SHALL BE POSITIONED ON THE SIDE OF THE SIGN NEAREST THE ROADWAY.

7. ALL TEMPORARY SIGNS, TYPE III BARRICADES, THEIR SUPPORT SYSTEMS AND LIGHTING REQUIREMENTS SHALL MEET NCHRP 350 CRASHWORTHLY REQUIREMENTS STIPULATED IN THE CURRENT EDITION OF THE MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, THE CURRENT EDITION OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION, THE STANDARD PLANS AND APPLICABLE SPECIAL PROVISIONS. ONLY DESIGNS AND MATERIALS APPROVED BY MDOT WILL BE ALLOWED.

9. ALL TRAFFIC REGULATORS SHALL BE PROPERLY TRAINED AND SUPERVISED.

9A. IN ANY OPERATION INVOLVING MORE THAN ONE TRAFFIC REGULATOR, ONE PERSON SHOULD BE DESIGNATED AS HEAD TRAFFIC REGULATOR.

10. ALL TRAFFIC REGULATORS' CONDUCT, THEIR EQUIPMENT, AND TRAFFIC REGULATING PROCEDURES SHALL CONFORM TO THE CURRENT EDITION OF THE MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MMUTCD) AND THE CURRENT EDITION OF THE MDOT HANDBOOK ENTITLED "TRAFFIC REGULATORS INSTRUCTION MANUAL."

11. WHEN TRAFFIC REGULATING IS ALLOWED DURING THE HOURS OF DARKNESS, APPROPRIATE LIGHTING SHALL BE PROVIDED TO SUFFICIENTLY ILLUMINATE THE TRAFFIC REGULATOR'S STATIONS.

12E. THE MAXIMUM DISTANCE BETWEEN THE TRAFFIC REGULATORS SHALL BE NO MORE THAN 2 MILES IN LENGTH UNLESS RESTRICTED FURTHER IN THE SPECIAL PROVISIONS FOR MAINTAINING TRAFFIC. ALL SEQUENCES OF MORE THAN 2 MILES IN LENGTH WILL REQUIRE WRITTEN PERMISSION FROM THE ENGINEER BEFORE PROCEEDING.

13. WHEN INTERSECTING ROADS OR SIGNIFICANT TRAFFIC GENERATORS (SHOPPING CENTERS, MOBILE HOME PARKS, ETC.) OCCUR WITHIN THE ONE-LANE TWO-WAY OPERATION, INTERMEDIATE TRAFFIC REGULATORS AND APPROPRIATE SIGNING SHALL BE PLACED AT THESE LOCATIONS.

14. ADDITIONAL SIGNING AND/OR ELONGATED SIGNING SEQUENCES SHOULD BE USED WHEN TRAFFIC VOLUMES ARE SIGNIFICANT ENOUGH TO CREATE BACKUPS BEYOND THE W3-4 SIGNS.

15. THE HAND HELD (PADDLE) SIGNS REQUIRED BY THE MMUTCD TO CONTROL TRAFFIC WILL BE PAID FOR AS PART OF FLAG CONTROL.

16A. ADDITIONAL SPEED LIMIT SIGNS REFLECTING THE REDUCED SPEED SHALL BE PLACED AFTER EACH MAJOR CROSSROAD THAT INTERSECTS THE WORK AREA WHERE THE REDUCED SPEED IS IN EFFECT, AND AT INTERVALS ALONG THE ROADWAY SUCH THAT NO SPEED LIMIT SIGNS REFLECTING THE REDUCED SPEED ARE MORE THAN TWO MILES APART.

16B. WHEN REDUCED SPEED LIMITS ARE UTILIZED IN THE WORK AREA, ADDITIONAL SPEED LIMIT SIGNS RETURNING TRAFFIC TO ITS NORMAL SPEED SHALL BE PLACED BEYOND THE LIMITS OF THE REDUCED SPEED AS INDICATED.

16E. WHEN EXISTING SPEED LIMITS ARE REDUCED MORE THAN 10 MPH, THE SPEED LIMIT SHALL BE STEPPED DOWN IN NO MORE THAN 10 MPH INCREMENTS.

28E. THE TRAFFIC REGULATORS SHOULD BE POSITIONED AT OR NEAR THE SIDE OF THE ROAD SO THAT THEY ARE SEEN CLEARLY AT A MINIMUM DISTANCE OF 500 FEET. THIS MAY REQUIRE EXTENDING THE BEGINNING OF THE LANE CLOSURE TO OVERCOME VIEWING PROBLEMS CAUSED BY HILLS AND CURVES.

SIGN SIZES

DIAMOND WARNING	- 48" x 48"
RECTANGULAR REGULATORY	- 48" x 60"
R5-18c REGULATORY	- 48" x 48"

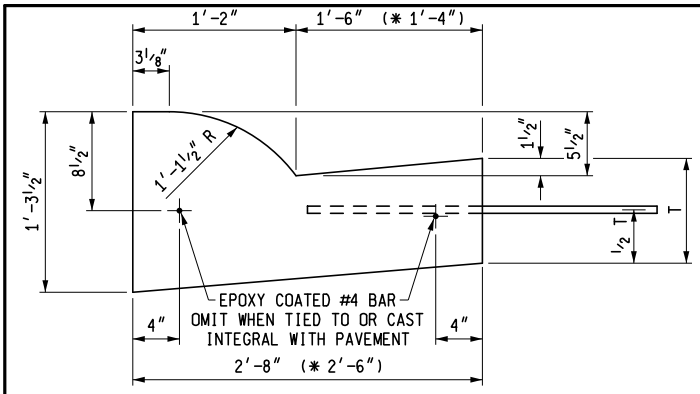
NOT TO SCALE

MDOT Michigan Department of Transportation
TRAFFIC AND SAFETY
MAINTAINING TRAFFIC TYPICAL

TYPICAL TEMPORARY TRAFFIC CONTROL FOR A TWO-LANE TWO-WAY ROADWAY WHERE ONE LANE IS CLOSED UTILIZING TRAFFIC REGULATORS AND USING A SINGLE STEP DOWN IN SPEED LIMIT

DRAWN BY: CON:AE:djf	OCTOBER 2011	M0150a	SHEET 2 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		

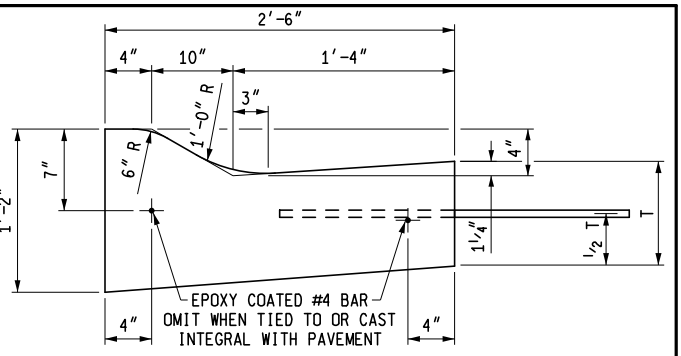
FILE: PW RD/TS/Typicals/Signs/MT NON FWY/M0150a.dgn REV. 10/04/2011



(* GUTTER PAN WIDTH MAY BE REDUCED WHEN APPROVED BY THE ENGINEER)

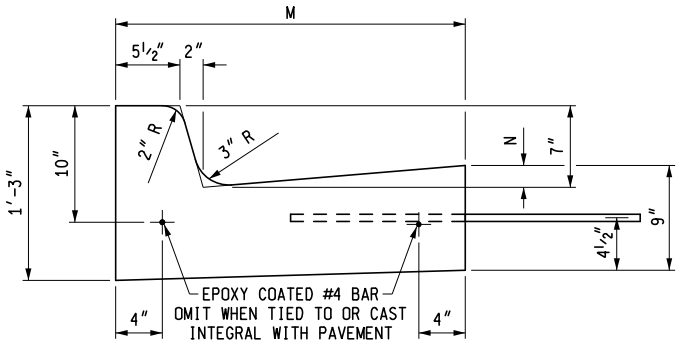
DETAIL	DIMENSION T	LANE TIES	CONCRETE CYD / LFT	CONCRETE CYD / LFT
B1	9″	AS SHOWN	0.0900	(* 0.0855)
B2	9″	OMITTED	0.0900	(* 0.0855)
B3	10″	AS SHOWN	0.0941	(* 0.0894)

B



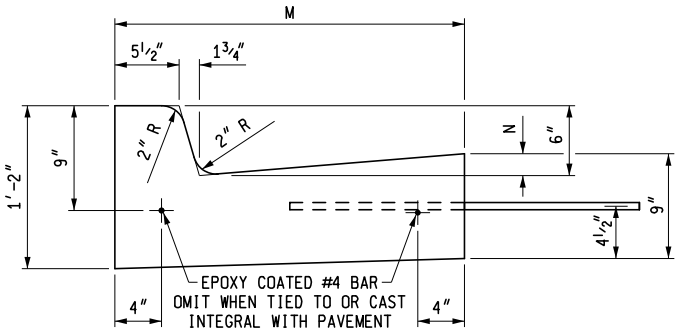
DETAIL	DIMENSION T	LANE TIES	CONCRETE CYD / LFT
D1	9″	AS SHOWN	0.0788
D2	9″	OMITTED	0.0788
D3	10″	AS SHOWN	0.0826

D



DETAIL	DIMENSION M	DIMENSION N	LANE TIES	CONCRETE CYD / LFT
C1	1′-6″	7/8″	AS SHOWN	0.0506
C2	1′-6″	7/8″	OMITTED	0.0506
C3	2′-0″	1 3/8″	AS SHOWN	0.0632
C4	2′-0″	1 3/8″	OMITTED	0.0632
C5	2′-6″	1 7/8″	AS SHOWN	0.0757
C6	2′-6″	1 7/8″	OMITTED	0.0757

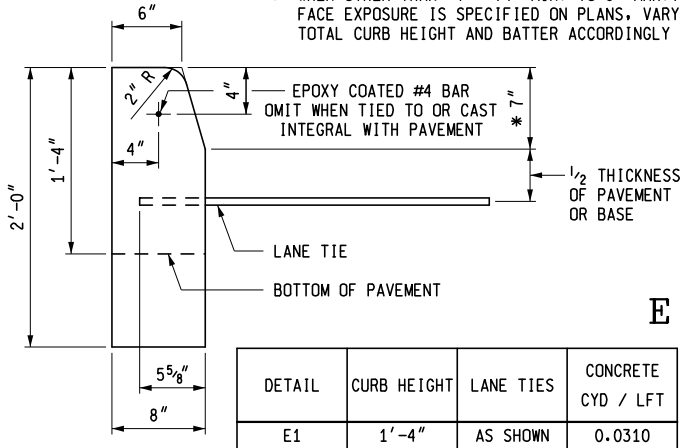
C



DETAIL	DIMENSION M	DIMENSION N	LANE TIES	CONCRETE CYD / LFT
F1	1′-6″	7/8″	AS SHOWN	0.0484
F2	1′-6″	7/8″	OMITTED	0.0484
F3	2′-0″	1 3/8″	AS SHOWN	0.0610
F4	2′-0″	1 3/8″	OMITTED	0.0610
F5	2′-6″	1 7/8″	AS SHOWN	0.0737
F6	2′-6″	1 7/8″	OMITTED	0.0737

F

* WHEN OTHER THAN 7″ (4″ MIN. TO 9″ MAX.) FACE EXPOSURE IS SPECIFIED ON PLANS, VARY TOTAL CURB HEIGHT AND BATTER ACCORDINGLY



E

DETAIL	CURB HEIGHT	LANE TIES	CONCRETE CYD / LFT
E1	1′-4″	AS SHOWN	0.0310
E2	1′-4″	OMITTED	0.0310
E4	2′-0″	OMITTED	0.0477

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Steudle

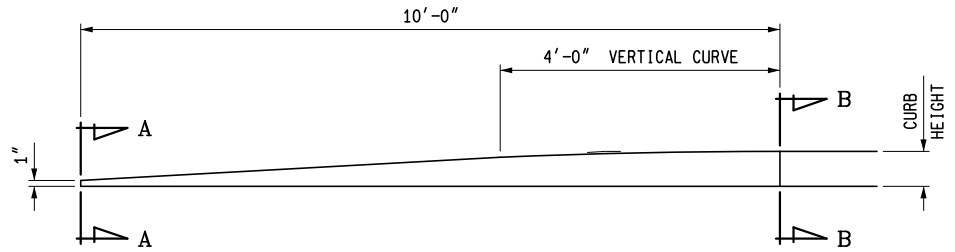
APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

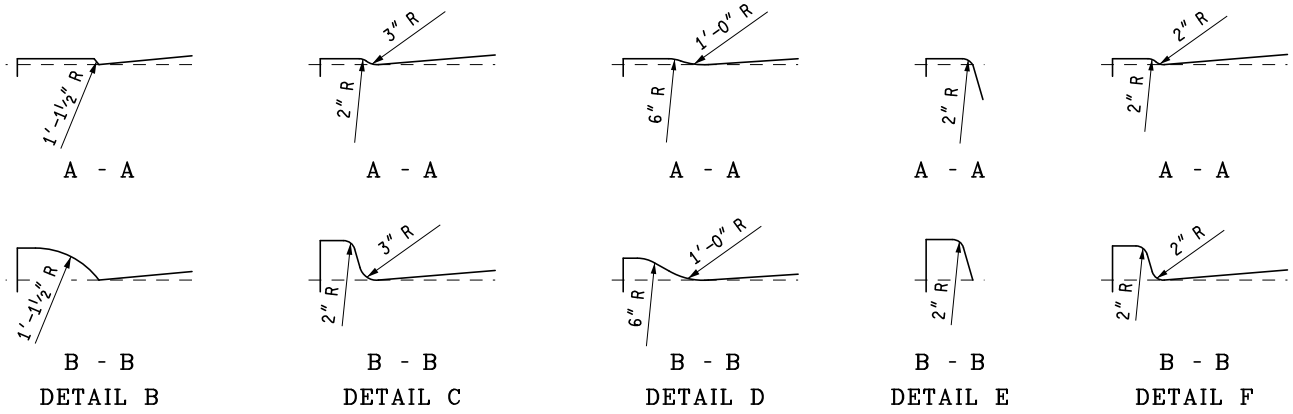
APPROVED BY: _____
DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

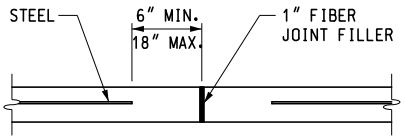
CONCRETE CURB AND CONCRETE CURB & GUTTER

9-30-2014 F.H.W.A. APPROVAL	2-6-2014 PLAN DATE	R-30-G	SHEET 1 OF 2

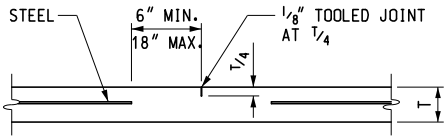




CONCRETE CURB, CURB AND GUTTER ENDINGS



1″ FIBER JOINT FILLER



CONTRACTION JOINT

NOTES:

CURB AND GUTTER RADII SHALL BE DIMENSIONED TO THE FRONT EDGE OF THE GUTTER PAN OR EDGE OF PAVEMENT.

CONCRETE CURB AND GUTTER ENDINGS WILL BE PAID FOR IN LINEAR FEET OF THE ADJACENT CURB DETAIL.

JOINTS SHALL BE PLACED AT RIGHT ANGLES TO THE EDGE OF CONCRETE CURB AND GUTTER.

JOINTS DETAILED ON THE PLANS SHALL SUPERSEDE THOSE SPECIFIED ON THIS STANDARD PLAN.

BOTTOM SLOPE OF CURB AND GUTTER STRUCTURE MAY BE THE SAME SLOPE AS BOTTOM OF PAVEMENT. BACK OF CURB AND VERTICAL EDGE OF GUTTER PAN MAY HAVE A MAXIMUM ½″ BATTER TO FACILITATE FORMING.

WHEN CURB AND GUTTER IS CAST INTEGRALLY, SEE CURRENT STANDARD PLAN R-31-SERIES.

ALL JOINTS FOR CURB OR CURB AND GUTTER ARE INCLUDED IN THE PAY ITEM FOR THE CURB OR CURB AND GUTTER.

JOINTS IN CURB OR CURB AND GUTTER NOT TIED TO CONCRETE PAVEMENT; ADJACENT TO CONCRETE BASE COURSE; OR ADJACENT TO HMA PAVEMENT:

A. PLACE 1″ FIBER JOINT FILLER AT 400′ MAXIMUM INTERVALS.

B. PLACE 1″ FIBER JOINT FILLER AT SPRING POINTS OF INTERSECTING STREETS.

C. PLACE ½″ ISOLATION JOINT AT CATCH BASINS PER STANDARD PLAN R-37-SERIES.

D. PLACE CONTRACTION JOINTS AT 40′ MAXIMUM INTERVALS.

JOINTS IN CURB OR CURB AND GUTTER TIED TO JOINTED PAVEMENT

A. PLACE 1″ FIBER JOINT FILLER OPPOSITE ALL TRANSVERSE EXPANSION JOINTS IN PAVEMENT.

B. PLACE ½″ ISOLATION JOINT AT CATCH BASINS PER STANDARD PLAN R-37-SERIES.

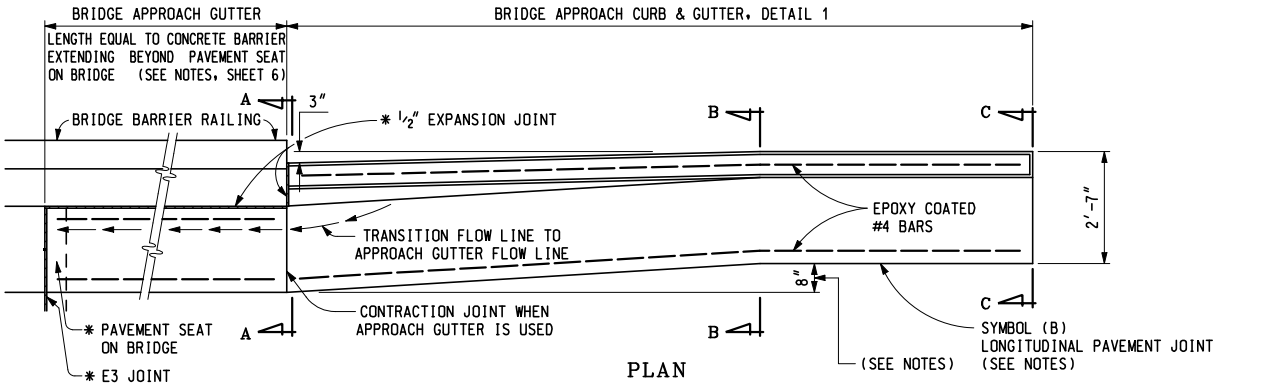
C. PLACE CONTRACTION JOINTS OPPOSITE ALL TRANSVERSE CONTRACTION JOINTS IN PAVEMENT.

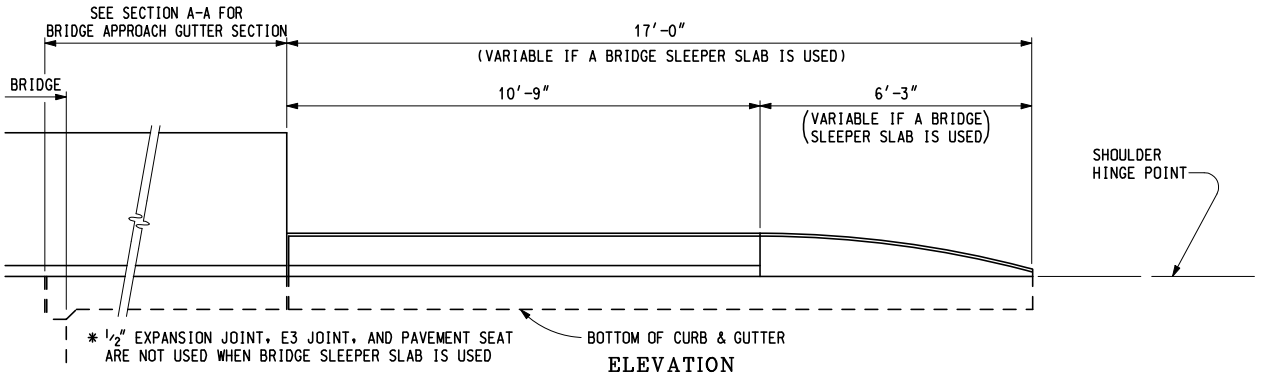
D. A SYMBOL (B) JOINT SHALL BE PLACED BETWEEN CURB OR CURB AND GUTTER AND ADJACENT CONCRETE PAVEMENT AS SPECIFIED ON STANDARD PLAN R-41-SERIES.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

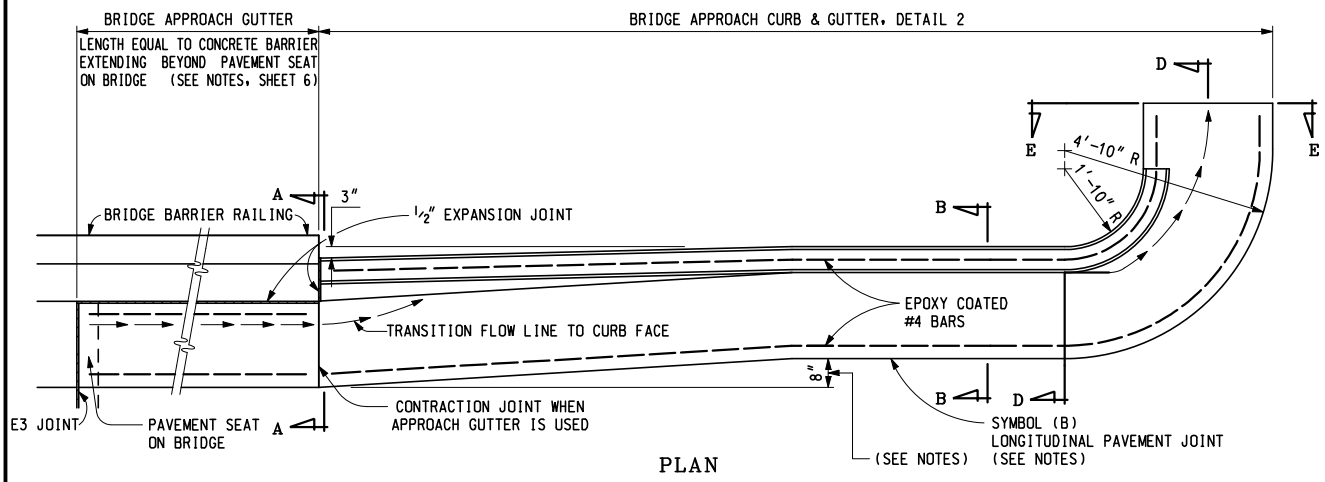
CONCRETE CURB AND CONCRETE CURB & GUTTER

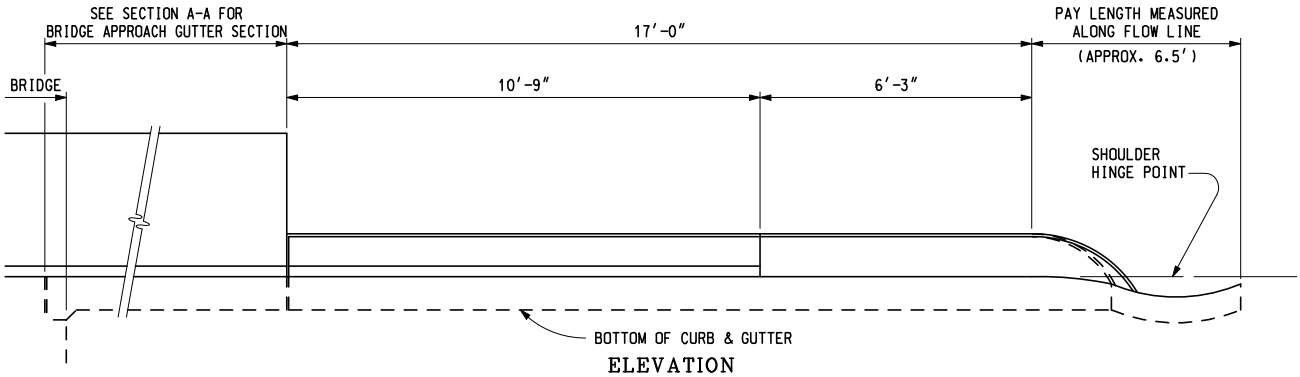
9-30-2014 F.H.W.A. APPROVAL	2-6-2014 PLAN DATE	R-30-G	SHEET 2 OF 2





BRIDGE APPROACH CURB & GUTTER, DETAIL 1





BRIDGE APPROACH CURB & GUTTER, DETAIL 2

MDOT Michigan Department of Transportation

PREPARED BY DESIGN SUPPORT AREA

DRAWN BY: B.L.T.

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ENGINEER OF CONSTRUCTION & TECHNOLOGY

ENGINEER OF MAINTENANCE

ENGINEER OF TRAFFIC AND SAFETY

ENGINEER OF DESIGN SUPPORT AREA

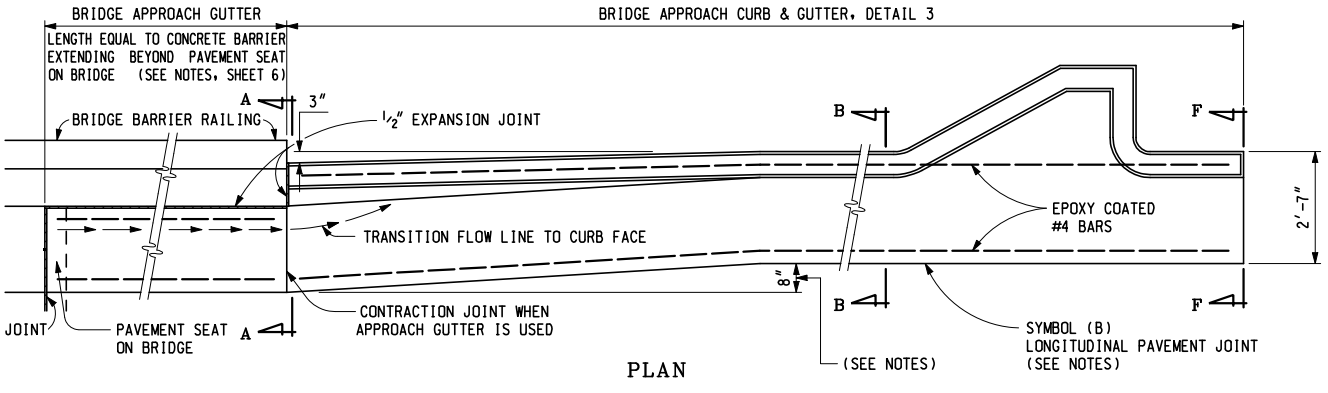
DEPARTMENT DIRECTOR
Gloria J. Jeff

ENGINEER OF DEVELOPMENT

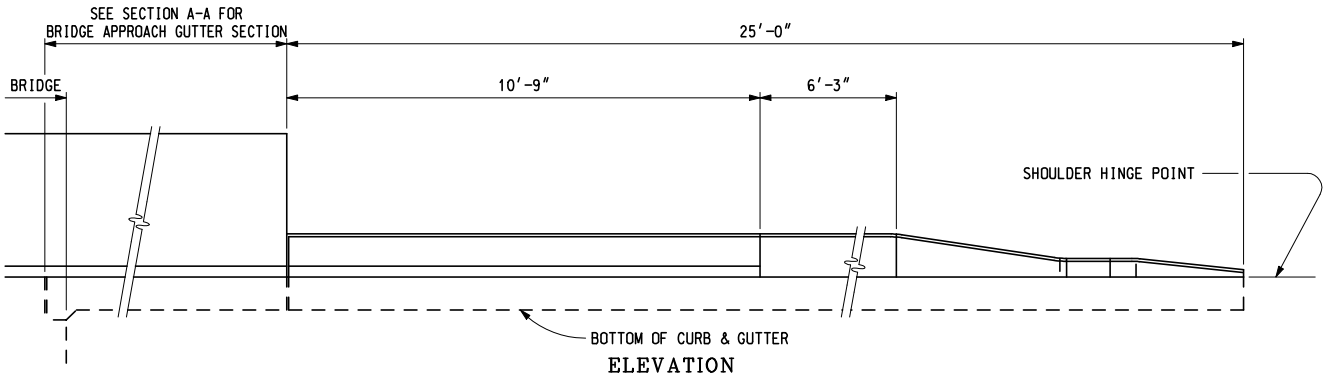
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

APPROACH CURB & GUTTER DOWNSPOUTS
(FOR BRIDGE BARRIER ON RURAL HIGHWAYS)

10-27-2004	4-28-2004	R-32-E	SHEET 1 OF 6
F.H.W.A. APPROVAL	PLAN DATE		

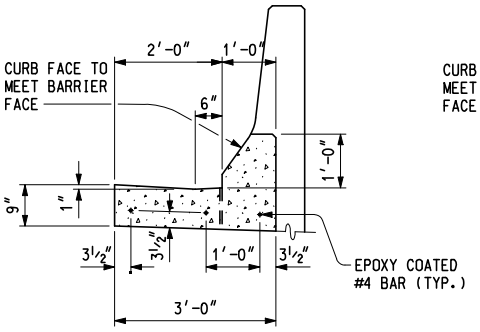


PLAN

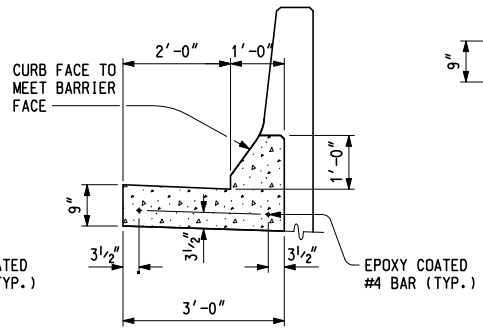


ELEVATION

BRIDGE APPROACH CURB & GUTTER, DETAIL 3

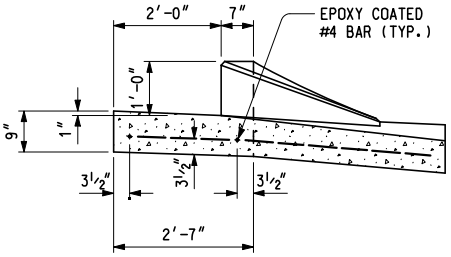


CROSS SECTION WHEN APPROACH GUTTER IS USED

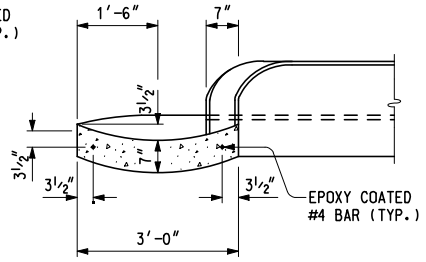


CROSS SECTION WHEN APPROACH GUTTER IS NOT USED

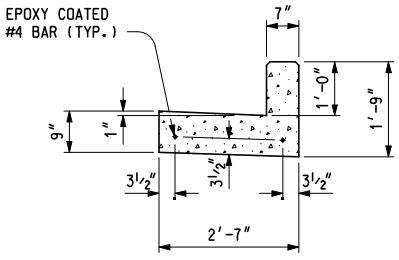
SECTION A - A
(SEE NOTES, SHEET 6)



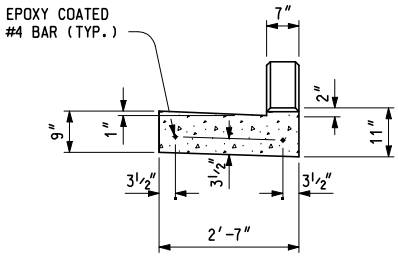
SECTION D - D



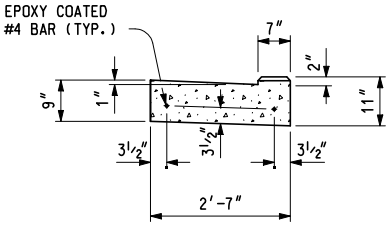
SECTION E - E



SECTION B - B



SECTION C - C



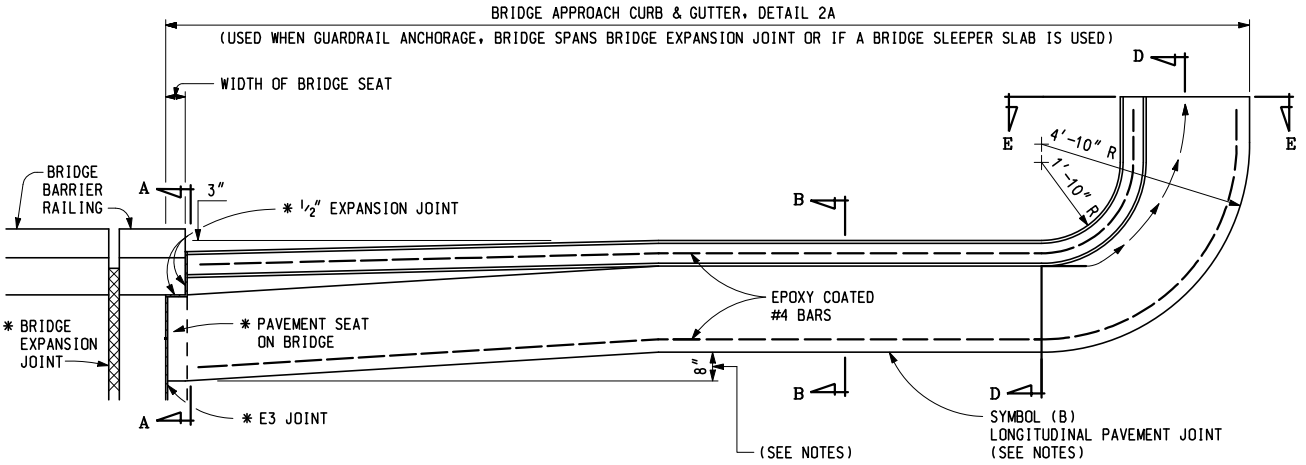
SECTION F - F

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

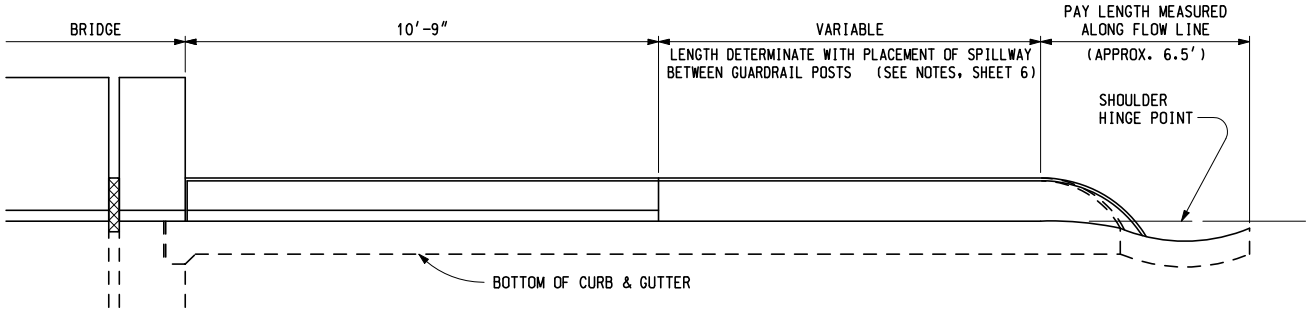
APPROACH CURB & GUTTER DOWNSPOUTS

(FOR BRIDGE BARRIER ON RURAL HIGHWAYS)

10-27-2004 F.H.W.A. APPROVAL	4-28-2004 PLAN DATE	R-32-E	SHEET 2 OF 6

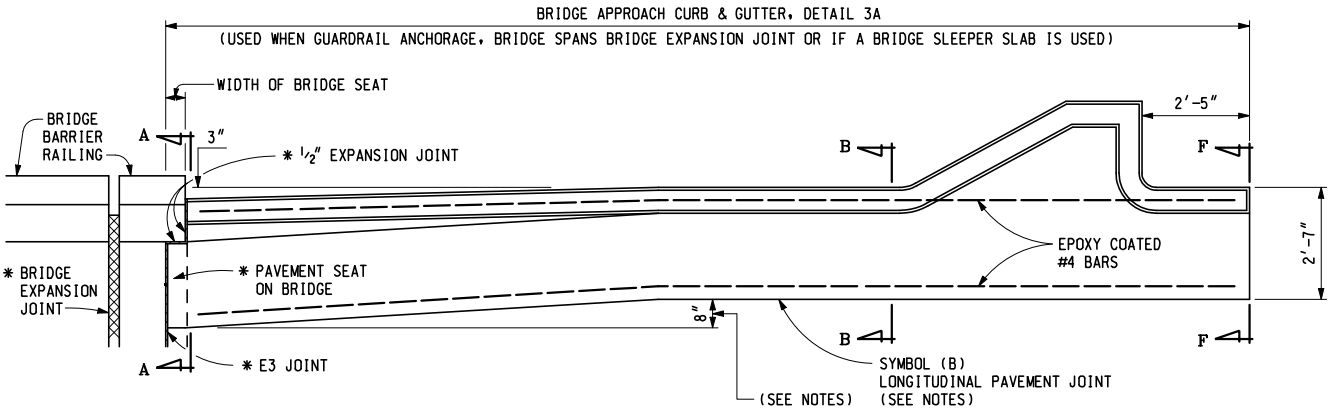


PLAN

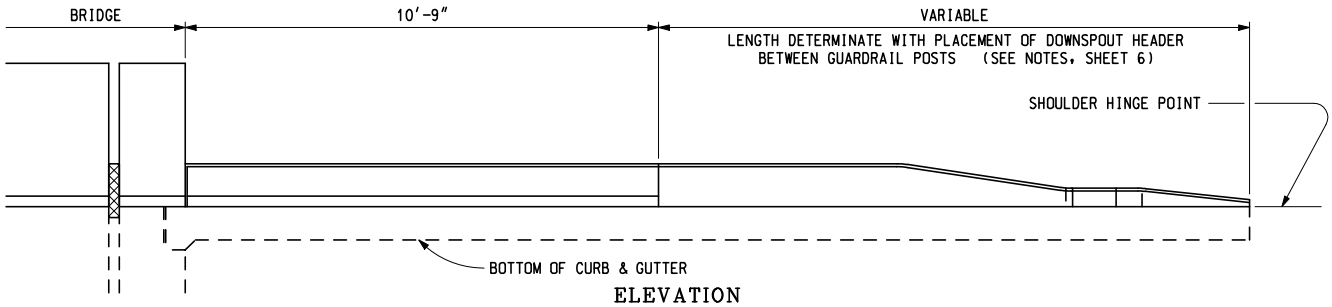


ELEVATION

BRIDGE APPROACH CURB & GUTTER, DETAIL 2A



PLAN



ELEVATION

BRIDGE APPROACH CURB & GUTTER, DETAIL 3A

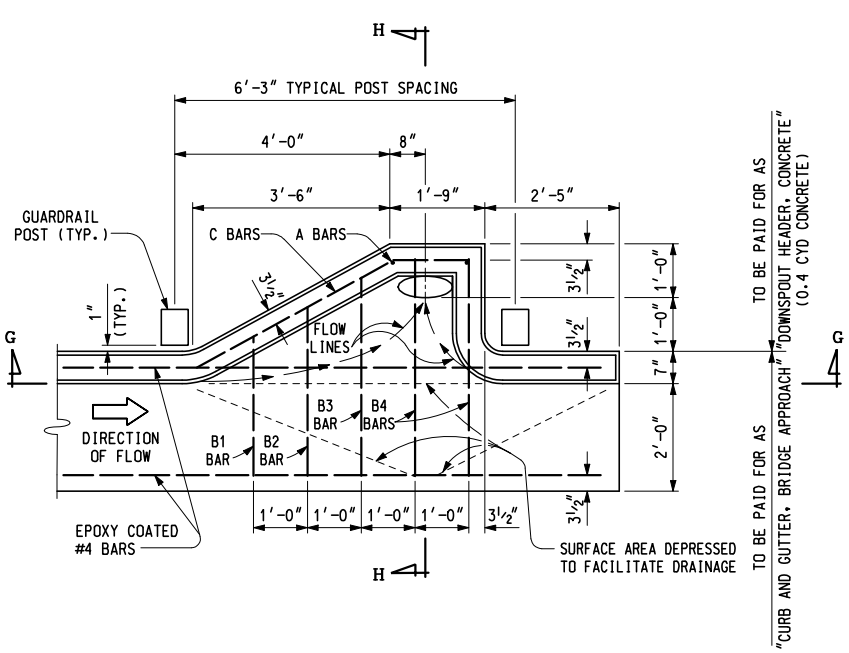
* BRIDGE EXPANSION JOINT, 1/2" EXPANSION JOINT, E3 JOINT, AND PAVEMENT SEAT ARE NOT USED WHEN BRIDGE SLEEPER SLAB IS USED

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

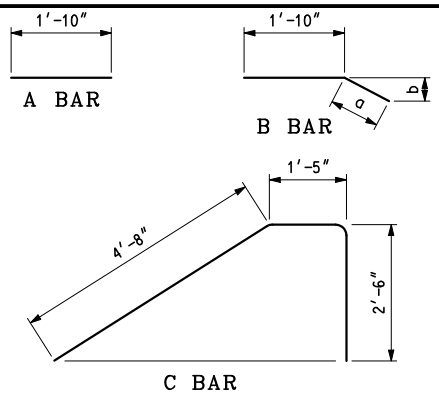
APPROACH CURB & GUTTER DOWNSPOUTS

(FOR BRIDGE BARRIER ON RURAL HIGHWAYS)

10-27-2004 F.H.W.A. APPROVAL	4-28-2004 PLAN DATE	R-32-E	SHEET 3 OF 6



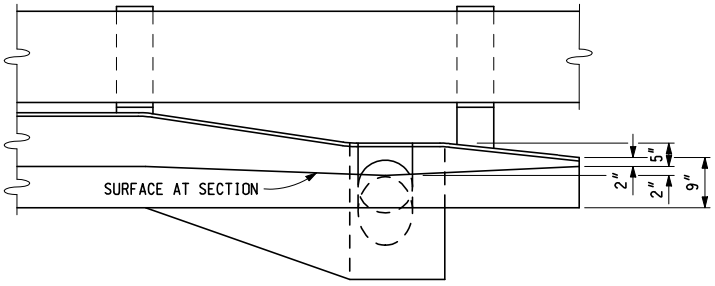
PLAN OF CONCRETE DOWNSPOUT HEADER



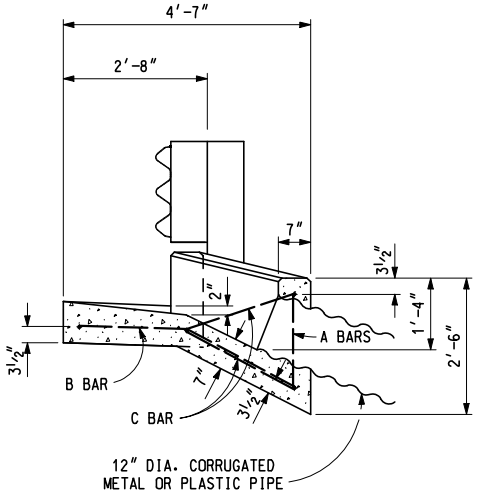
NOTE: ALL BARS ARE EPOXY COATED

DOWNSPOUT STEEL REINFORCEMENT

BAR	DIMENSIONS a	DIMENSIONS b	BAR SIZE	NUMBER REQUIRED	TOTAL LENGTH
A			#4	2	3′-8″
B1	11″	5″	#4	1	2′-9″
B2	1′-7″	8½″	#4	1	3′-5″
B3	2′-3″	1′-0″	#4	1	4′-1″
B4	2′-7″	1′-2″	#4	2	8′-10″
C			#4	2	17′-2″
TOTAL WEIGHT OF STEEL 26.7 LBS					

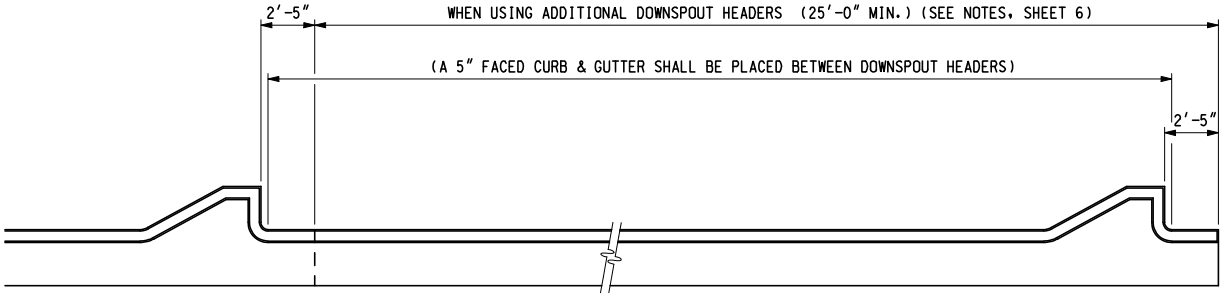


SECTION G - G



SECTION H - H

DETAIL SHOWS RELATIONSHIP OF GUARDRAIL WITH DOWNSPOUT HEADER



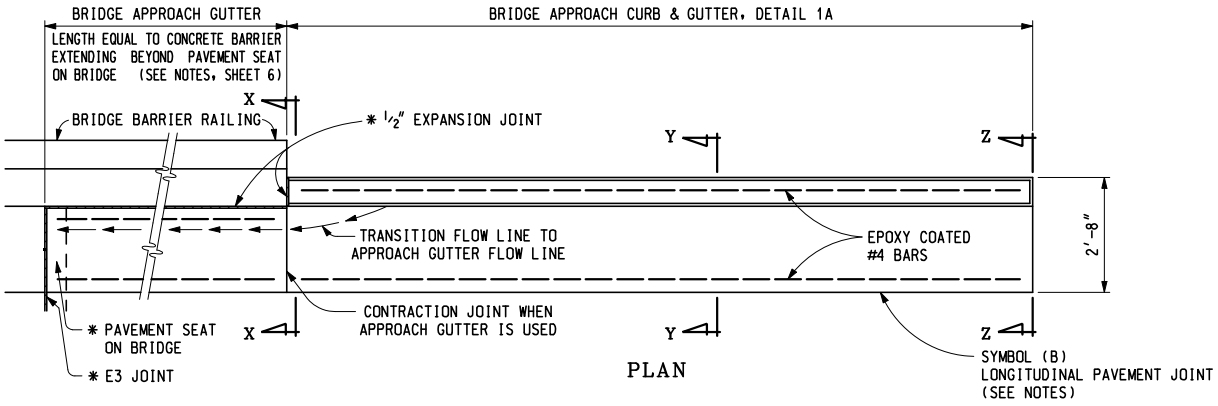
PLAN OF ADDITIONAL CONCRETE DOWNSPOUT HEADERS

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

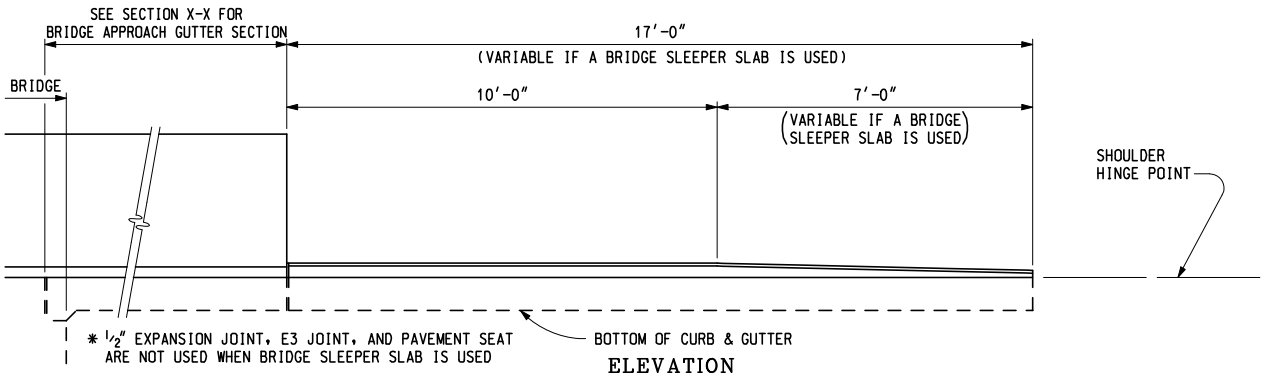
APPROACH CURB & GUTTER DOWNSPOUTS

(FOR BRIDGE BARRIER ON RURAL HIGHWAYS)

10-27-2004 F.H.W.A. APPROVAL	4-28-2004 PLAN DATE	R-32-E	SHEET 4 OF 6



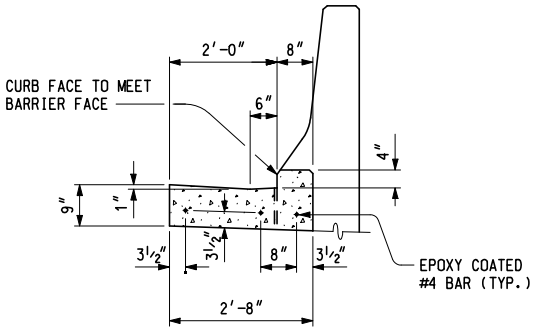
PLAN



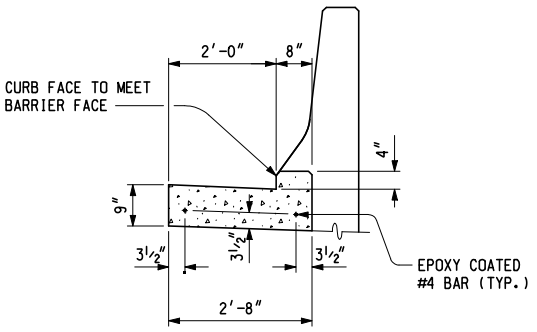
ELEVATION

BRIDGE APPROACH CURB & GUTTER, DETAIL 1A

NOTE: FOR USE PRIMARILY WHEN GUARDRAIL IS NOT NEEDED ON DEPARTING ENDS, BUT CAN BE USED WITH GUARDRAIL WHEN DRAINAGE CONDITIONS ALLOW.



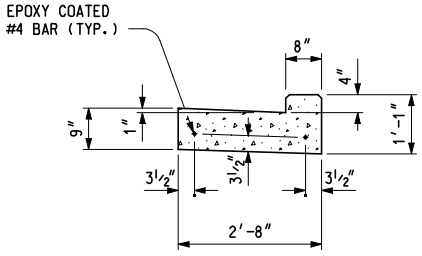
CROSS SECTION WHEN DEPARTING GUTTER IS USED



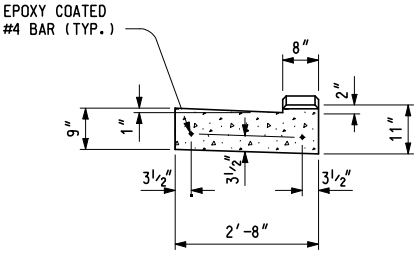
CROSS SECTION WHEN DEPARTING GUTTER IS NOT USED

SECTION X - X

(SEE NOTES, SHEET 6)



SECTION Y - Y



SECTION Z - Z

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

APPROACH CURB & GUTTER DOWNSPOUTS

(FOR BRIDGE BARRIER ON RURAL HIGHWAYS)

10-27-2004 F.H.W.A. APPROVAL	4-28-2004 PLAN DATE	R-32-E	SHEET 5 OF 6

NOTES:

ALL MATERIALS AND WORKMANSHIP SHALL BE ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS FOR CONCRETE CURB AND GUTTER.

FOR TYPE OF BRIDGE APPROACH CURB AND GUTTER TO USE AT A SPECIFIC LOCATION, SEE BRIDGE APPROACH PLANS.

SEE STANDARD PLAN R-27-SERIES FOR BRIDGE APPROACH CURB AND GUTTER USING EXISTING CATCH BASIN.

THE LENGTH OF BRIDGE APPROACH GUTTER (USED WHEN THE BRIDGE BARRIER RAILING EXTENDS BEYOND PAVEMENT SEAT ON BRIDGE) SHALL BE INCLUDED IN THE PAY ITEM "CURB AND GUTTER, BRIDGE APPROACH". OMIT BRIDGE APPROACH GUTTER WHEN CONCRETE BARRIER ENDS AT PAVEMENT SEAT ON BRIDGE. (SEE SECTION A-A)

THE CURB AND GUTTER SHALL BE ALIGNED WITH THE BEAM GUARDRAIL AS SPECIFIED ON STANDARD PLAN R-67-SERIES. THE LOCATION OF GUARDRAIL POSTS SHOULD BE DETERMINED PRIOR TO LOCATING THE SPILLWAY OR DOWNSPOUT HEADER.

THE AREA BETWEEN THE EDGE OF THE PAVEMENT AND THE GUTTER SHALL BE SURFACED WITH THE SAME MATERIAL AS THE SHOULDERS, EXCEPT IN THE CASE OF AGGREGATE SHOULDERS, WHERE A BITUMINOUS TREATMENT WILL BE REQUIRED.

ALL EXPANSION JOINTS REQUIRED WILL BE INCLUDED IN THE PAY ITEM FOR BRIDGE APPROACH CURB AND GUTTER.

JOINTS SHALL BE AS SPECIFIED ON STANDARD PLAN R-30-SERIES.

ALL EXPOSED EDGES SHALL BE CHAMFERED $^{3}/_{4}$".

THE CONCRETE DOWNSPOUT HEADER SHALL BE USED IN CONJUNCTION WITH BRIDGE APPROACH CURB AND GUTTER, DETAILS 3 AND 3A.

CORRUGATED PIPE WILL BE PAID FOR SEPARATELY.

WHEN THE DRAINAGE AREA REQUIRES ADDITIONAL CONCRETE DOWNSPOUT HEADERS, SPACING OF THE SECOND AND/OR ADDITIONAL DOWNSPOUT HEADERS SHOULD BE DETERMINED ACCORDING TO THEIR INDIVIDUAL DRAINAGE AREAS. ADDITIONAL DOWNSPOUT HEADERS ARE TO BE LOCATED BETWEEN GUARDRAIL POSTS AS SPECIFIED ON THE PLAN OF CONCRETE DOWNSPOUT HEADER.

A SYMBOL (B) JOINT SHALL BE PLACED BETWEEN CURB OR CURB AND GUTTER AND ADJACENT CONCRETE PAVEMENT AS SPECIFIED ON STANDARD PLAN R-41-SERIES.

THE 8" ALIGNMENT OFFSET IS REQUIRED FOR GUTTER PAN AND CURB FACE FOR BRIDGE RAILING, TYPE 4 OR TYPE 5 ONLY. OTHERWISE, ALIGN THE APPROACH CURB AND GUTTER WITH THE BARRIER FACE, BRUSH BLOCK, OR SIDEWALK CURB.

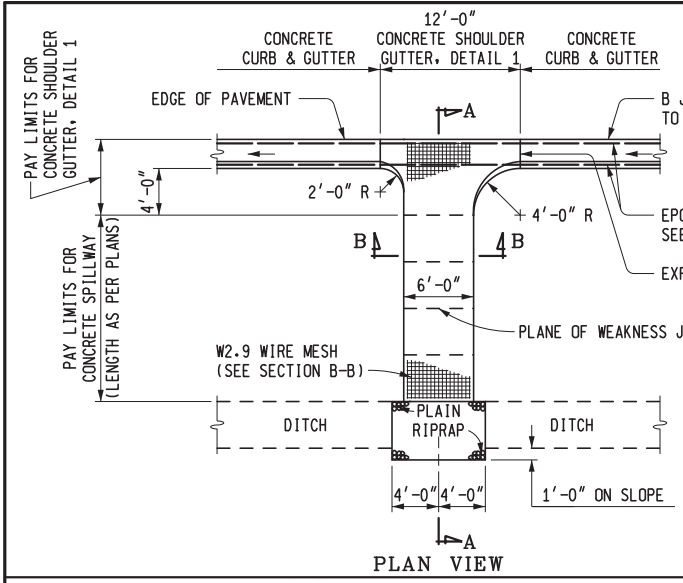
MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

APPROACH CURB & GUTTER DOWNSPOUTS

(FOR BRIDGE BARRIER ON RURAL HIGHWAYS)

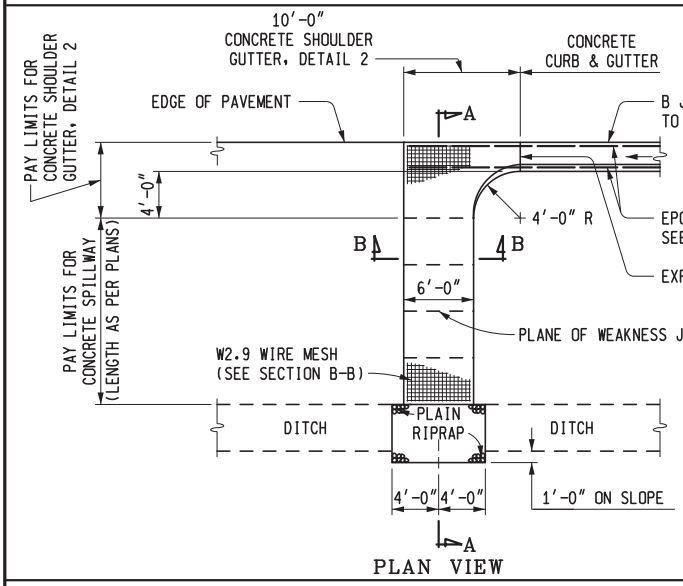
10-27-2004 F.H.W.A. APPROVAL	4-28-2004 PLAN DATE	R-32-E	SHEET 6 OF 6



COMPONENTS OF CONCRETE SHOULDER GUTTER, DETAIL 1		
CURB & GUTTER DETAIL	STEEL REINFORCEMENT LBS	CONCRETE CYD
C1 OR C2	39	1.5
C3 OR C4	39	1.7
C5 OR C6	39	1.8
D1 OR D2	39	1.8

DETAIL 1

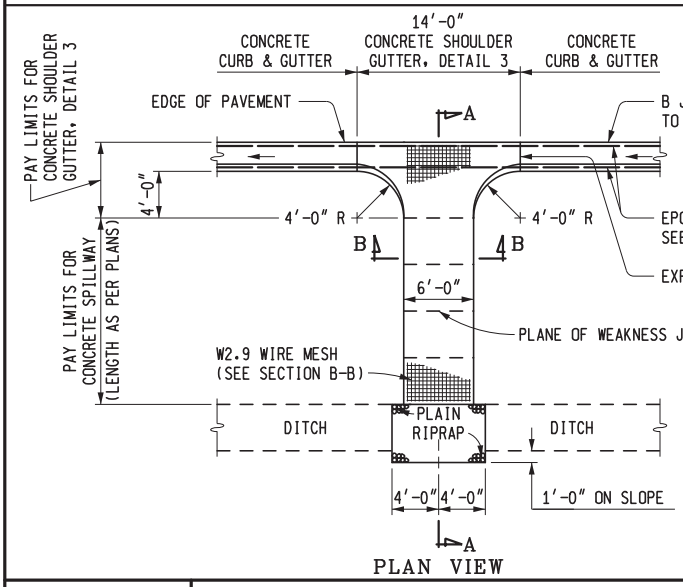
USED AS INTERMEDIATE OPENING IN CURB & GUTTER



COMPONENTS OF CONCRETE SHOULDER GUTTER, DETAIL 2		
CURB & GUTTER DETAIL	STEEL REINFORCEMENT LBS	CONCRETE CYD
C1 OR C2	36	1.4
C3 OR C4	36	1.5
C5 OR C6	36	1.7
D1 OR D2	36	1.6

DETAIL 2

USED AT END OF CURB



COMPONENTS OF CONCRETE SHOULDER GUTTER, DETAIL 3		
CURB & GUTTER DETAIL	STEEL REINFORCEMENT LBS	CONCRETE CYD
C1 OR C2	41	1.7
C3 OR C4	41	1.9
C5 OR C6	41	2.1
D1 OR D2	41	2.1

DETAIL 3

USED AT LOW POINT IN GUTTER LINE

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Steudle

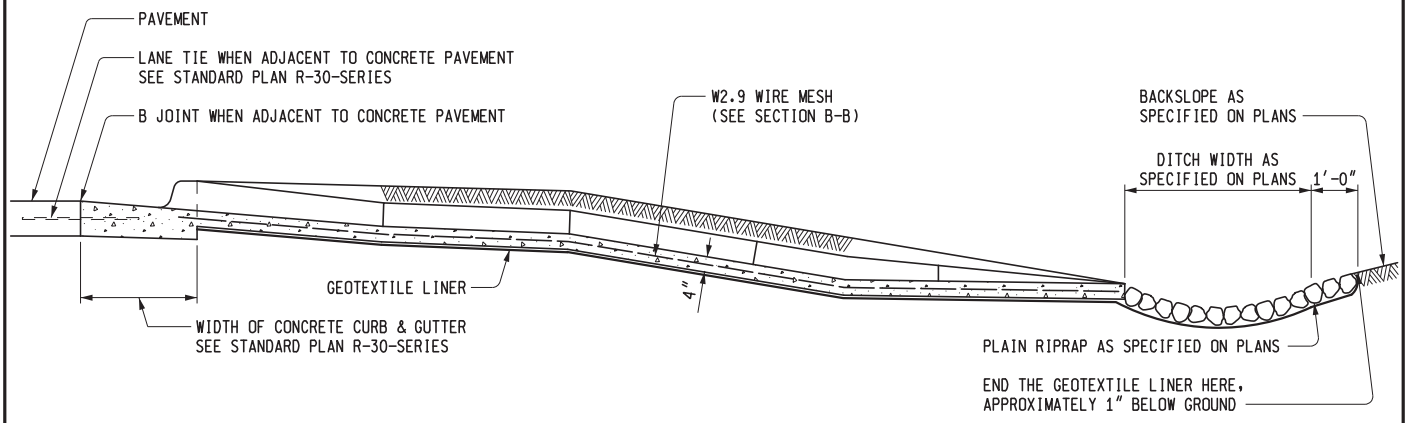
APPROVED BY: Kimberly Avery
Digitally signed by Kimberly Avery
DN: cn=Kimberly Avery, o=MDOT, ou=Bureau of Field Services, email=averyk@michigan.gov, c=US
Date: 2016.12.15 08:59:57 -05'00'
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: Bradley C. Wieferich
Digitally signed by Bradley C. Wieferich
DN: cn=Bradley C. Wieferich, o=Michigan Department of Transporation, ou=Design Division, email=wieferichb@michigan.gov, c=US
Date: 2016.12.10 09:51:10 -05'00'
DIRECTOR, BUREAU OF DEVELOPMENT

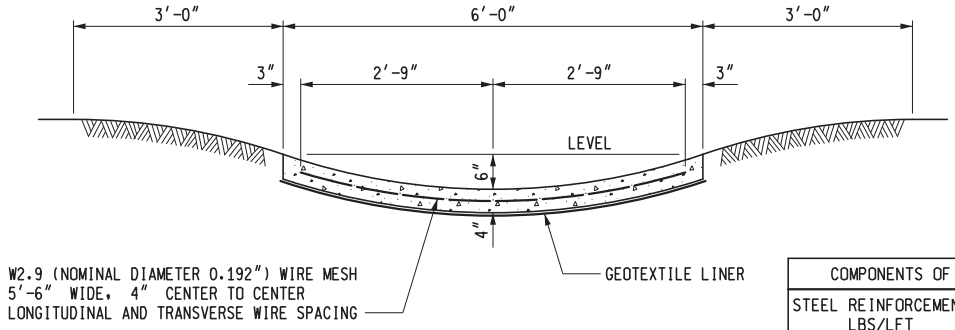
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

CONCRETE SHOULDER GUTTER AND SPILLWAY

7-25-2017	10-28-2016	R-35-D	SHEET 1 OF 2
F.H.W.A. APPROVAL	PLAN DATE		



SECTION A - A



COMPONENTS OF CONCRETE SPILLWAY	
STEEL REINFORCEMENT LBS/LFT	CONCRETE CYD/LFT
3.56	0.074

SECTION B - B

NOTES:

A GRADUAL UNIFORM TRANSITION SHALL BE MADE FROM THE STANDARD CONCRETE CURB AND GUTTER TO THE CONCRETE SPILLWAY.

PLANE OF WEAKNESS JOINT SPACING SHALL BE AT UNIFORM INTERVALS OF APPROXIMATELY 4'-0".

THE SPILLWAY SHOULDERS AND FORESLOPES WILL BE UNDERLAID WITH GEOTEXTILE LINER FROM THE BACK SIDE OF CURB TO THE FAR END OF THE PLAIN RIPRAP INCLUDING THE ENTIRE FOOTPRINT OF THE PLAIN RIPRAP.

WHEN USING SPILLWAYS IN OTHER AREAS, SUCH AS BACKSLOPES, THE GEOTEXTILE LINER SHALL UNDERLAY THE FULL LENGTH OF THE SPILLWAY AND THE ENTIRE FOOTPRINT OF THE PLAIN RIPRAP. THE GEOTEXTILE LINER SHALL HAVE A MINIMUM WIDTH EQUAL TO THE WIDTH OF THE SPILLWAY.

THE SPILLWAY SHALL BE GIVEN A TRANSVERSE COARSE BROOM FINISH.

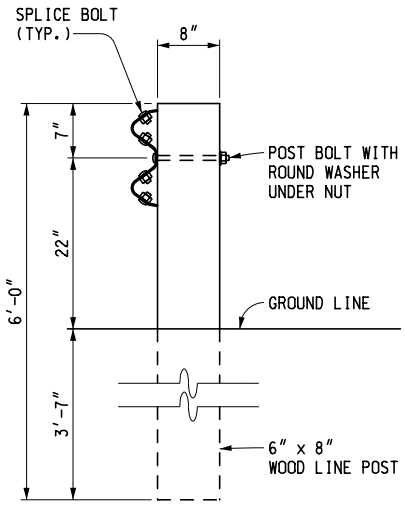
WHILE CONCRETE SPILLWAY IS SHOWN ON THE FORESLOPE, IT MAY BE USED ON THE BACKSLOPE, AS SPECIFIED ON THE PLANS. CONCRETE SHOULDER GUTTER WOULD BE CORRESPONDINGLY OMITTED.

THE CURB AND GUTTER SHALL BE ALIGNED WITH THE BEAM GUARDRAIL AS SPECIFIED ON STANDARD PLAN R-67-SERIES. THE LOCATION OF GUARDRAIL POSTS SHOULD BE DETERMINED PRIOR TO LOCATING THE SPILLWAY OR DOWNSPOUT HEADER.

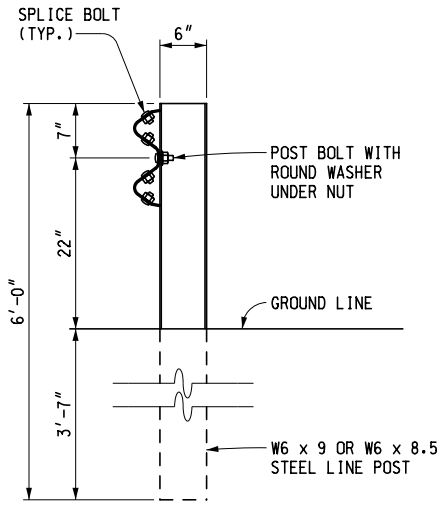
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

CONCRETE SHOULDER GUTTER AND SPILLWAY

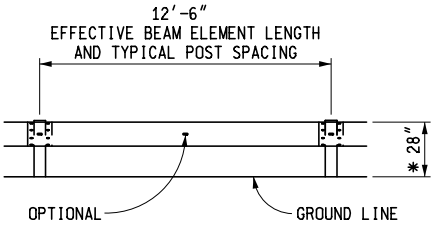
7-25-2017 F.H.W.A. APPROVAL	10-28-2016 PLAN DATE	R-35-D	SHEET 2 OF 2



WOOD POST



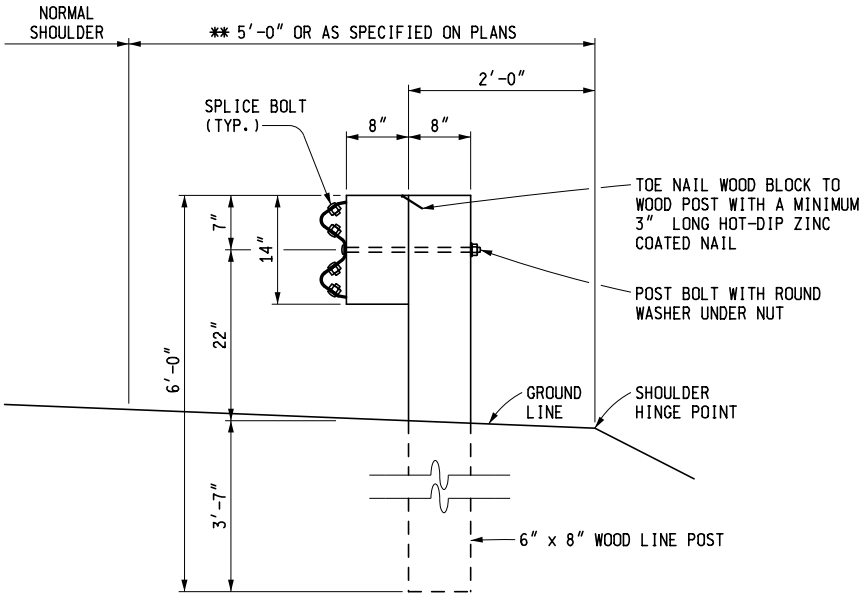
STEEL POST



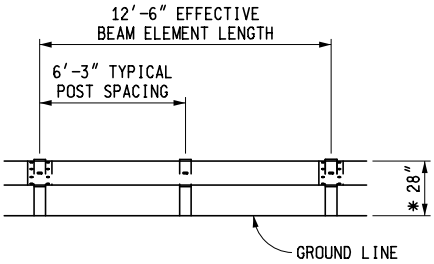
ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUARDRAIL, TYPE A



** FOR PAVED SHOULDER WIDTHS OF AT LEAST 12′, USE 3′-0″.

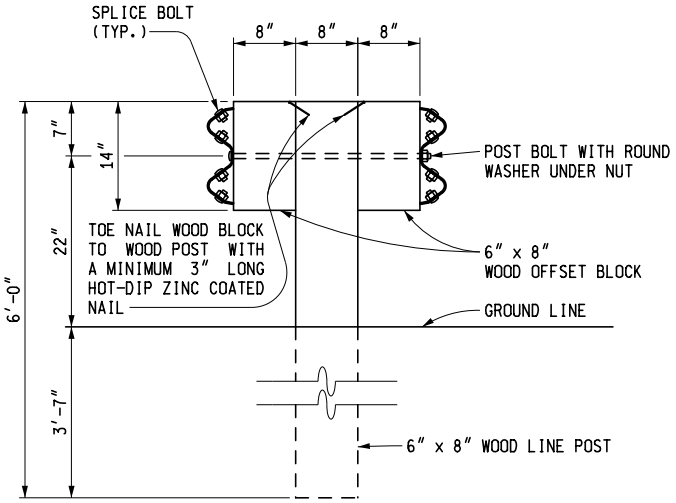


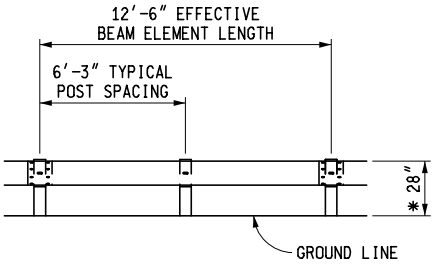
ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUARDRAIL, TYPE B
(WOOD POST)

MDOT Michigan Department of Transportation PREPARED BY DESIGN DIVISION DRAWN BY: B.L.T. CHECKED BY: W.K.P.	DEPARTMENT DIRECTOR Kirk T. Steudle APPROVED BY: _____ DIRECTOR, BUREAU OF FIELD SERVICES APPROVED BY: _____ DIRECTOR, BUREAU OF DEVELOPMENT	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D		
		F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 1 OF 16

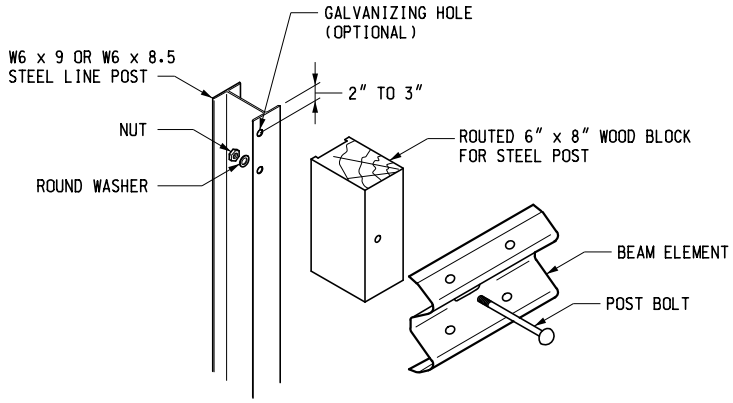


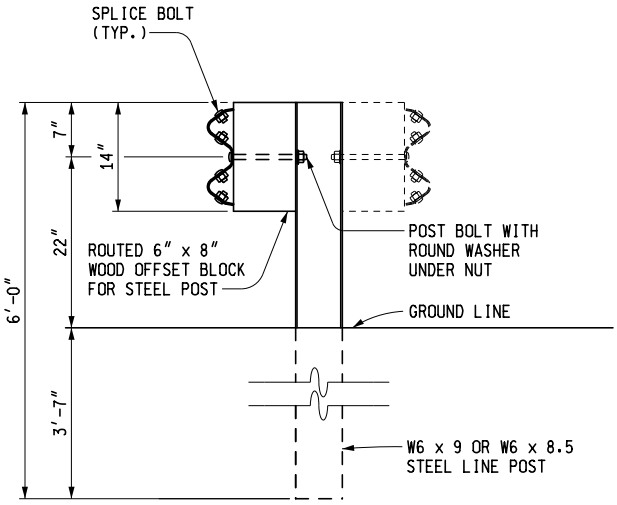


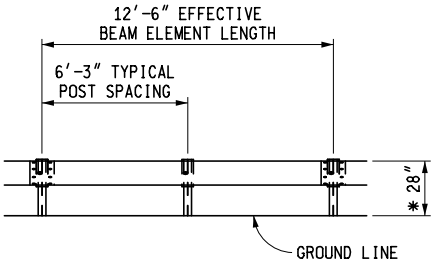
ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUARDRAIL, TYPE BD
(WOOD POST)







ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

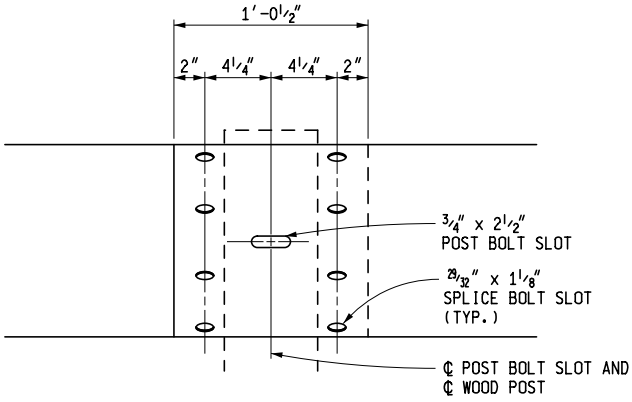
GUARDRAIL, TYPE B (OR BD)
(STEEL POST)

MICHIGAN DEPARTMENT OF TRANSPORTATION

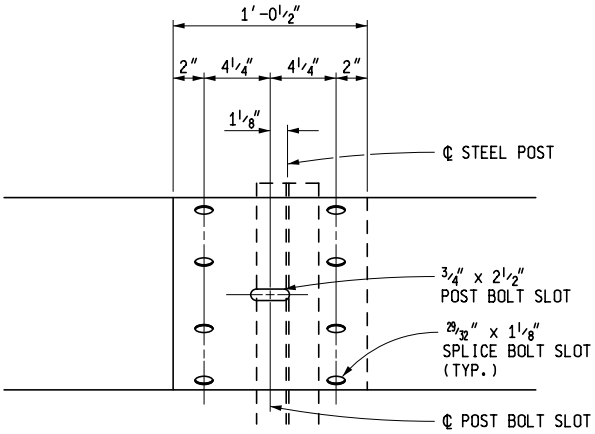
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 2 OF 16

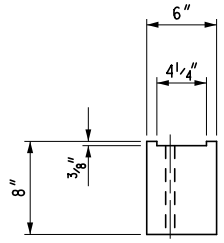


WOOD POST

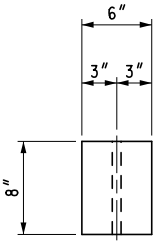


STEEL POST

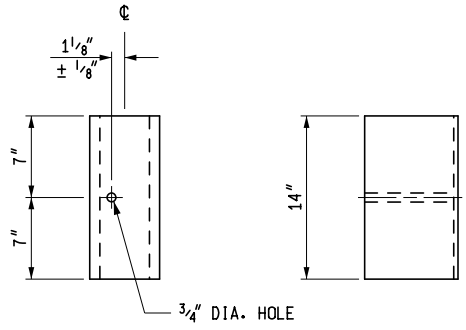
BEAM ELEMENT SPLICE DETAILS



TOP

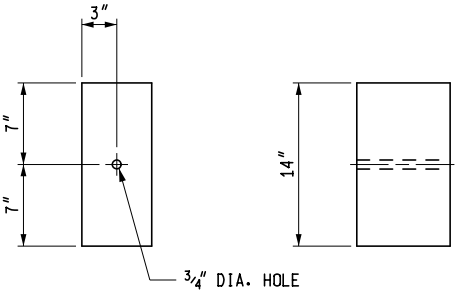


TOP



FRONT SIDE

FOR USE ON STEEL POSTS



FRONT SIDE

FOR USE ON WOOD POSTS

(SEE NOTES ON SHEET 16 OF 16)

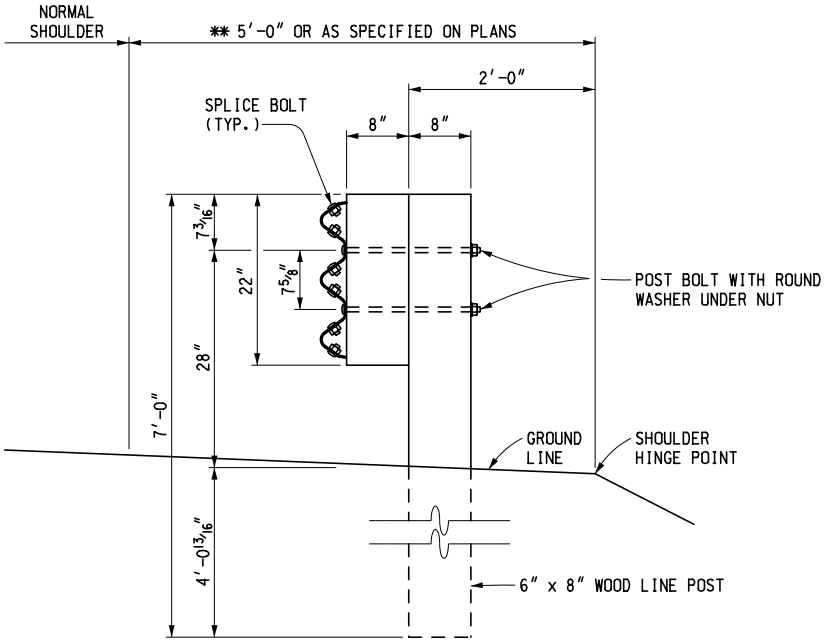
WOOD OFFSET BLOCKS FOR GUARDRAIL, TYPE B AND TYPE BD

MICHIGAN DEPARTMENT OF TRANSPORTATION

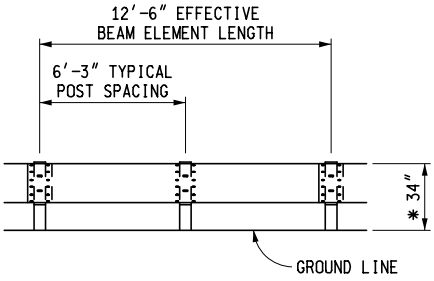
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 3 OF 16



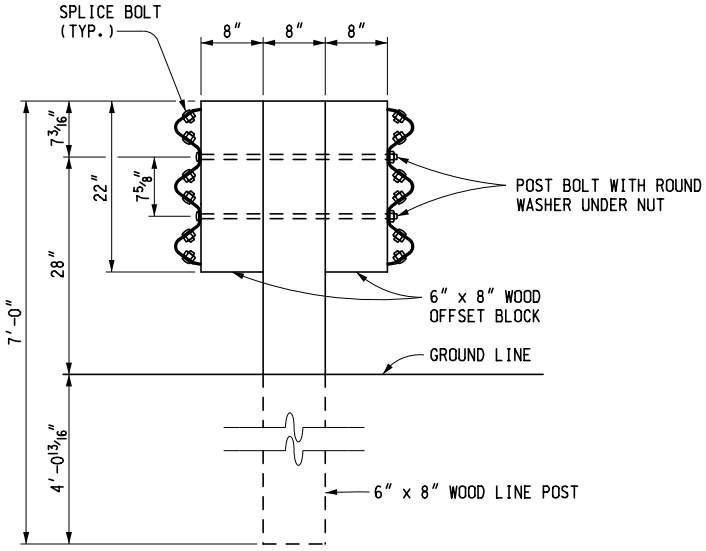
** FOR PAVED SHOULDER WIDTHS OF AT LEAST 12′, USE 3′-0″.

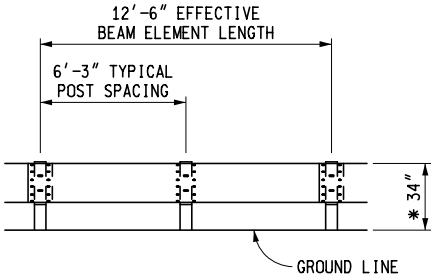


ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUARDRAIL, TYPE T
(WOOD POST)





ELEVATION SHOWING POST SPACING

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

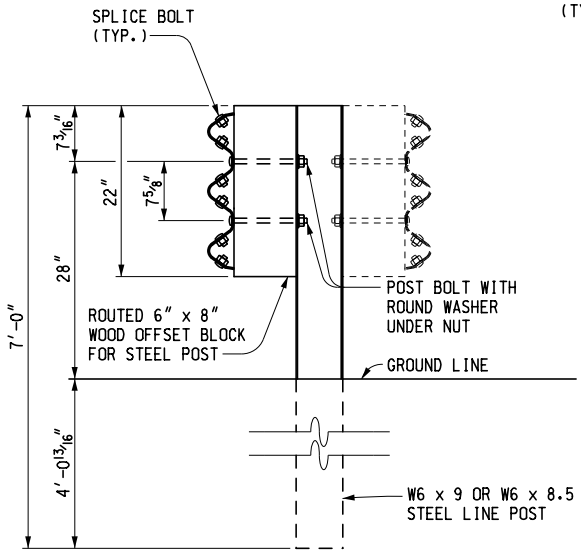
GUARDRAIL, TYPE TD
(WOOD POST)

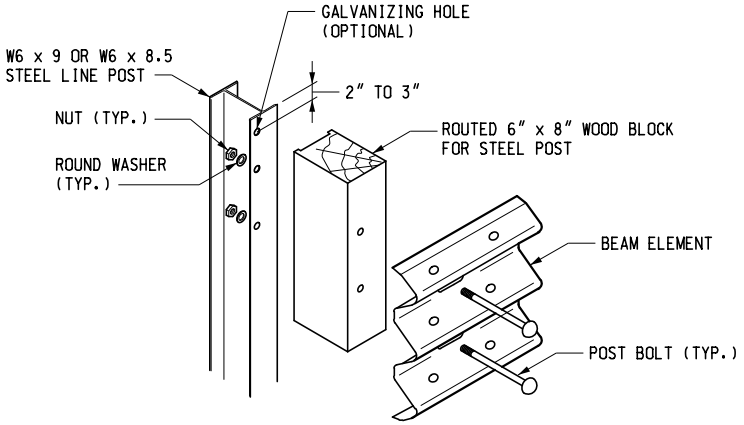
MICHIGAN DEPARTMENT OF TRANSPORTATION

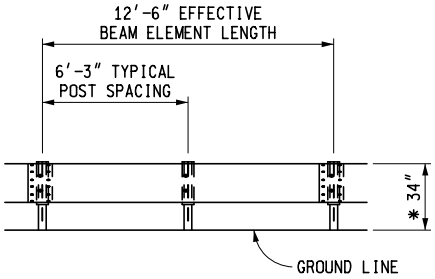
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 4 OF 16



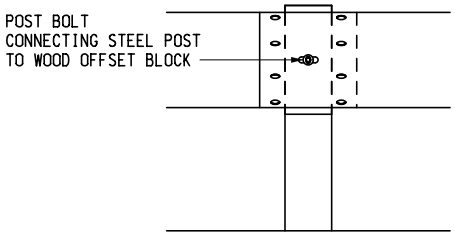




ELEVATION SHOWING POST SPACING

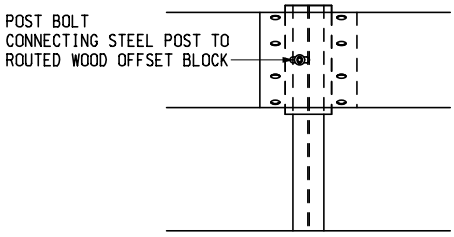
* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUARDRAIL, TYPE T OR TD
(STEEL POST)



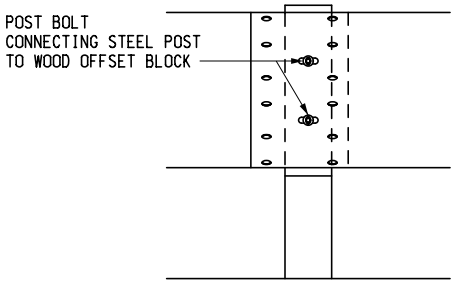
GUARDRAIL, TYPE B

WOOD POST



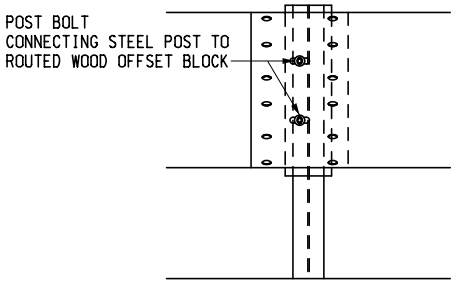
GUARDRAIL, TYPE B

STEEL POST



GUARDRAIL, TYPE T

WOOD POST



GUARDRAIL, TYPE T

STEEL POST

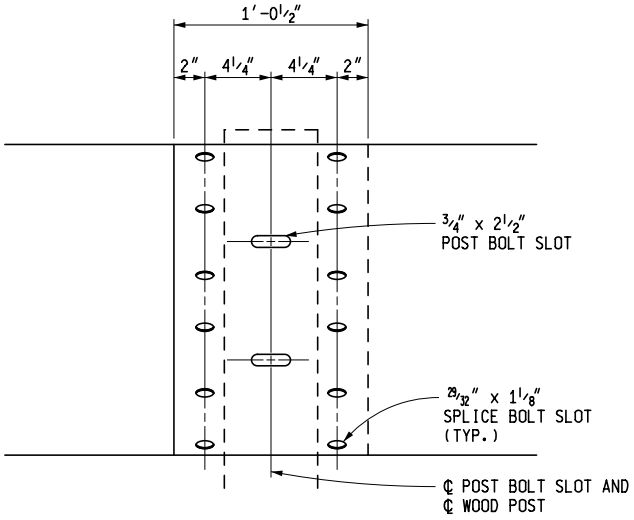
BLOCK AND POST CONNECTION DETAILS

MICHIGAN DEPARTMENT OF TRANSPORTATION

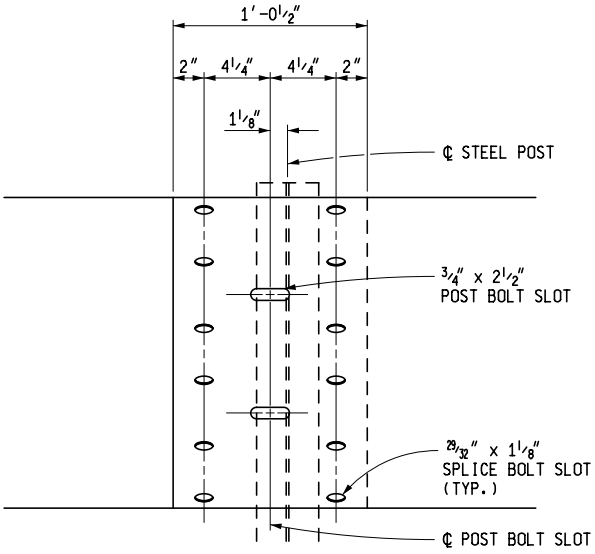
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 5 OF 16

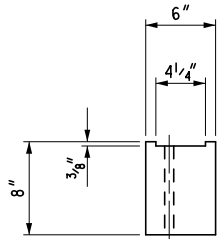


WOOD POST



STEEL POST

THRIE BEAM ELEMENT SPLICE DETAILS



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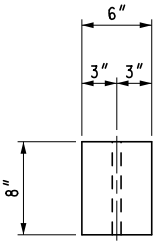

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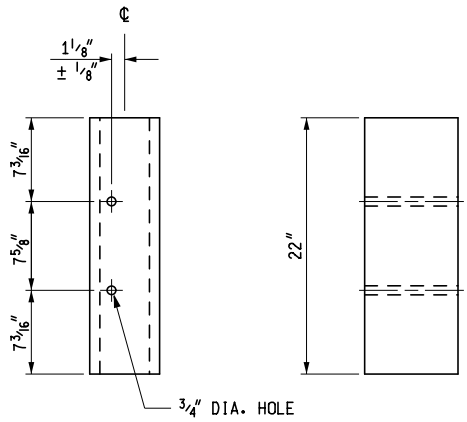
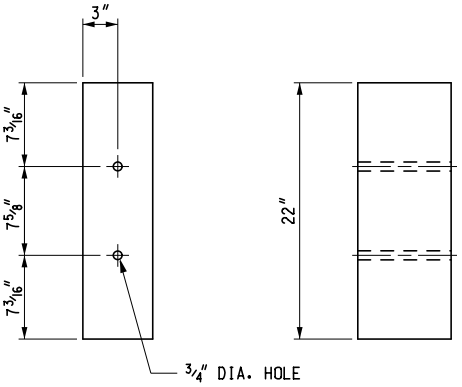


FRONT SIDE

FOR USE ON STEEL POSTS



FRONT SIDE

FOR USE ON WOOD POSTS

(SEE NOTES ON SHEET 16 OF 16)

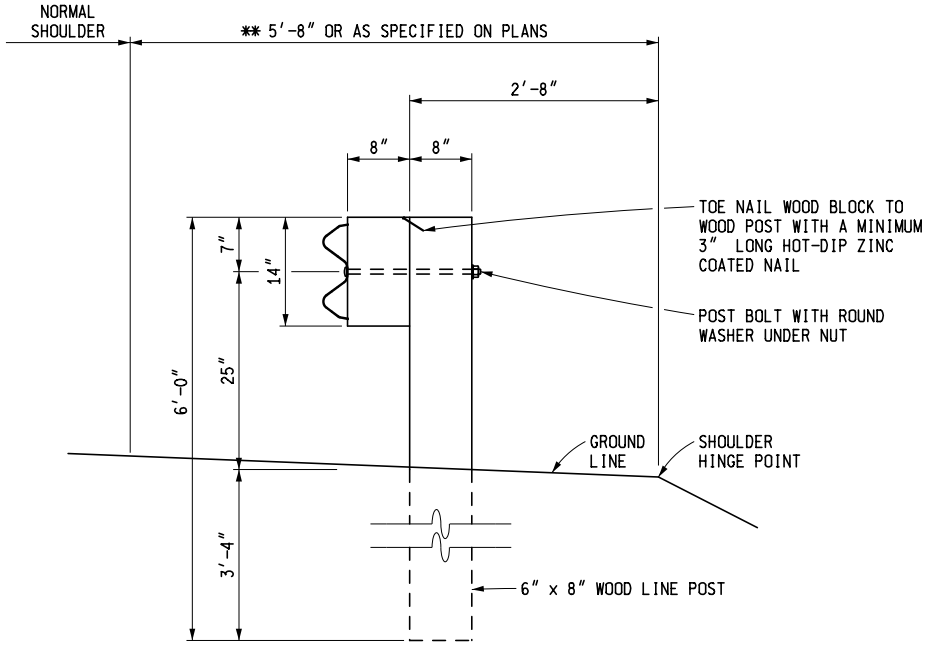
WOOD OFFSET BLOCKS FOR GUARDRAIL, TYPE T AND TYPE TD

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

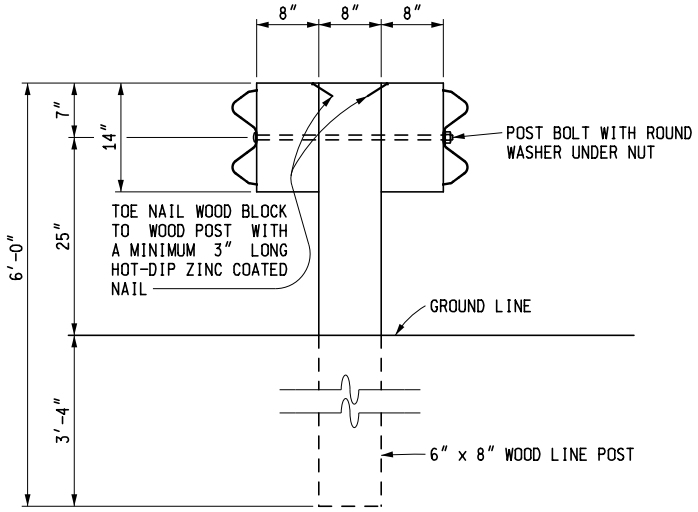
GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 6 OF 16



** FOR PAVED SHOULDER WIDTHS OF AT LEAST 12′, USE 3′-8″.

GUARDRAIL, TYPE MGS-8
(WOOD POST)



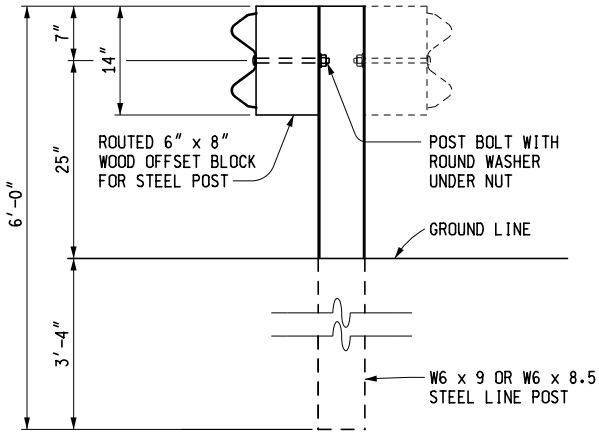
** FOR PAVED SHOULDER WIDTHS OF AT LEAST 12′, USE 3′-0″.

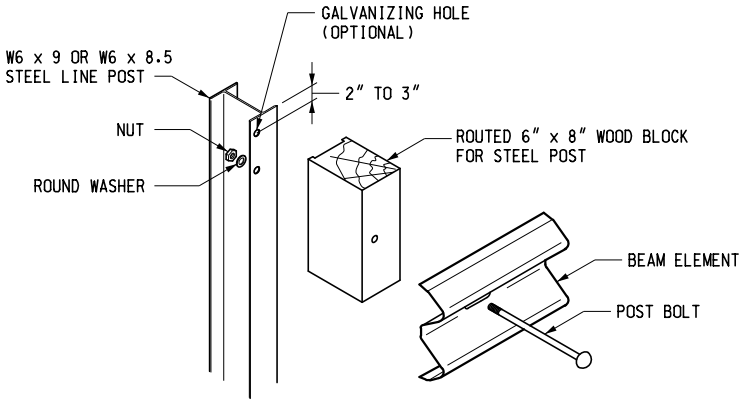
GUARDRAIL, TYPE MGS-8D
(WOOD POST)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 7 OF 16



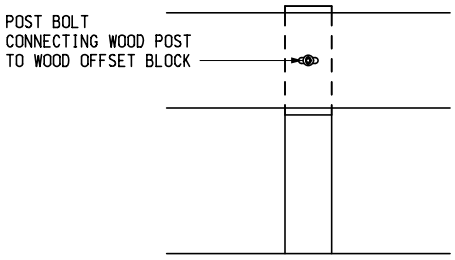


GUARDRAIL, TYPE MGS-8 (OR MGS-8D)
(STEEL POST)

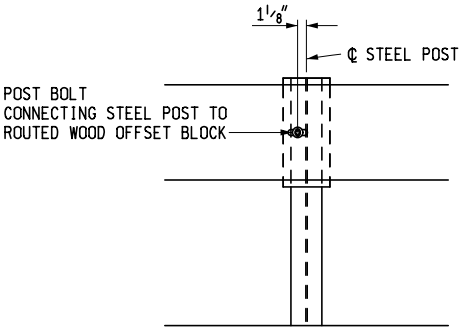
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 8 OF 16

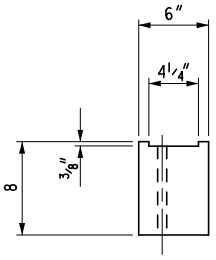


WOOD POST



STEEL POST

BLOCK AND POST CONNECTION DETAILS



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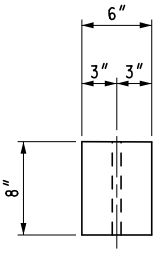

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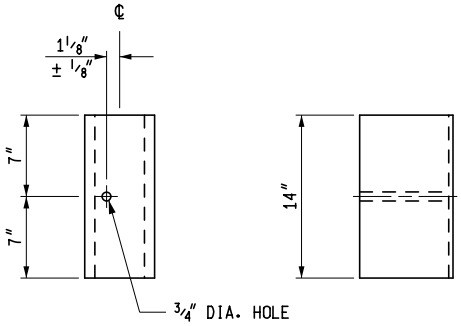
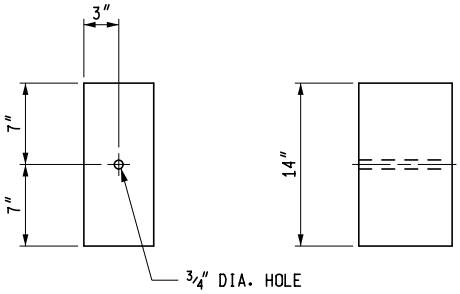


FRONT SIDE

FOR USE ON STEEL POSTS



FRONT SIDE

FOR USE ON WOOD POSTS

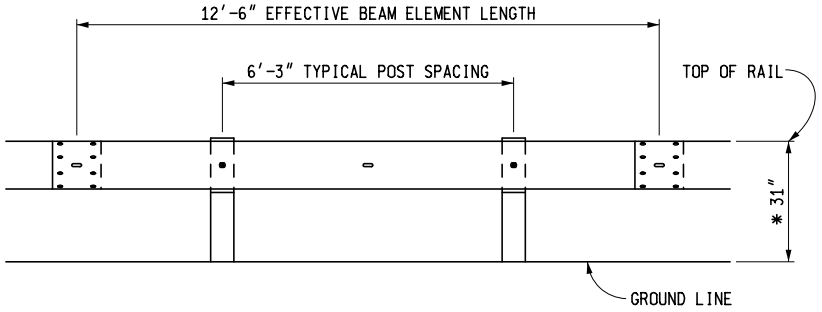
(SEE NOTES ON SHEET 16 OF 16)

WOOD OFFSET BLOCKS FOR GUARDRAIL, TYPE MGS-8 AND TYPE MGS-8D

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

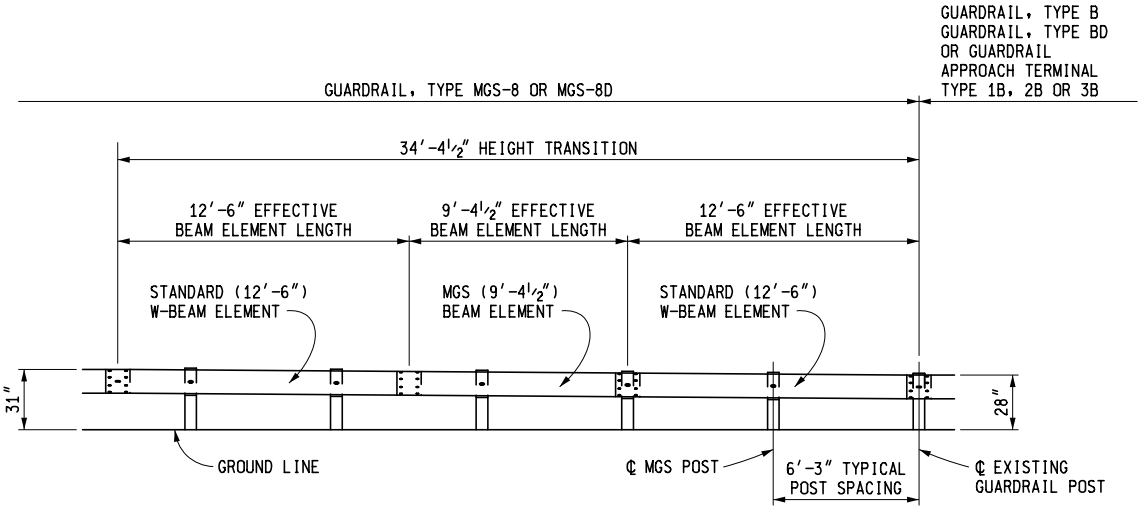
GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 9 OF 16

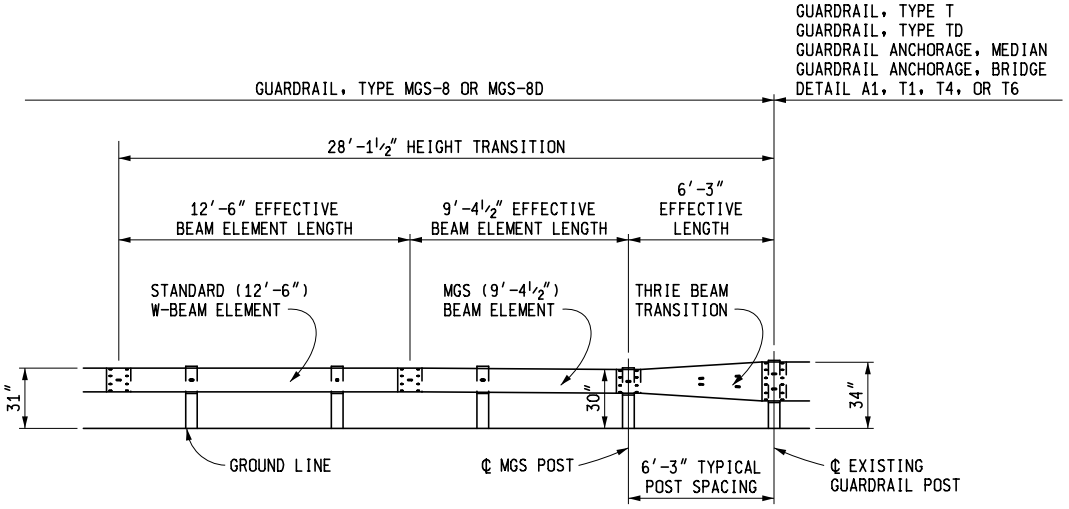


ELEVATION SHOWING POST SPACING FOR
GUARDRAIL, TYPE MGS-8 OR MGS-8D

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB



ELEVATION SHOWING POST SPACING CONNECTING
GUARDRAIL, TYPE MGS-8 OR MGS-8D TO
GUARDRAIL, TYPE B, GUARDRAIL, TYPE BD, OR
GUARDRAIL APPROACH TERMINAL TYPE 1B, 2B, OR 3B

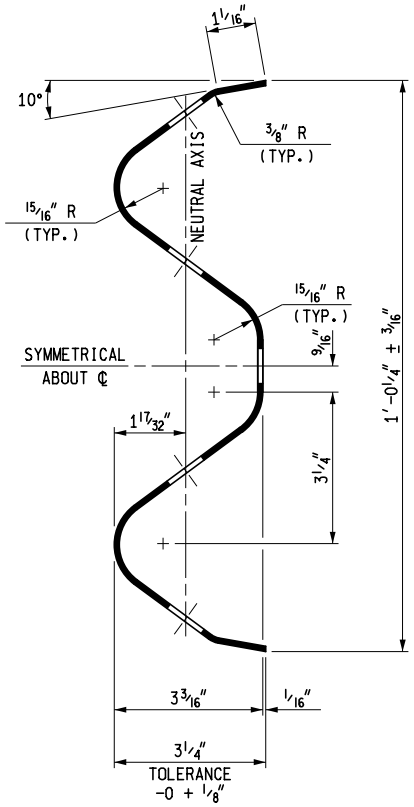


ELEVATION SHOWING POST SPACING CONNECTING
GUARDRAIL, TYPE MGS-8 OR MGS-8D TO
GUARDRAIL, TYPE T, GUARDRAIL, TYPE TD,
GUARDRAIL ANCHORAGE, MEDIAN,
GUARDRAIL ANCHORAGE, BRIDGE DETAIL A1, T1, T4 OR T6

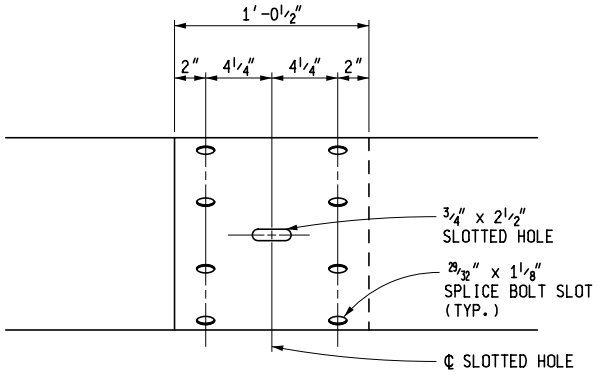
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

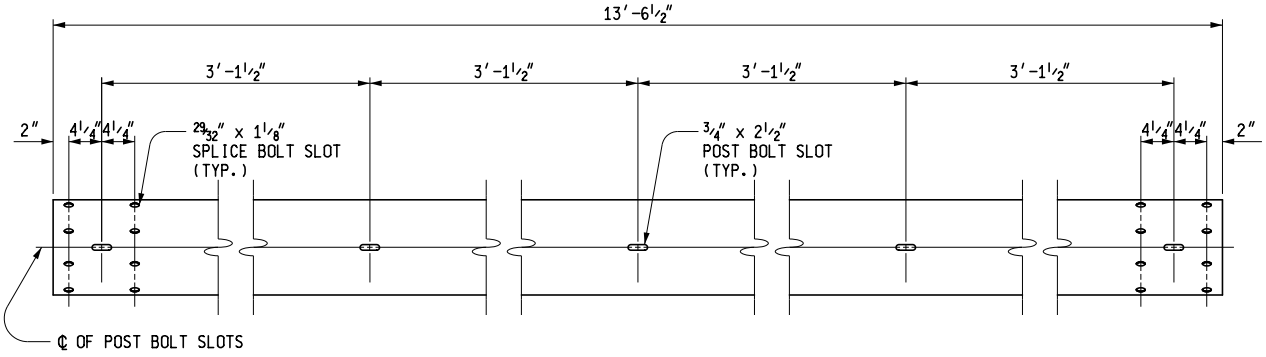
F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 10 OF 16



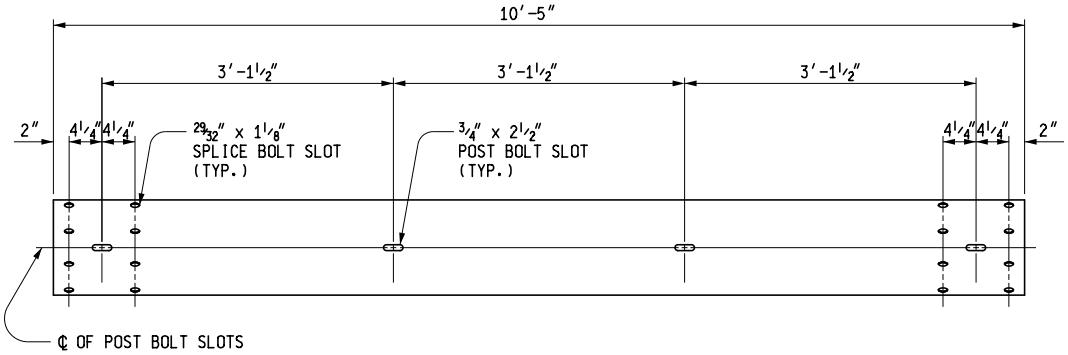
SECTION THROUGH BEAM ELEMENT



BEAM ELEMENT SPLICE DETAILS



FRONT ELEVATION OF BEAM ELEMENT



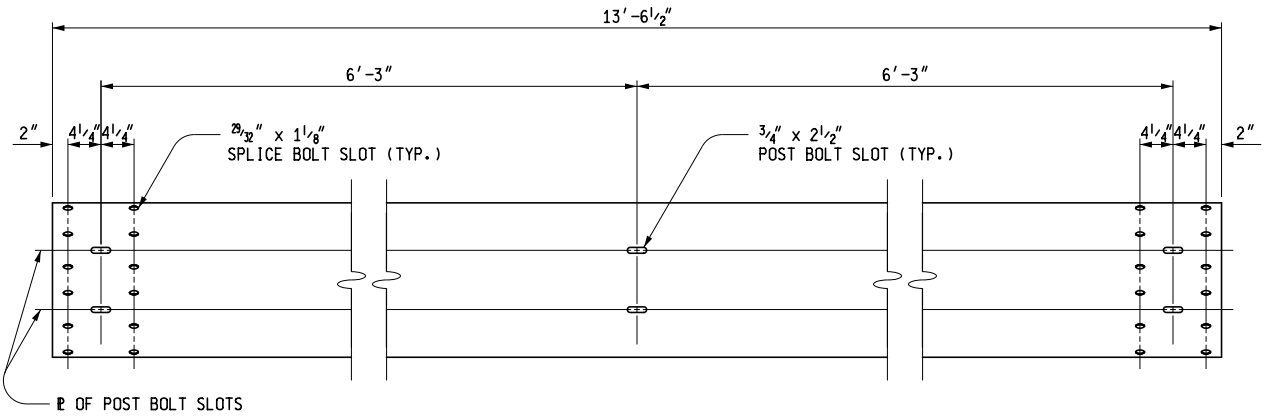
FRONT ELEVATION OF MGS (9'-4 1/2") BEAM ELEMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION

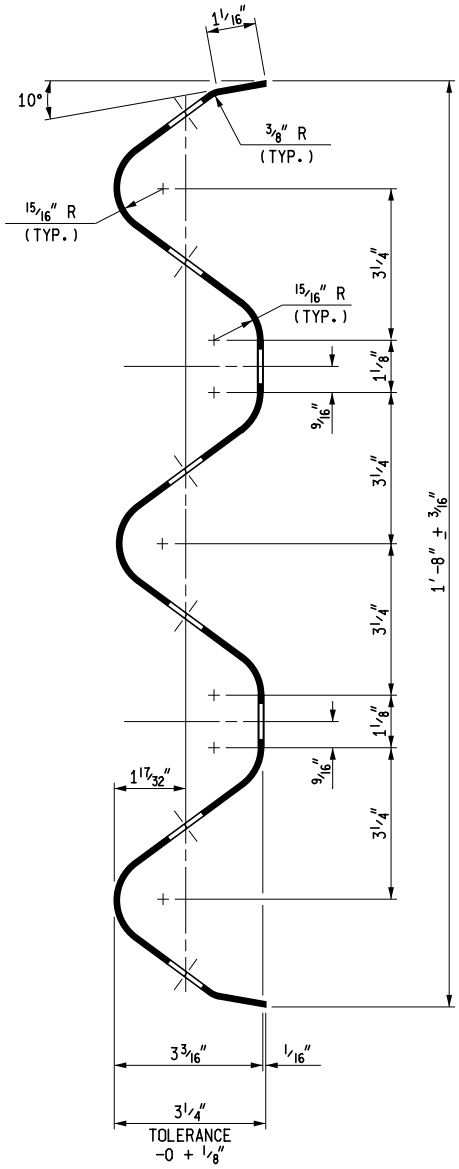
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 11 OF 16



FRONT ELEVATION OF THRIE BEAM ELEMENT



SECTION THROUGH THRIE BEAM ELEMENT

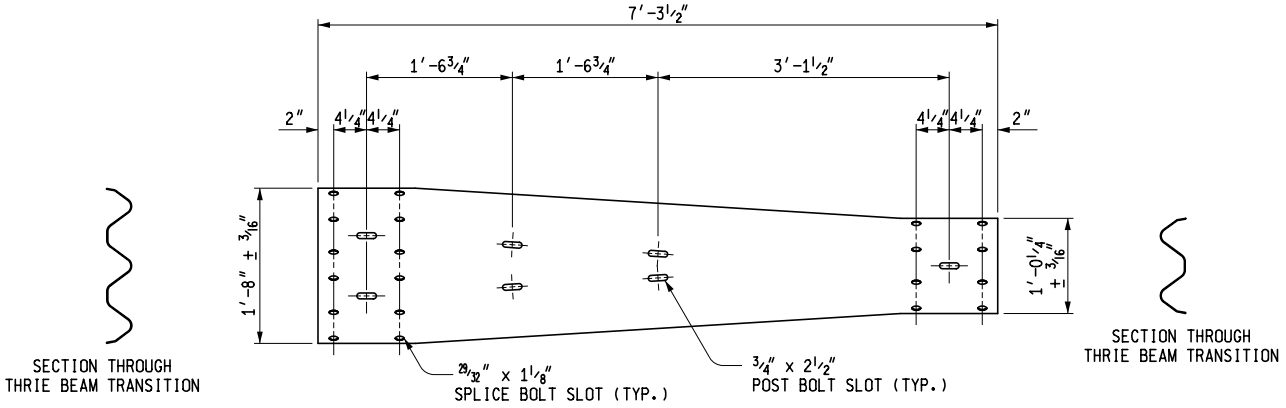
(FOR GUARDRAIL, TYPE T AND TD)

MICHIGAN DEPARTMENT OF TRANSPORTATION

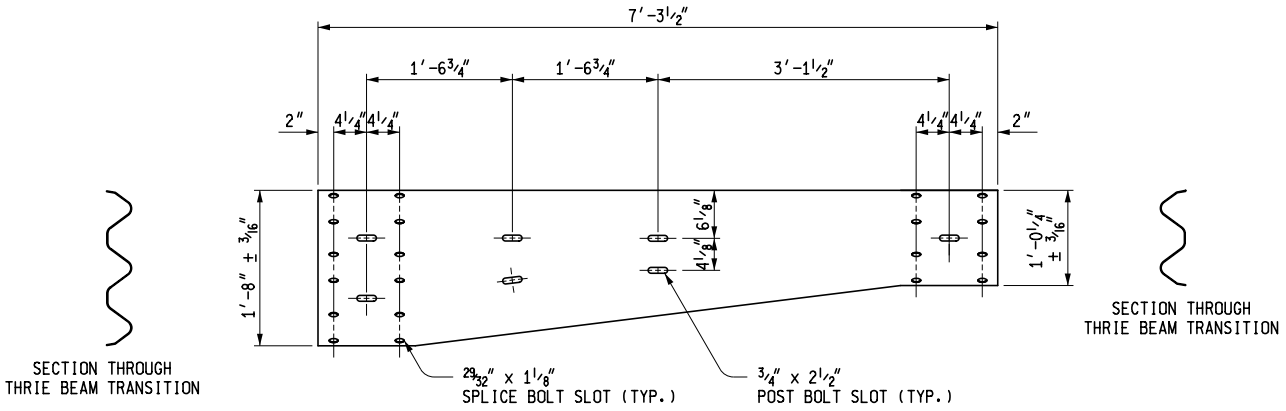
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

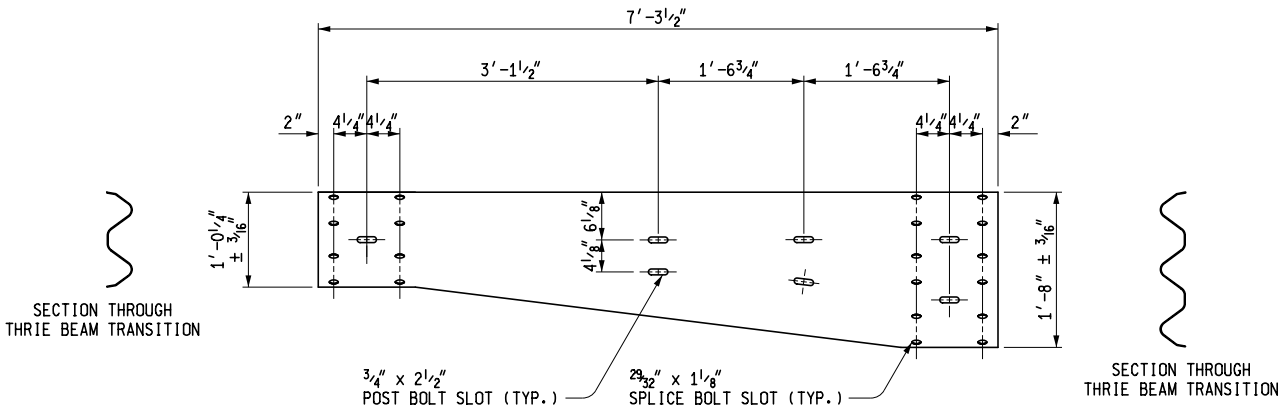
GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 12 OF 16



THRIE BEAM TRANSITION





ASYMMETRICAL THRIE BEAM TRANSITIONS

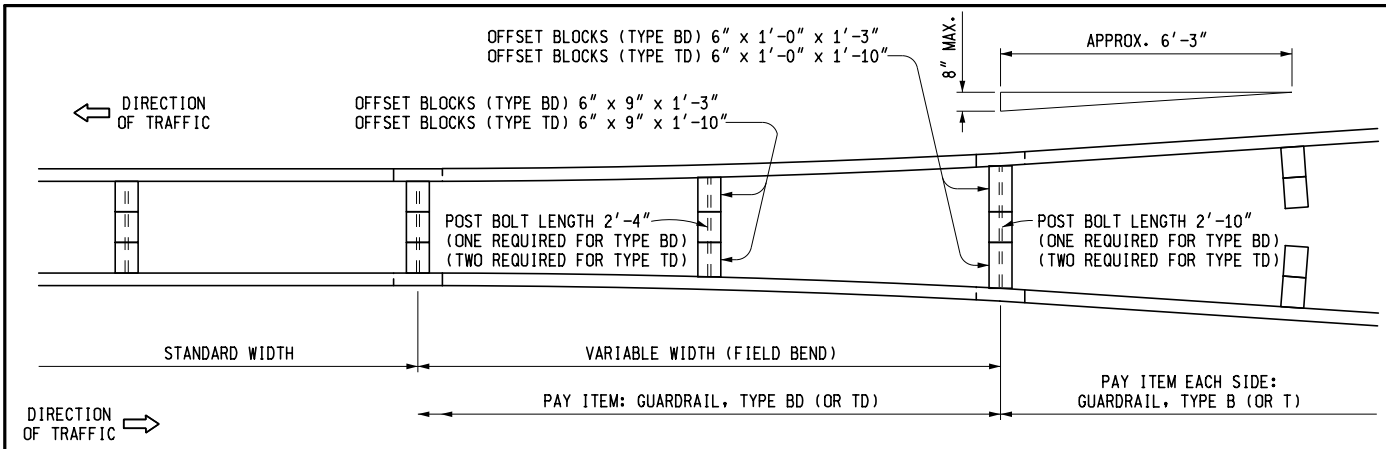
NOTE: ASYMMETRICAL TRANSITION TYPE WILL VARY BY LOCATION DEPENDING ON GUARDRAIL LAYOUT

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 13 OF 16



DETAIL SHOWING TRANSITION FROM GUARDRAIL, TYPE B (OR TYPE T) TO GUARDRAIL, TYPE BD (OR TYPE TD)

POST BOLTS, SPLICE BOLTS AND WASHERS AT BEAM ELEMENT SPLICE POSTS AND AT INTERMEDIATE POSTS

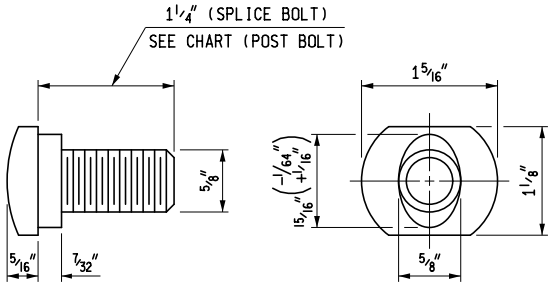
GUARDRAIL TYPE	POST	OFFSET BLOCK	POST BOLTS NO. REQ'D	POST BOLTS LENGTH	SPLICE BOLTS (1¼" LONG) (NO. REQ'D)		WASHERS (ROUND) (NO. REQ'D)
A	WOOD	N/A	1	9½"	8	NOT NEEDED AT INTERMEDIATE POSTS	1
	STEEL	N/A	1	2"			1
B	WOOD	WOOD	1	18"	8		1
	STEEL	WOOD	1	9½"			1
BD	WOOD	WOOD	1	*26½"	16		——
	STEEL	WOOD	2	9½"			2
T	WOOD	WOOD	2	18"	12		2
	STEEL	WOOD	2	9½"			2
TD	WOOD	WOOD	2	*26½"	24		——
	STEEL	WOOD	4	9½"			4

THRIE BEAM TRANSITIONS REQUIRE 20 SPLICE BOLTS EACH (12 ON TYPE T END AND 8 ON TYPE B END).

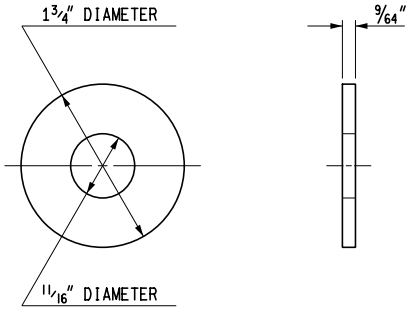
* EXCEPT AS SPECIFIED ON DETAIL SHOWING TRANSITION FROM GUARDRAIL, TYPE B (OR TYPE T) TO GUARDRAIL, TYPE BD (OR TYPE TD). POST BOLTS SHALL NOT EXTEND MORE THAN ½" BEYOND NUT.

MINIMUM POST BOLT THREAD LENGTH

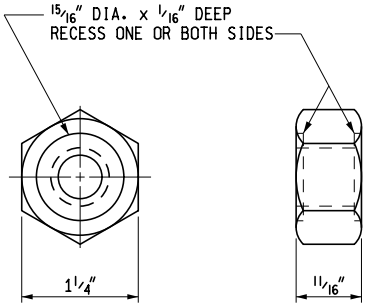
BOLT LENGTH	MINIMUM THREAD LENGTH
9½"	1¾"
18"	2½"
26½"	3"



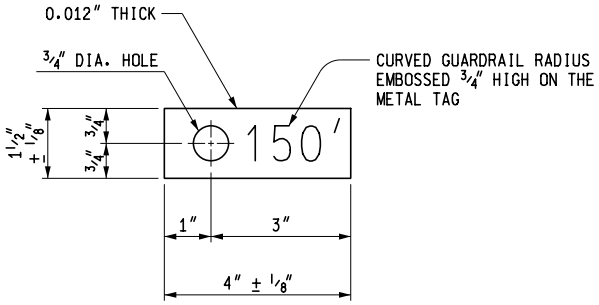
SPLICE BOLT AND POST BOLT



ROUND WASHER



NUT



METAL TAG

FOR CURVED GUARDRAIL WITH RADIUS OF 150' OR LESS

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

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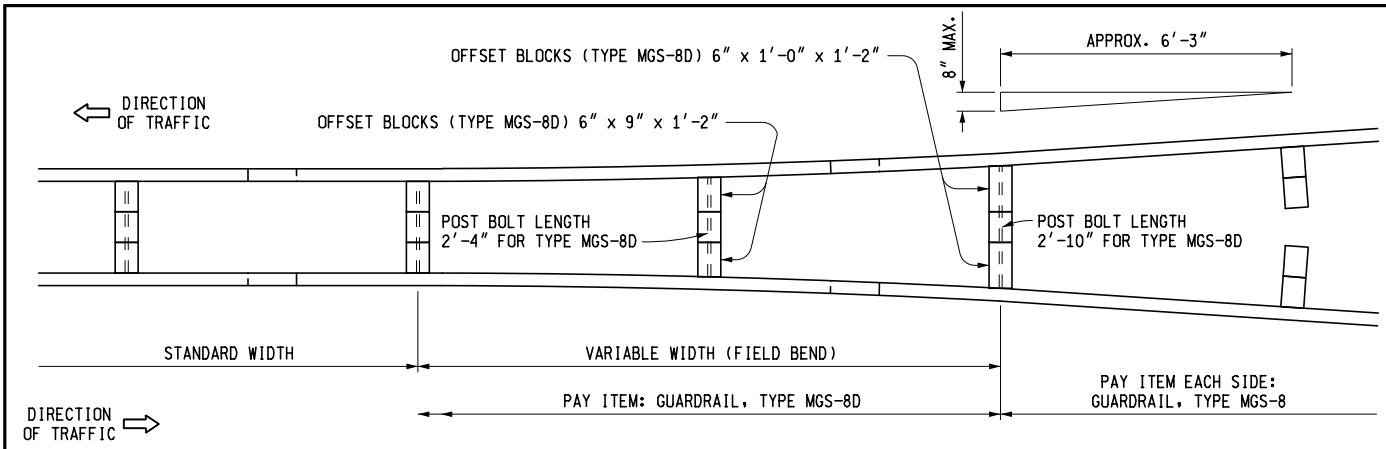


DETAIL SHOWING TRANSITION FROM GUARDRAIL, TYPE MGS-8 TO GUARDRAIL, TYPE MGS-8D

POST BOLTS, SPLICE BOLTS AND WASHERS AT BEAM ELEMENT SPLICE POSTS AND AT INTERMEDIATE POSTS						
GUARDRAIL TYPE	POST	OFFSET BLOCK	POST BOLTS		SPLICE BOLTS	WASHERS
			NO. REQ'D	LENGTH	(1 1/4" LONG) (NO. REQ'D)	(ROUND) (NO. REQ'D)
MGS-8	WOOD	WOOD	1	18"	8	1
	STEEL	WOOD	1	9 1/2"		1
MGS-8D	WOOD	WOOD	1	*26 1/2"	16	———
	STEEL	WOOD	2	9 1/2"		2

THRIE BEAM TRANSITIONS REQUIRE 20 SPLICE BOLTS EACH (12 ON TYPE T END AND 8 ON TYPE MGS END).

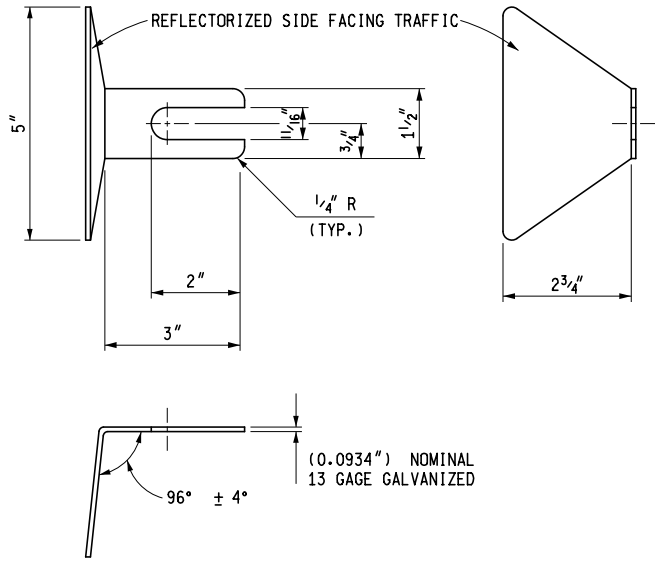
* EXCEPT AS SPECIFIED ON DETAIL SHOWING TRANSITION FROM GUARDRAIL, TYPE MGS-8 TO GUARDRAIL, TYPE MGS-8D POST BOLTS SHALL NOT EXTEND MORE THAN 1/2" BEYOND NUT.

MINIMUM POST BOLT THREAD LENGTH	
BOLT LENGTH	MINIMUM THREAD LENGTH
9 1/2"	1 3/4"
18"	2 1/2"
26 1/2"	3"

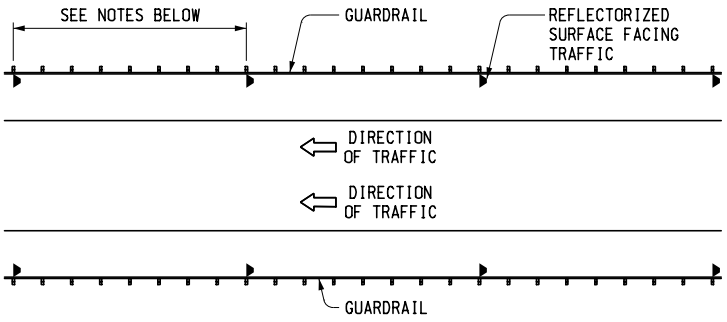
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

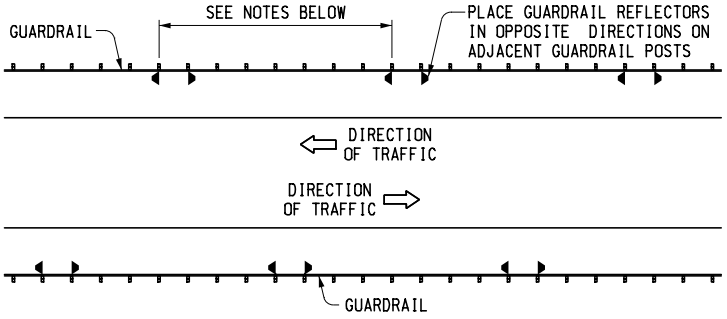
F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 15 OF 16



GUARDRAIL REFLECTOR



ONE-WAY TRAFFIC

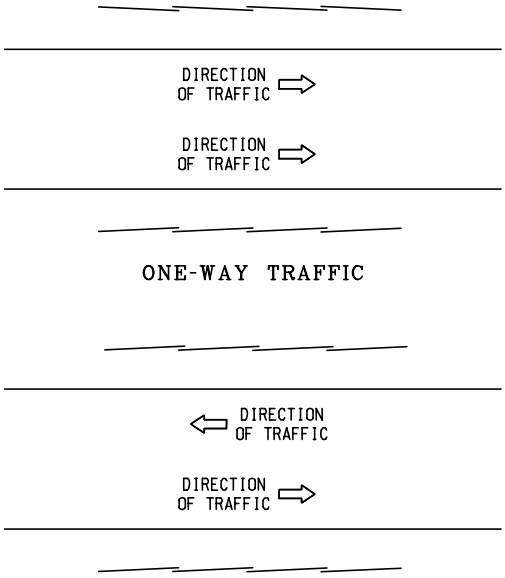


TWO-WAY TRAFFIC

PLACEMENT OF GUARDRAIL REFLECTORS

NOTES GOVERNING THE USE OF GUARDRAIL REFLECTORS

1. GUARDRAIL REFLECTORS SHALL BE USED ON ALL STANDARD GUARDRAIL RUNS, REGARDLESS OF ROADWAY LIGHTING.
2. GUARDRAIL REFLECTORS ARE TO BE SPACED AT THE FOLLOWING INTERVALS:
   a) 50'-0" ON TANGENT SECTIONS AND CURVES WITH A RADIUS OF 1150' OR MORE.
   b) 25'-0" ON CURVES WITH A RADIUS LESS THAN 1150'.
3. FOR GUARDRAIL REFLECTOR PLACEMENT ON APPROACH TERMINALS, SEE THE APPROPRIATE GUARDRAIL APPROACH TERMINAL STANDARD PLAN.
4. A GUARDRAIL REFLECTOR IS TO BE PLACED ON THE SECOND POST FROM THE GUARDRAIL DEPARTING TERMINAL.
5. ON GUARDRAIL, TYPE T AND TYPE TD GUARDRAIL REFLECTORS ARE TO BE PLACED ON THE UPPER POST BOLT.
6. GUARDRAIL REFLECTORS SHALL MATCH COLOR OF EDGE LINE.



TWO-WAY TRAFFIC

DIRECTION OF RAIL LAP

NOTES:

DETAILS SPECIFIED ON THIS STANDARD ARE ACCORDING TO THE AASHTO-AGC-ARTBA JOINT COMMITTEE, TASK FORCE 13 PUBLICATION TITLED "A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE."

BEAM ELEMENTS SHALL BE SHOP BENT TO PLAN RADIUS FOR CURVE RADII 150' OR LESS. A TAG IDENTIFYING THE CURVATURE OF THE SHOP BENT SECTION WILL BE REQUIRED FOR EACH CURVED ELEMENT.

SEE STANDARD PLAN R-61-SERIES, R-62-SERIES OR R-63-SERIES FOR GUARDRAIL APPROACH TERMINALS, STANDARD PLAN R-66-SERIES FOR GUARDRAIL DEPARTING TERMINALS AND STANDARD PLAN R-67-SERIES FOR GUARDRAIL ANCHORAGE, BRIDGE.

WHEN THE PLANS SPECIFY GUARDRAIL (TYPE B OR T) TO BE PLACED ON THE SHOULDER HINGE POINT, RATHER THAN AS SPECIFIED ON THIS PLAN, 8'-0" POSTS SHALL BE PROVIDED, WITH THE ADDITIONAL LENGTH EMBEDDED FOR ADDED STABILITY. (NOT NECESSARY WHEN THE SLOPE IS REASONABLY LEVEL BEYOND THE SHOULDER HINGE POINT, AS DETERMINED BY THE ENGINEER.)

WHEN THE PLANS SPECIFY GUARDRAIL TYPE MGS-8 TO BE PLACED ON THE SHOULDER HINGE POINT, RATHER THAN AS SPECIFIED ON THIS PLAN, 9'-0" POSTS SHALL BE PROVIDED, WITH THE ADDITIONAL LENGTH EMBEDDED FOR ADDED STABILITY. (NOT NECESSARY WHEN THE SLOPE IS REASONABLY LEVEL BEYOND THE SHOULDER HINGE POINT, AS DETERMINED BY THE ENGINEER.)

WOOD POSTS WITH 1/2" BEVELS AT THE TOP MAY BE USED IN LIEU OF WOOD POSTS WITHOUT BEVELS SPECIFIED. THE LENGTH, WIDTH AND DEPTH OF THE POST SHALL BE AS SPECIFIED ON THIS STANDARD AND THE POST BOLT HOLES SHALL BE LOCATED TO ENSURE PROPER RAIL HEIGHT.

WOOD OFFSET BLOCKS WITH 1/2" BEVELS AT THE TOP AND BOTTOM OR A 1" BEVELED TOP MAY BE USED IN LIEU OF WOOD BLOCKS WITHOUT BEVELS SPECIFIED. THE LENGTH (FRONT AND BACK FACE), WIDTH AND DEPTH OF THE BLOCK SHALL BE AS SPECIFIED ON THIS STANDARD AND THE POST BOLT HOLES SHALL BE LOCATED TO ENSURE PROPER RAIL HEIGHT AND COMPATIBILITY WITH POST HOLES.

WHEN THE FACE OF GUARDRAIL IS PLACED FLUSH WITH FACE OF CURB, THE RAIL HEIGHT SHOULD BE MEASURED FROM THE FRONT EDGE OF THE GUTTER PAN, WHICH IS THE POINT ON THE GUTTER PAN THAT IS CLOSEST TO THE EDGE OF THE TRAVELED LANE. WHEN THE FACE OF THE GUARDRAIL PANEL IS LOCATED BEHIND THE CURB THE RAIL HEIGHT SHOULD BE MEASURED FROM THE GROUND JUST IN FRONT OF THE GUARDRAIL.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	4-22-2016 PLAN DATE	R-60-J	SHEET 16 OF 16

GUARDRAIL APPROACH TERMINAL TYPE 1B "SRT"

POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.

** FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 19.

POST	** POST OFFSET DISTANCE (FROM TANGENT LINE TO CENTER OF POST)
1	52"
2	37 1/2"
3	33 1/4"
4	26 3/4"
5	21 1/2"
6	17 3/8"
7	14 3/8"
8	12 5/8"
9	12"

OPTION 1

(DETAILED ON SHEETS 1 THROUGH 7, 12 AND 13)

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Steudle

APPROVED BY: _____
ENGINEER OF DELIVERY

APPROVED BY: _____
ENGINEER OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

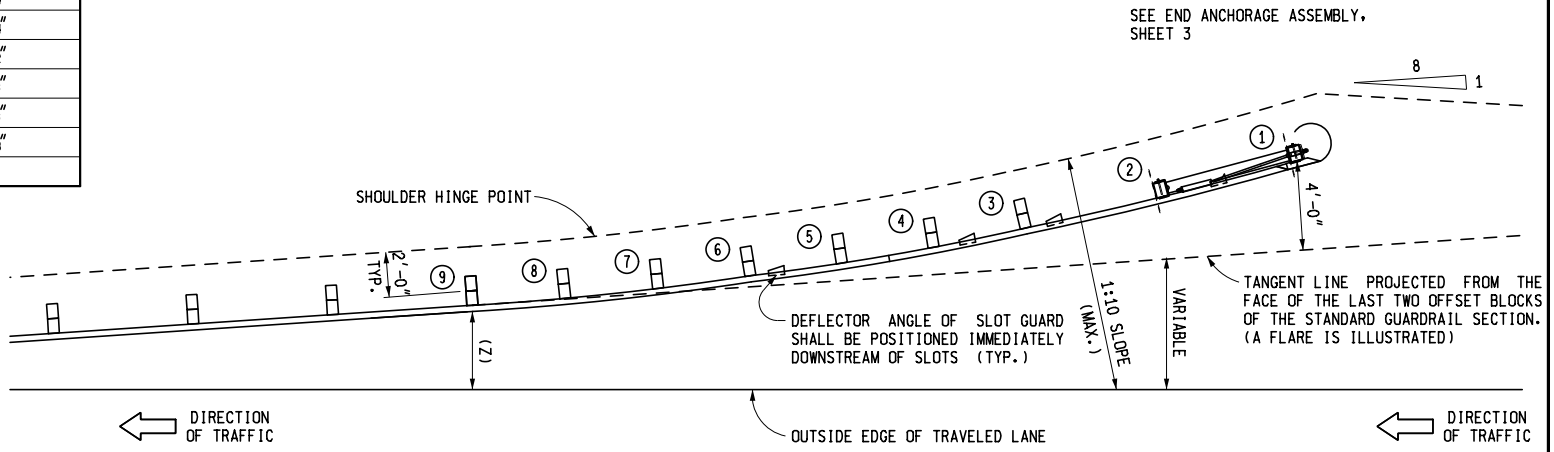
GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 1 OF 20

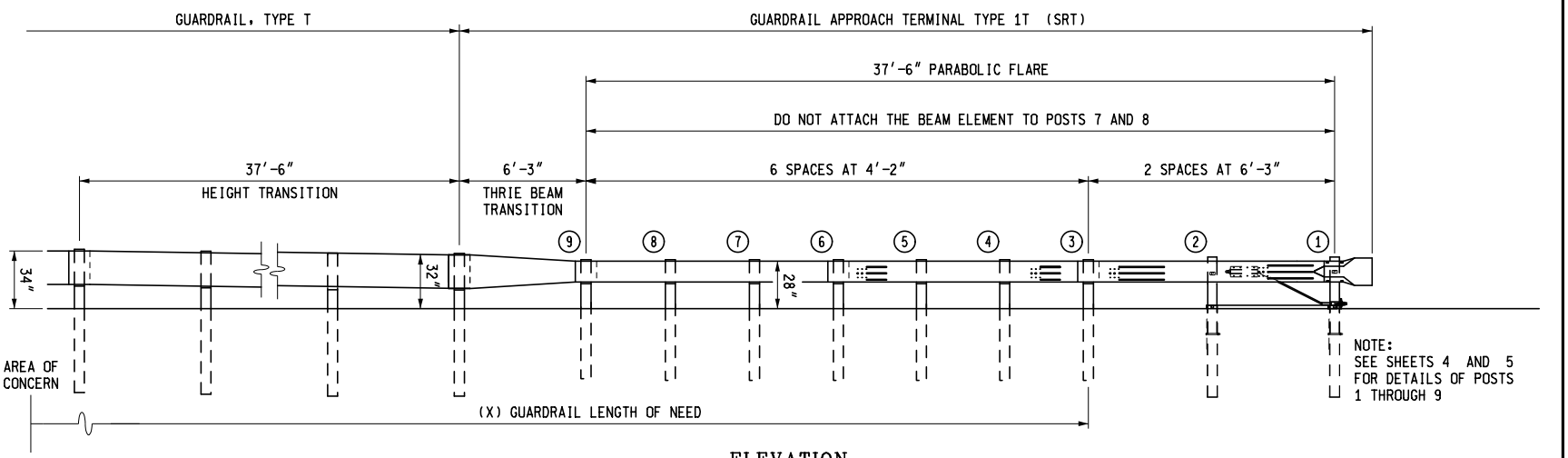
POST	** POST OFFSET DISTANCE (FROM TANGENT LINE TO CENTER OF POST)
1	52″
2	37 1/2″
3	33 1/4″
4	26 3/4″
5	21 1/2″
6	17 3/8″
7	14 3/8″
8	12 5/8″
9	12″

POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.

** FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 19.



PLAN VIEW



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 1T "SRT"

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

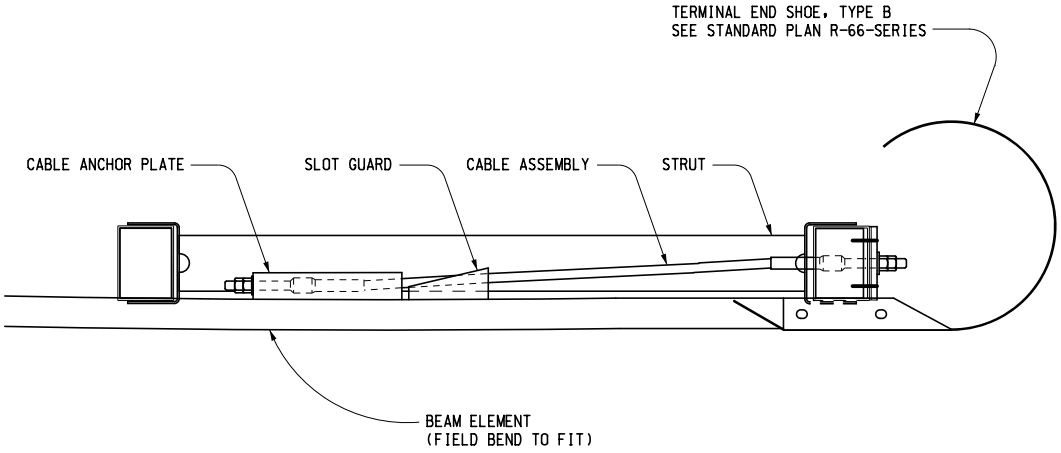
GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL

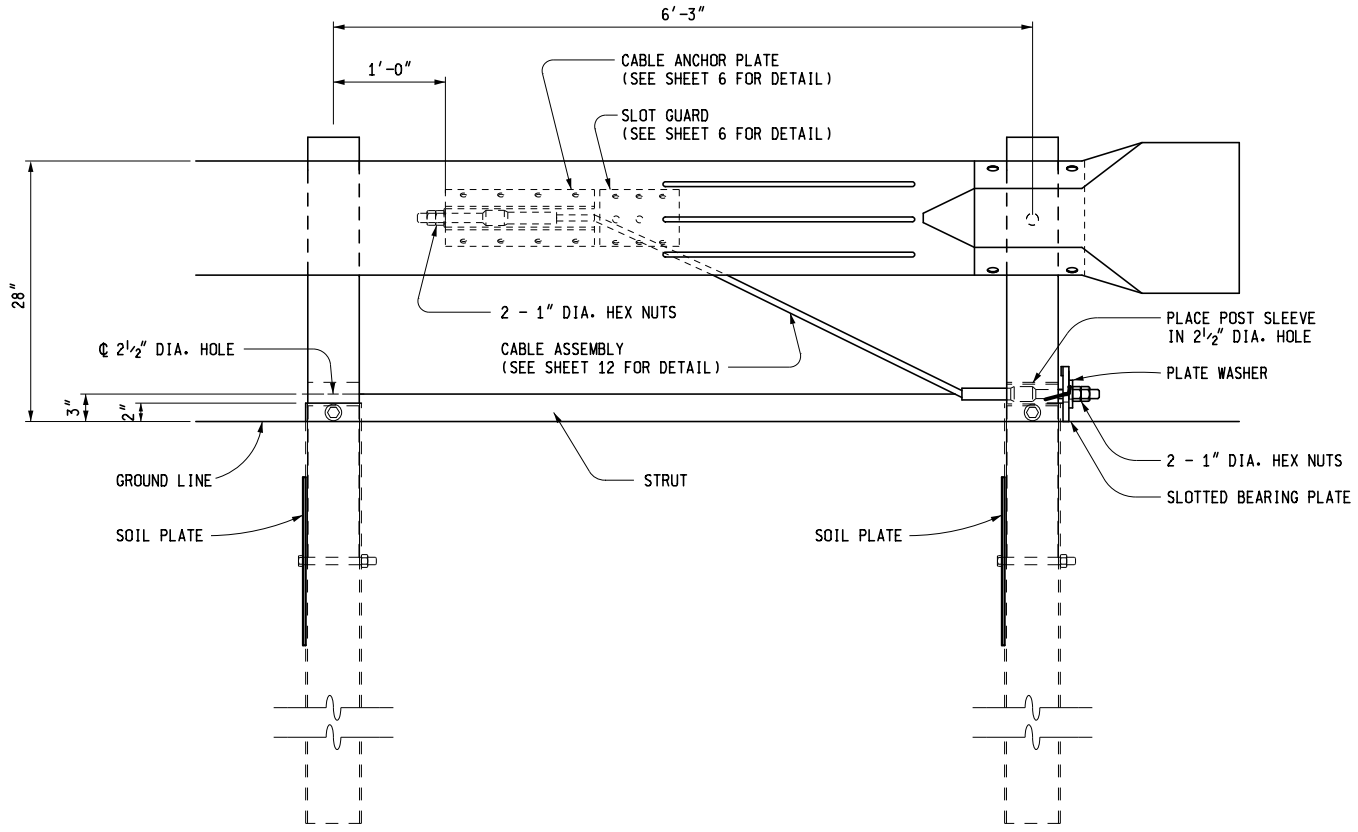
2-2-2017
PLAN DATE

R-61-H

SHEET 2 OF 20



PLAN VIEW



ELEVATION

END ANCHORAGE ASSEMBLY
(SRT)

NOTES:

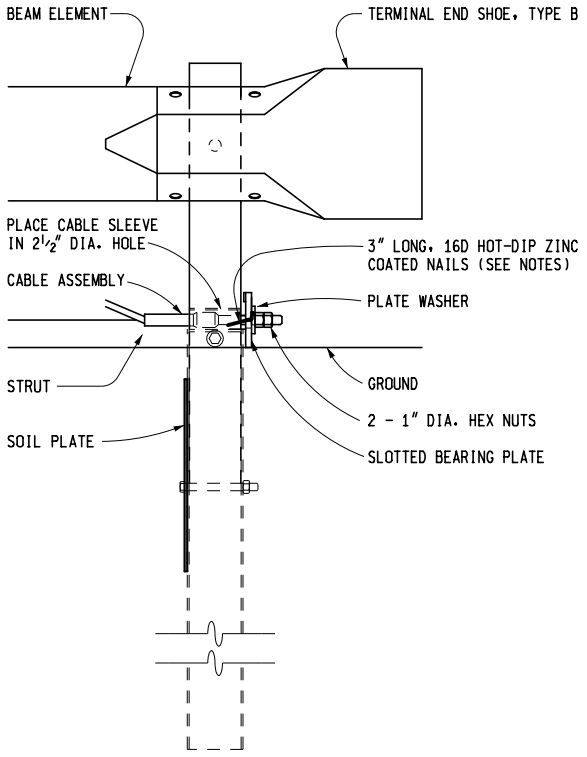
AFTER THE CABLE ASSEMBLY IS TAUT, A SECOND NUT SHALL BE INSTALLED ON EACH END OF THE CABLE SO THAT THE CABLE WILL NOT LOOSEN.

ASPHALT ROOFING CEMENT SHALL BE USED TO SEAL THE PERIMETER AREA BETWEEN THE STEEL SLEEVE (SOIL TUBE) AND THE WOOD BREAKAWAY POST.

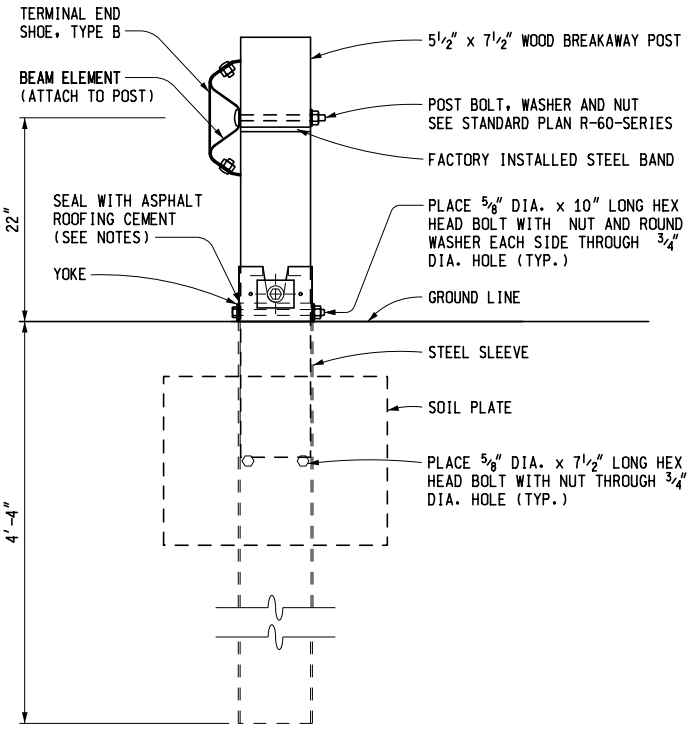
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 3 OF 20

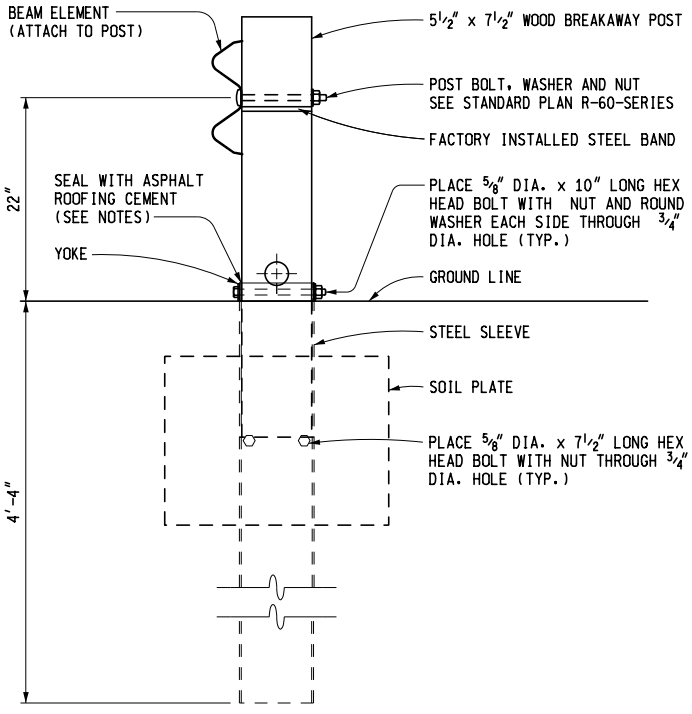


ELEVATION



SIDE

POST 1 DETAIL
(SRT)



POST 2 DETAIL
(SRT)

NOTES:

TWO 3" LONG, 16D HOT-DIP ZINC COATED NAILS SHALL BE DRIVEN INTO THE WOOD POST THROUGH THE HOLES IN THE SLOTTED BEARING PLATE ON POST 1 OF THE "SRT" TO KEEP THE PLATE FROM ROTATING.

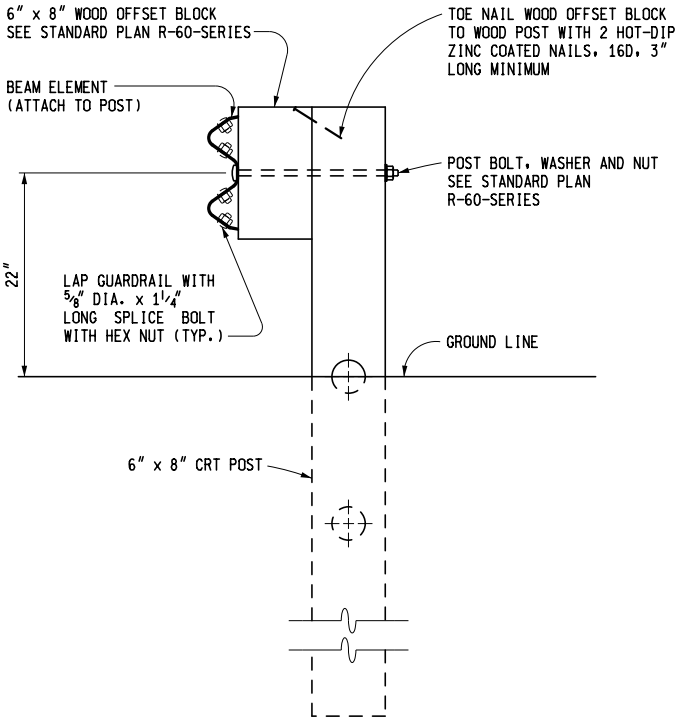
AFTER THE CABLE ASSEMBLY IS TAUT, A SECOND NUT SHALL BE INSTALLED ON EACH END OF THE CABLE SO THAT THE CABLE WILL NOT LOOSEN.

ASPHALT ROOFING CEMENT SHALL BE USED TO SEAL THE PERIMETER AREA BETWEEN THE STEEL SLEEVE (SOIL TUBE) AND THE WOOD BREAKAWAY POST.

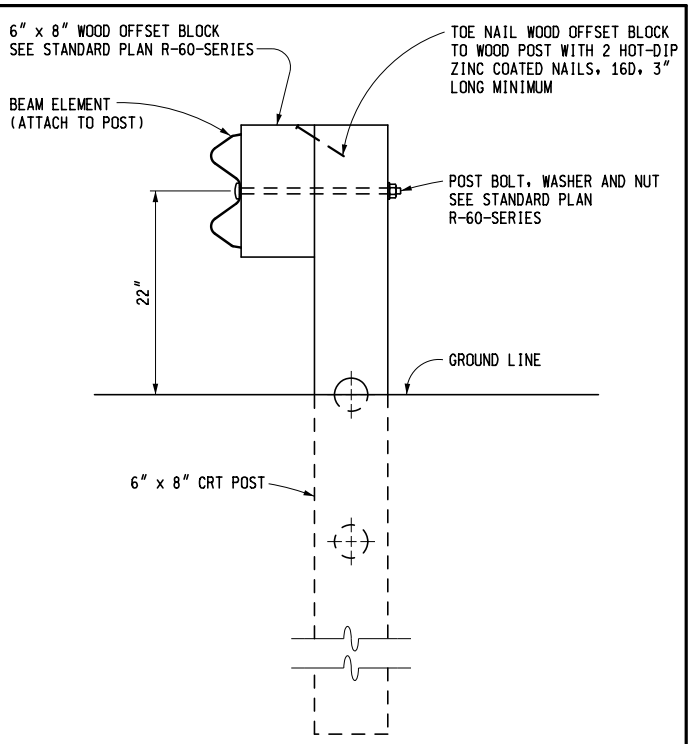
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

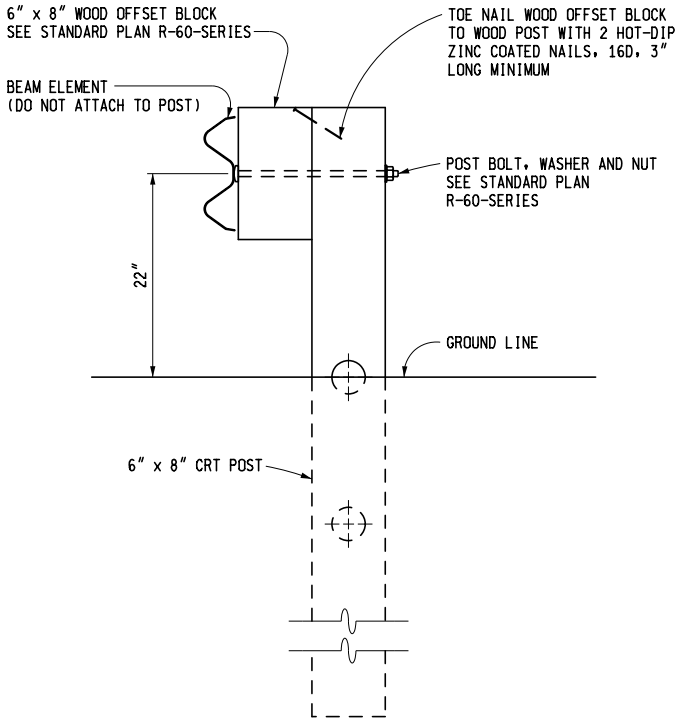
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 4 OF 20



POST 3 AND 6 DETAIL
(SRT)



POST 4 AND 5 DETAIL
(SRT)



POST 7 AND 8 DETAIL
(SRT)

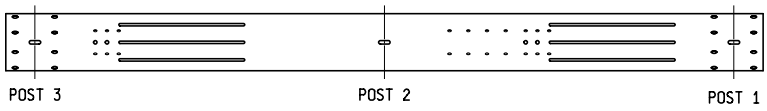
NOTE:

POST 9 IS A STANDARD LINE POST.

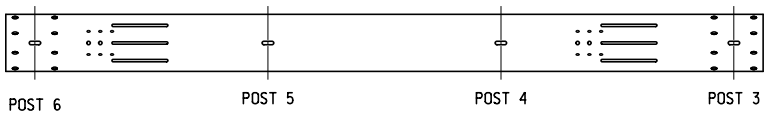
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

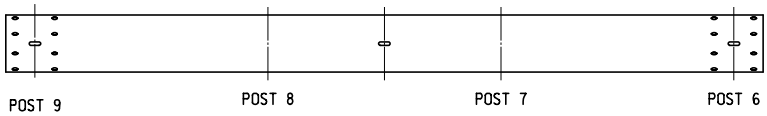
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 5 OF 20



SLOTTED RAIL BEAM ELEMENT *1 *
(POST 1 THROUGH 3)
(SRT)



SLOTTED RAIL BEAM ELEMENT *2 *
(POST 3 THROUGH 6)
(SRT)

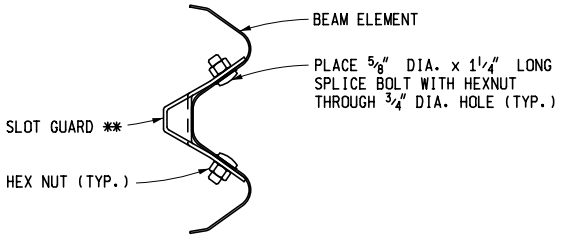


BEAM ELEMENT *3
(POST 6 THROUGH 9)
(SRT)

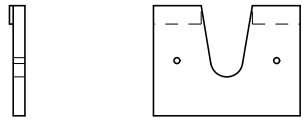
* INSTALL THE SLOTTED RAIL BEAM ELEMENTS IN THE ORDER AND ORIENTATION DETAILED ABOVE SO THAT THE SLOT GUARD ATTACHMENT HOLES ARE ON THE DOWNSTREAM END (AWAY FROM POST 1) OF THE ELONGATED SLOTS.

** PLACE THE SLOT GUARD SO THAT THE DEFLECTOR ANGLE GAP OPENS IN THE DIRECTION FACING THE ADJACENT SLOTS AND POST 1.

SLOT GUARD DETAILS
(SRT)



SLOT GUARD ASSEMBLY DETAIL **
(SRT)



SLOTTED BEARING PLATE
(SRT)

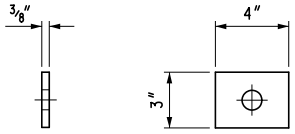
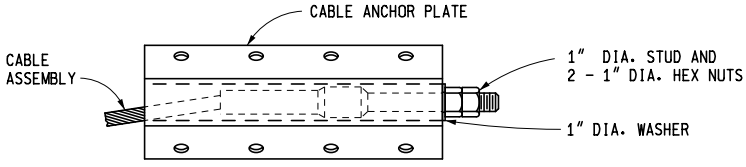
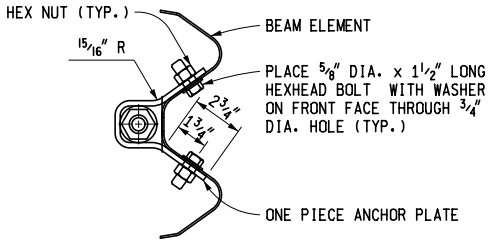


PLATE WASHER
(SRT)





CABLE ANCHOR PLATE DETAILS
(SRT)

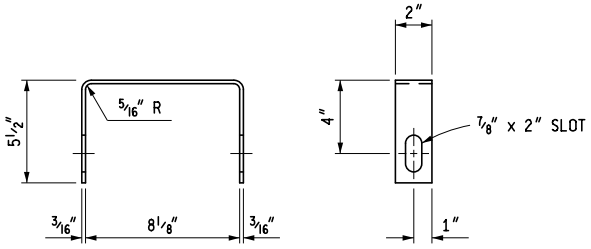
NOTES:

ALL "SRT" ITEMS ILLUSTRATED WITHOUT DIMENSIONS SHALL BE ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

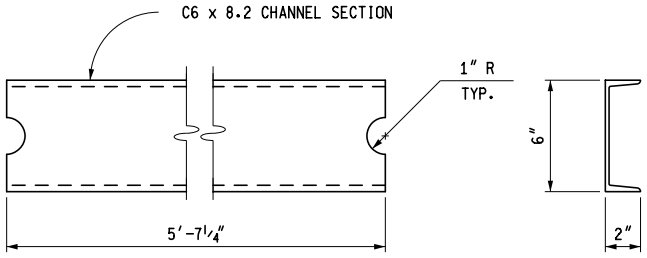
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

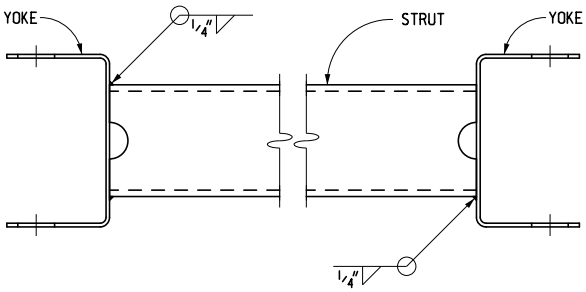
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 6 OF 20



YOKE DETAIL



STRUT DETAIL



ASSEMBLY DETAIL

STRUT AND YOKE ASSEMBLY

(SRT)

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

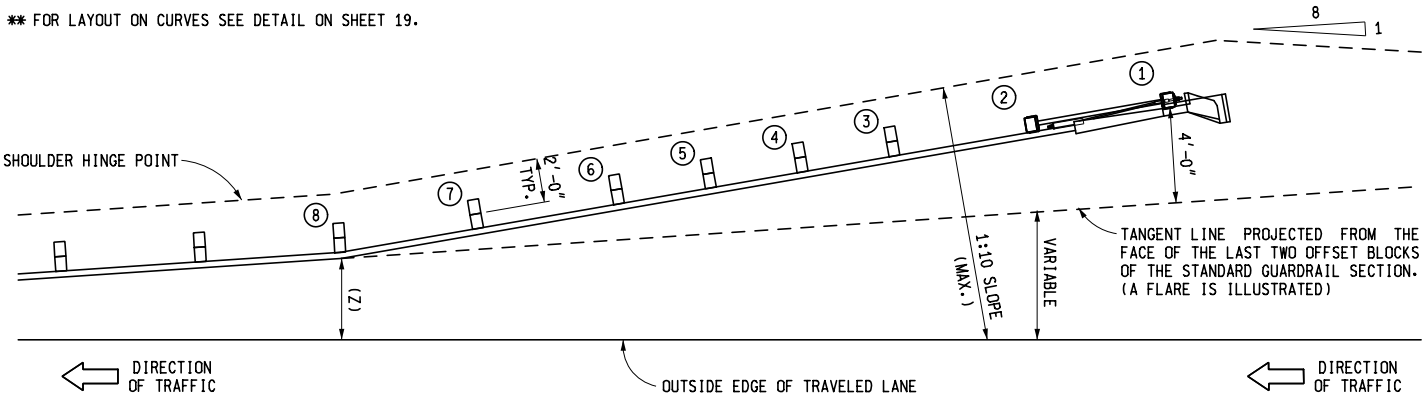
GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 7 OF 20

POST	** POST OFFSET DISTANCE (FROM TANGENT LINE TO CENTER OF POST)
1	52″
2	44″
3	44″
4	$38\frac{11}{16}$″
5	$33\frac{5}{16}$″
6	28″
7	20″
8	12″

POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.

** FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 19.

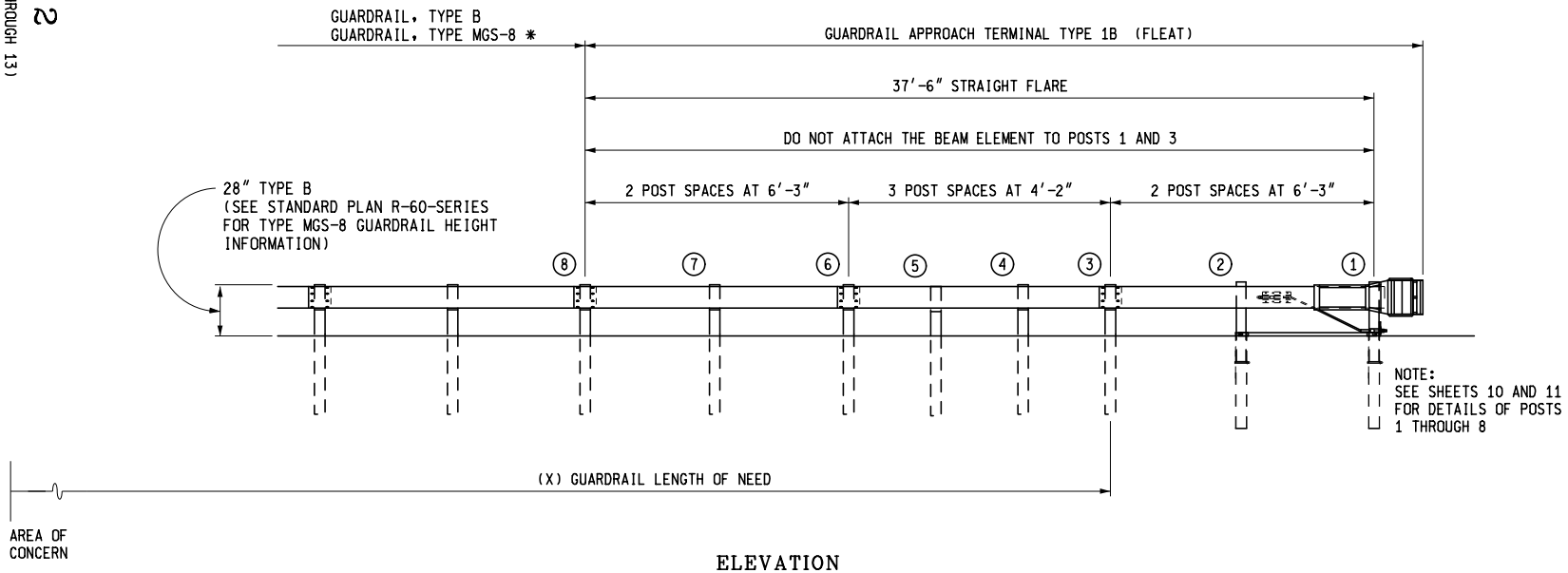


PLAN VIEW

* SEE STANDARD PLAN R-60-SERIES FOR POST SPACING AND GUARDRAIL LAYOUT TO TRANSITION FROM GUARDRAIL, TYPE MGS-8 TO GUARDRAIL APPROACH TERMINAL TYPE 1B

OPTION 2

(DETAILED ON SHEETS 8 THROUGH 13)



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 1B "FLEAT"

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL

2-2-2017
PLAN DATE

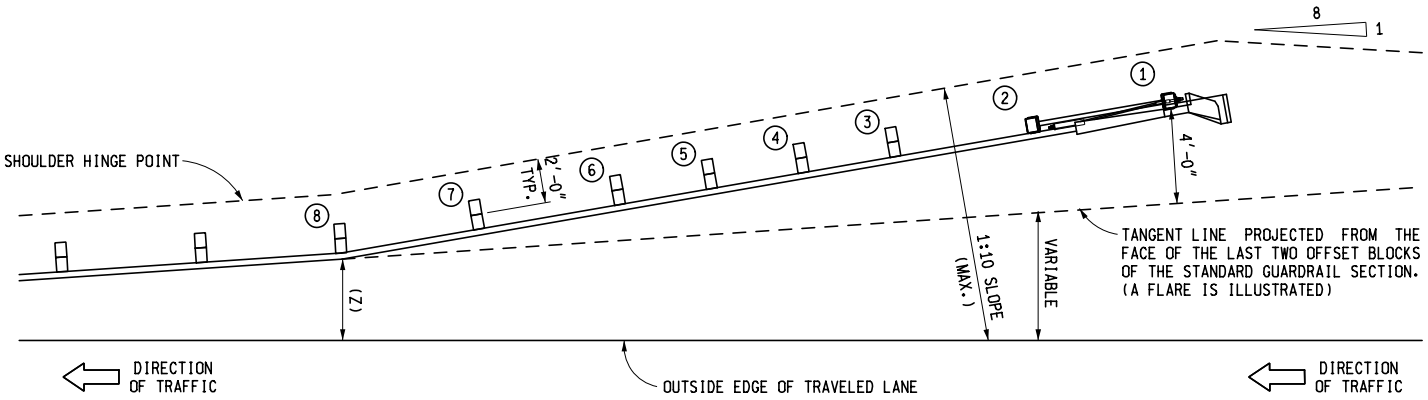
R-61-H

SHEET 8 OF 20

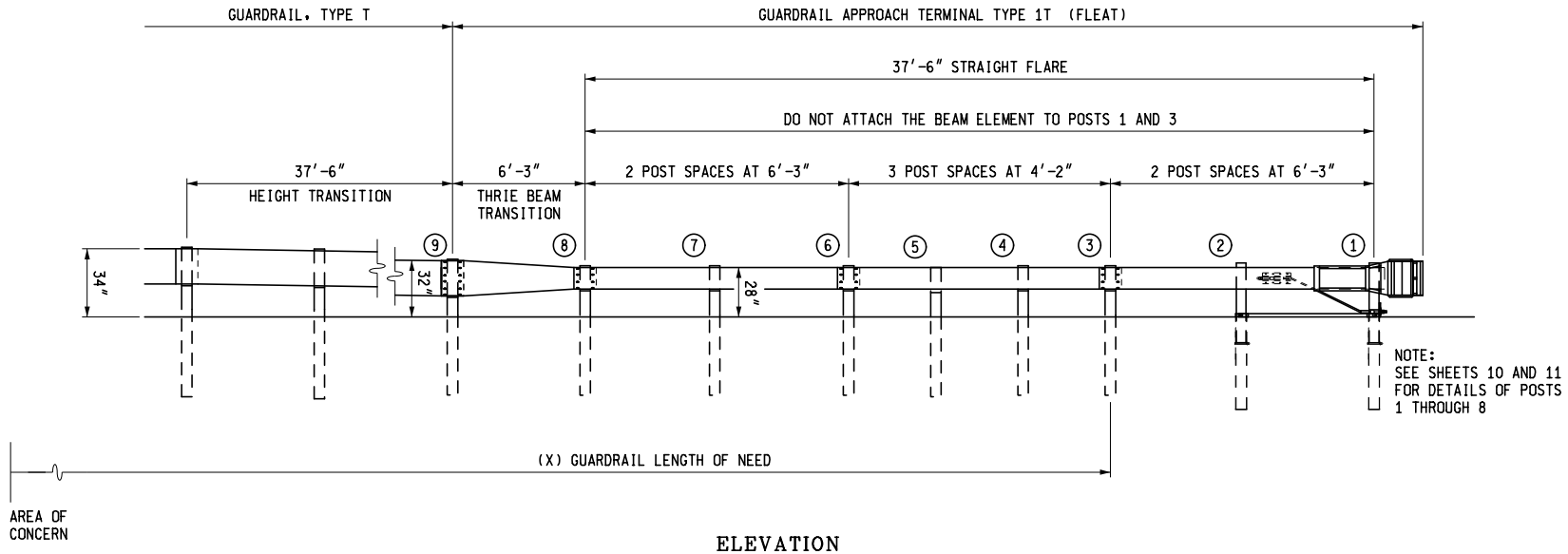
POST	** POST OFFSET DISTANCE (FROM TANGENT LINE TO CENTER OF POST)
1	52″
2	44″
3	44″
4	38 11/16″
5	33 5/16″
6	28″
7	20″
8	12″

POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.

** FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 19.



PLAN VIEW



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 1T "FLEAT"

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

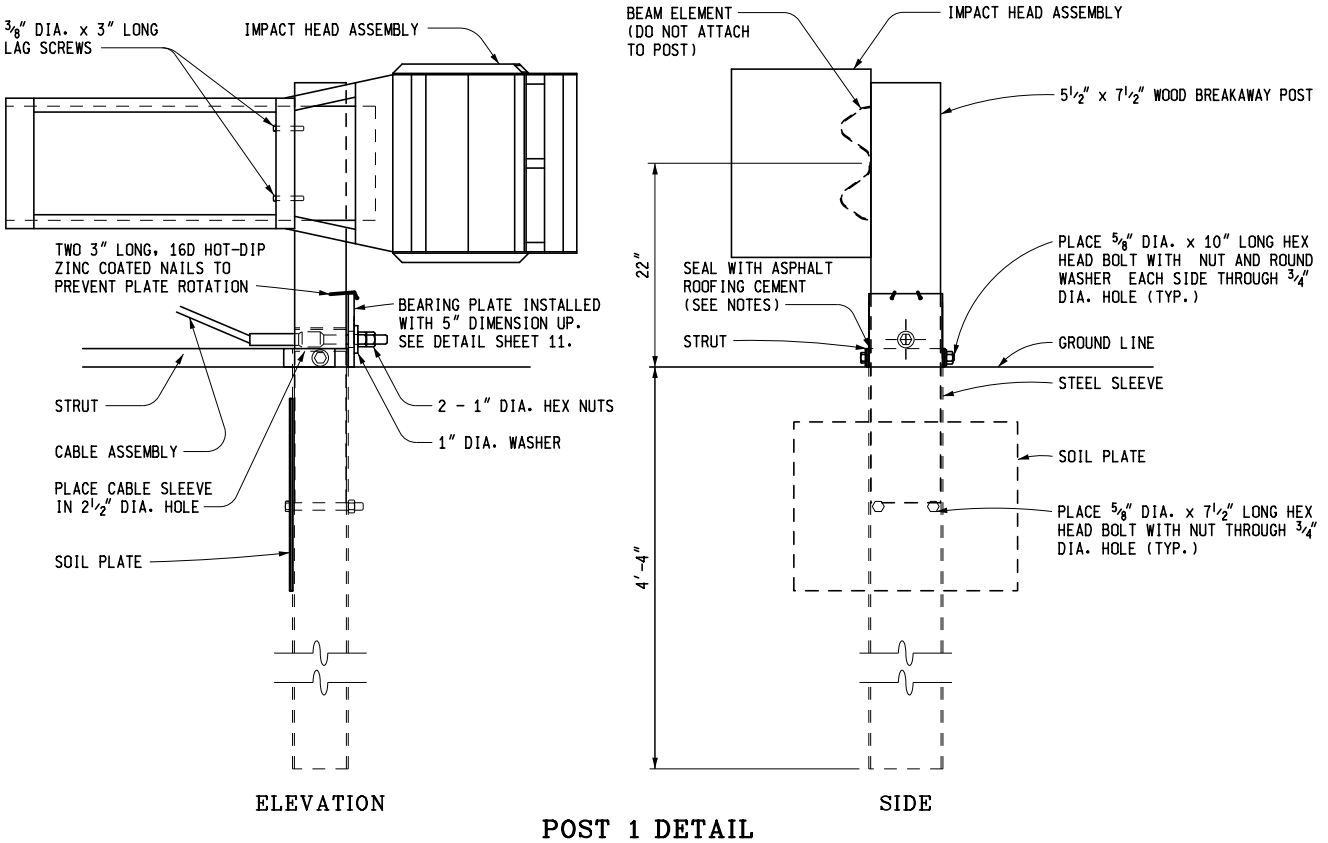
GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL

2-2-2017
PLAN DATE

R-61-H

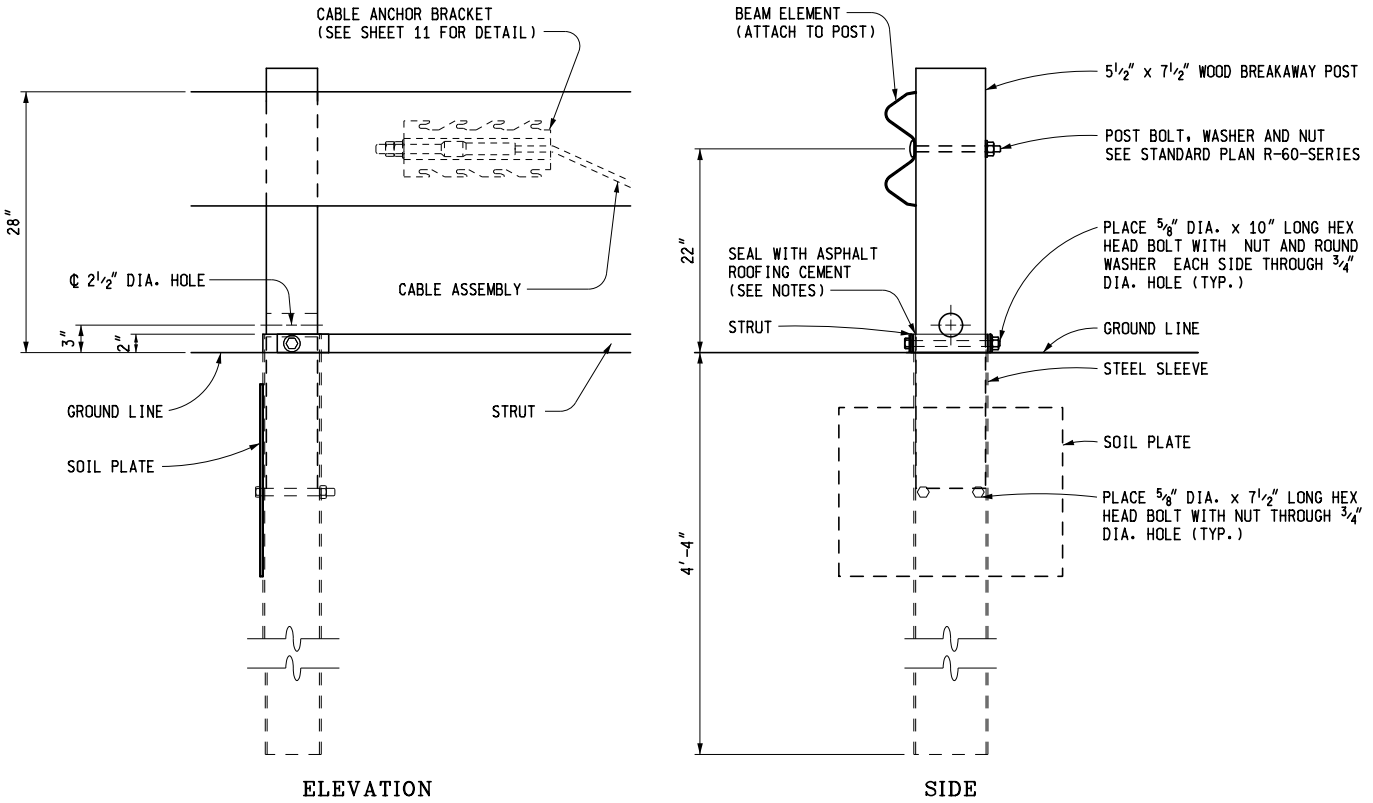
SHEET 9 OF 20



ELEVATION SIDE

POST 1 DETAIL

(FLEAT)



ELEVATION SIDE

POST 2 DETAIL

(FLEAT)

NOTES:

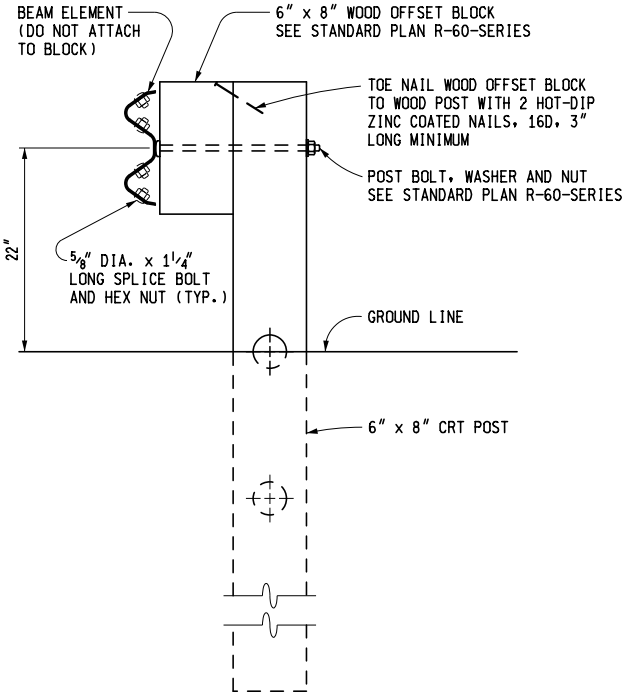
AFTER THE CABLE ASSEMBLY IS TAUT, A SECOND NUT SHALL BE INSTALLED ON EACH END OF THE CABLE SO THAT THE CABLE WILL NOT LOOSEN.

ASPHALT ROOFING CEMENT SHALL BE USED TO SEAL THE PERIMETER AREA BETWEEN THE STEEL SLEEVE (SOIL TUBE) AND THE WOOD BREAKAWAY POST.

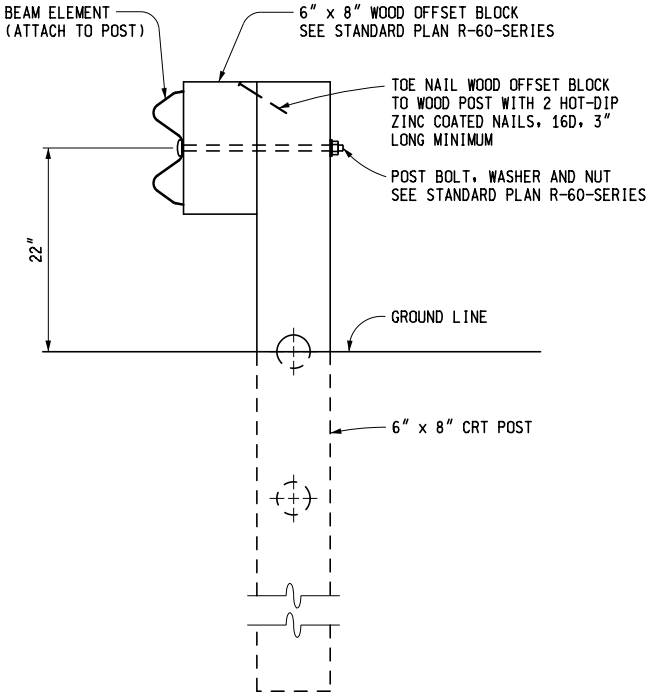
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

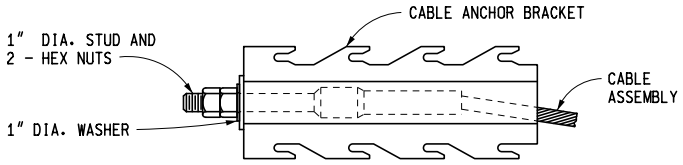
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 10 OF 20

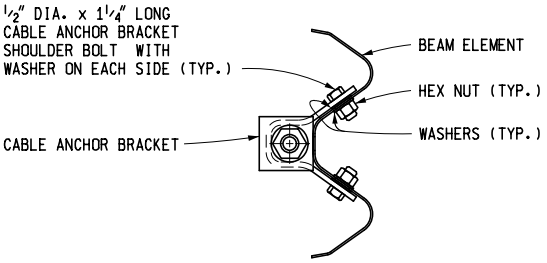


POST 3 DETAIL
(FLEAT)

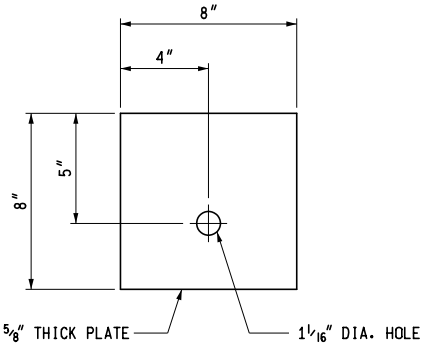


POST 4 THROUGH 7 DETAIL
(FLEAT)

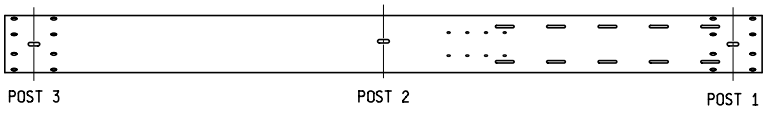




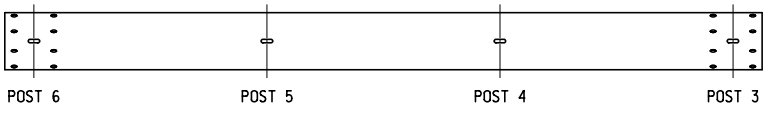
CABLE ANCHOR BRACKET DETAIL
(FLEAT)



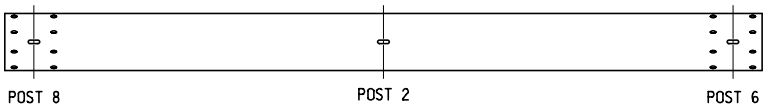
BEARING PLATE
(FLEAT)



BEAM ELEMENT *1 (SLOTTED RAIL)
(POST 1 THROUGH 3)
(FLEAT)



BEAM ELEMENT *2 WITH 4 POST BOLT SLOTS
(POST 3 THROUGH 6)
(FLEAT)



BEAM ELEMENT *3 WITH 3 POST BOLT SLOTS
(POST 6 THROUGH 8)
(FLEAT)

NOTES:

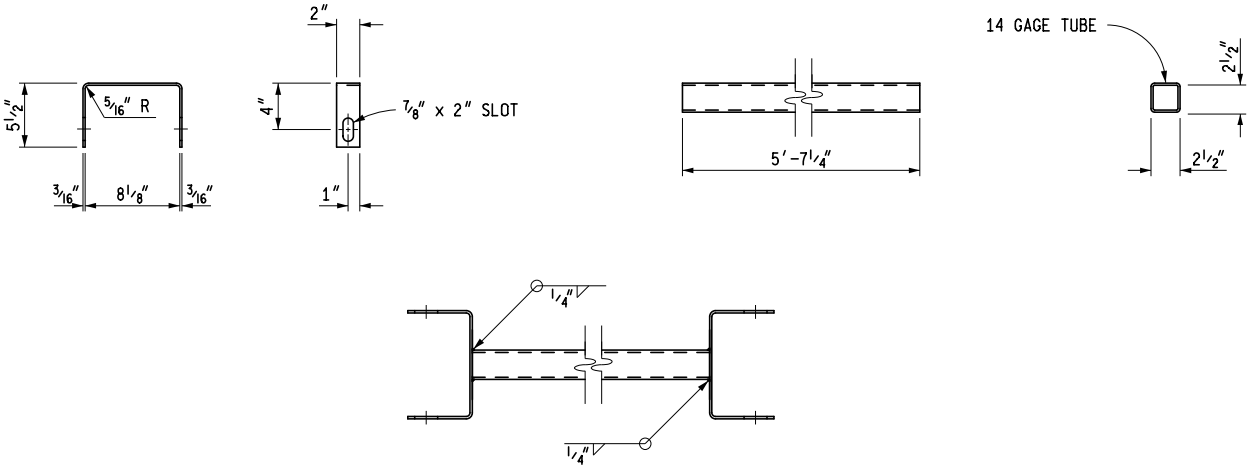
POST 8 IS A STANDARD LINE POST.

ALL "FLEAT" ITEMS ILLUSTRATED WITHOUT DIMENSIONS SHALL BE ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

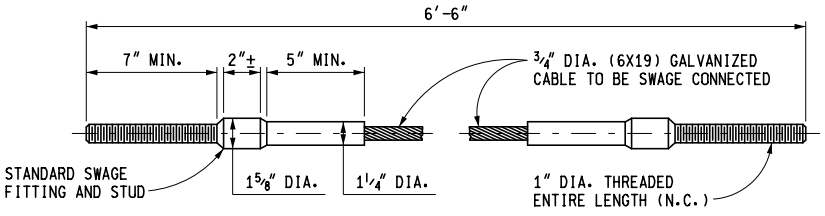
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 11 OF 20



ASSEMBLY DETAIL

STRUT DETAILS

(FLEAT)



CABLE ASSEMBLY

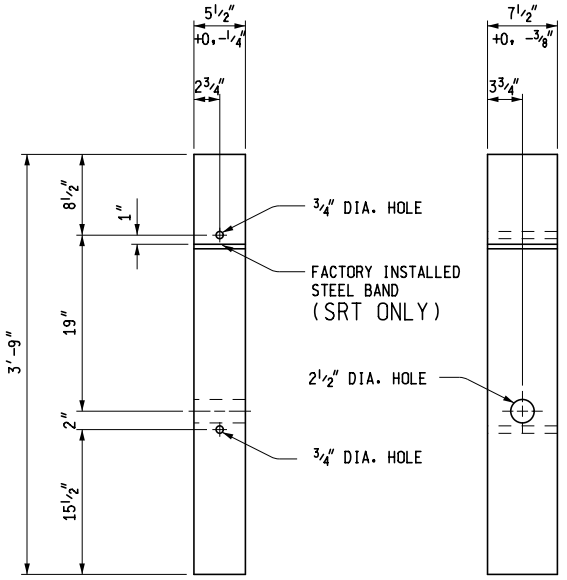
(SRT, FLEAT AND X-LITE-FLARED)

MICHIGAN DEPARTMENT OF TRANSPORTATION

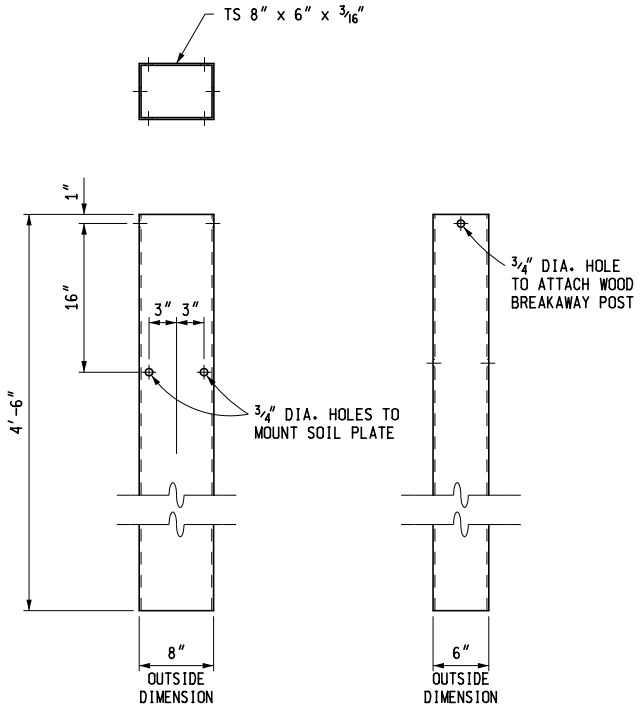
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

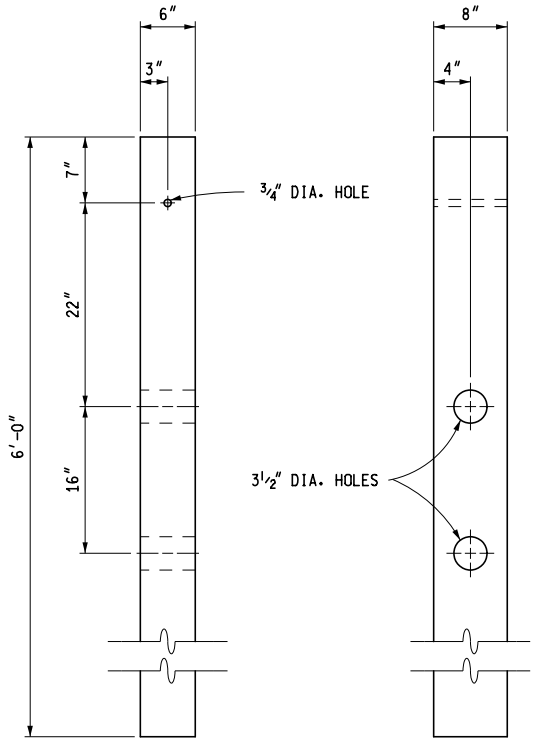
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 12 OF 20



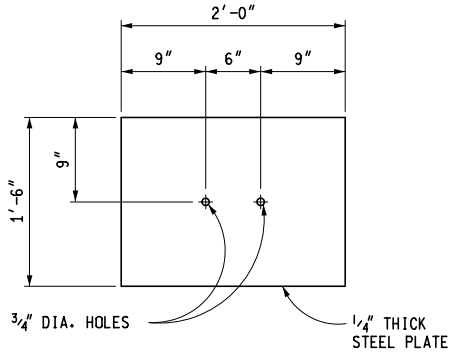
WOOD BREAKAWAY POST



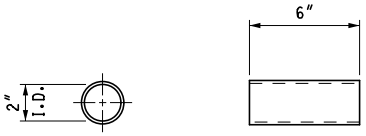
STEEL SLEEVE



CRT POST



SOIL PLATE



CABLE SLEEVE
(FOR POST 1)

NOTES:

DETAILS ON THIS SHEET APPLY TO THE "SRT" AND "FLEAT" UNLESS OTHERWISE NOTED.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

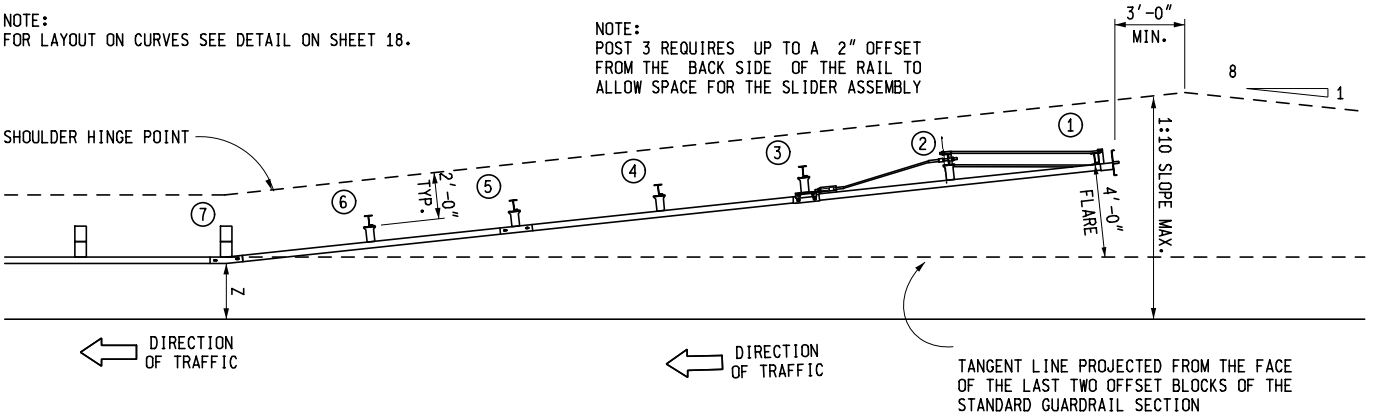
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 13 OF 20

TRAILING END

APPROACH END

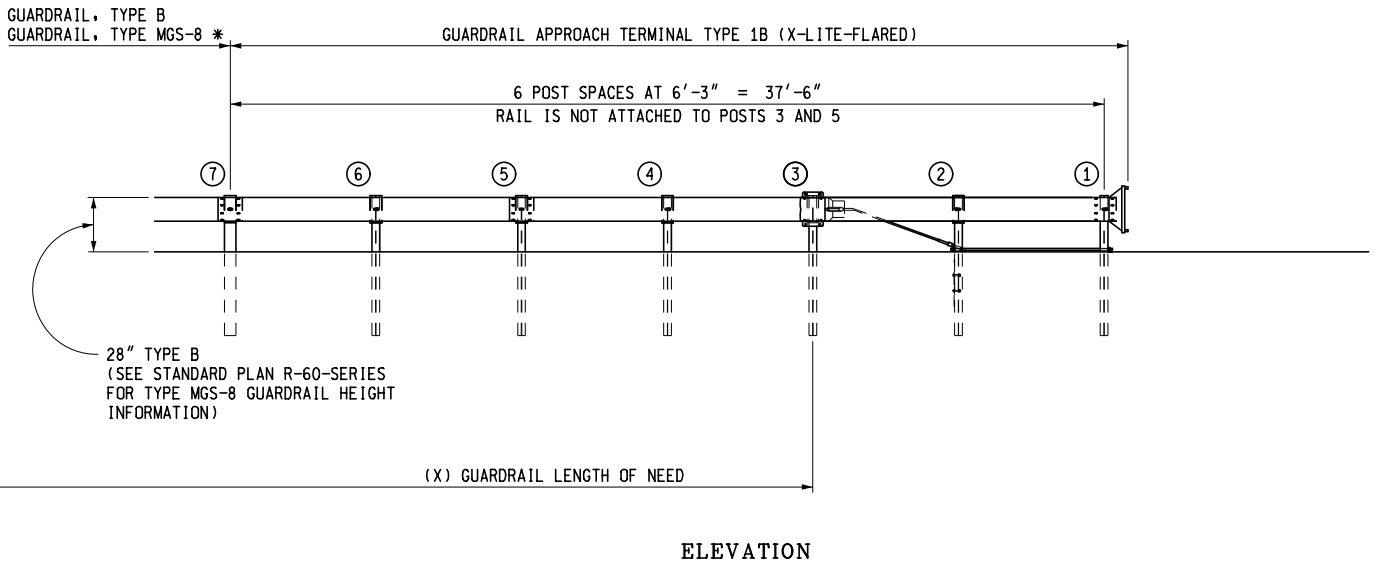
NOTE:
FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 18.

NOTE:
POST 3 REQUIRES UP TO A 2" OFFSET FROM THE BACK SIDE OF THE RAIL TO ALLOW SPACE FOR THE SLIDER ASSEMBLY



PLAN VIEW

* SEE STANDARD PLAN R-60-SERIES FOR POST SPACING AND GUARDRAIL LAYOUT TO TRANSITION FROM GUARDRAIL, TYPE MGS-8 TO GUARDRAIL APPROACH TERMINAL TYPE 1B



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 1B
"X-LITE-FLARED"

OPTION 3

(DETAILED ON SHEETS 13 THROUGH 17)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH
TERMINAL TYPES 1B & 1T
(SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL

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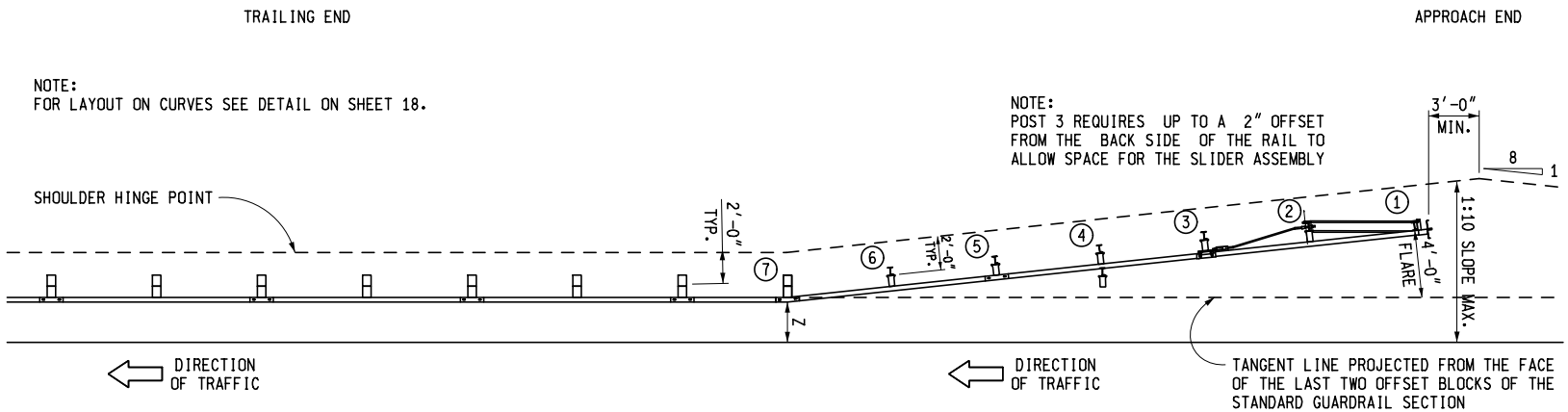
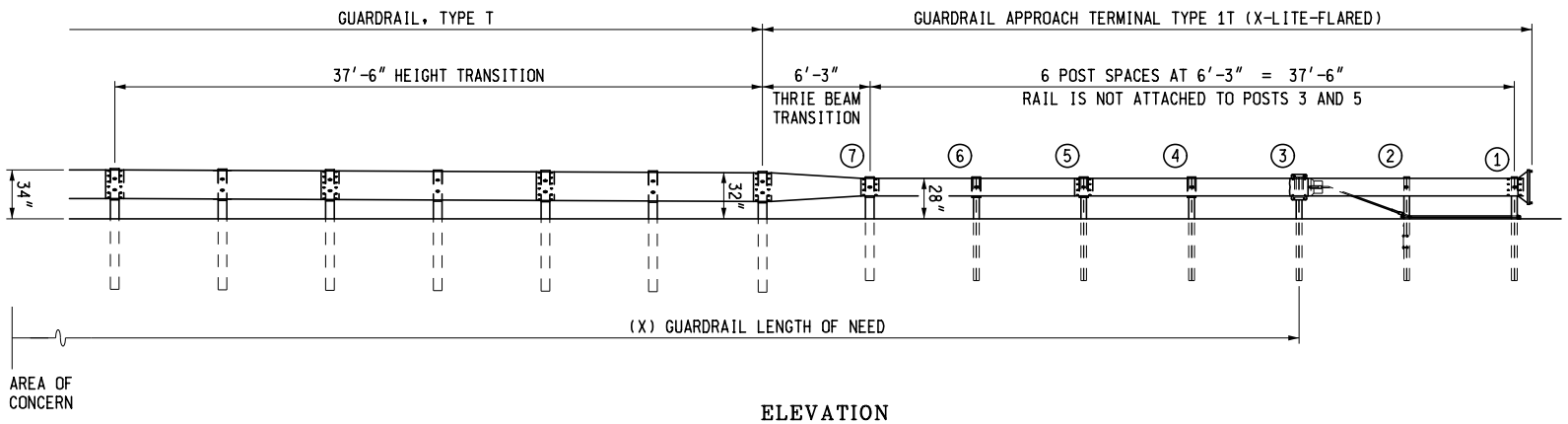


PLAN VIEW



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 1T "X-LITE-FLARED"

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL

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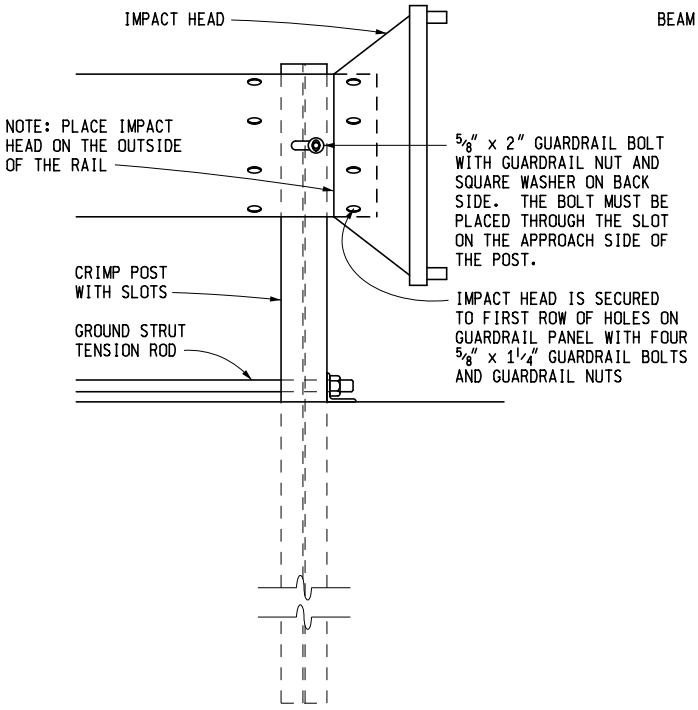
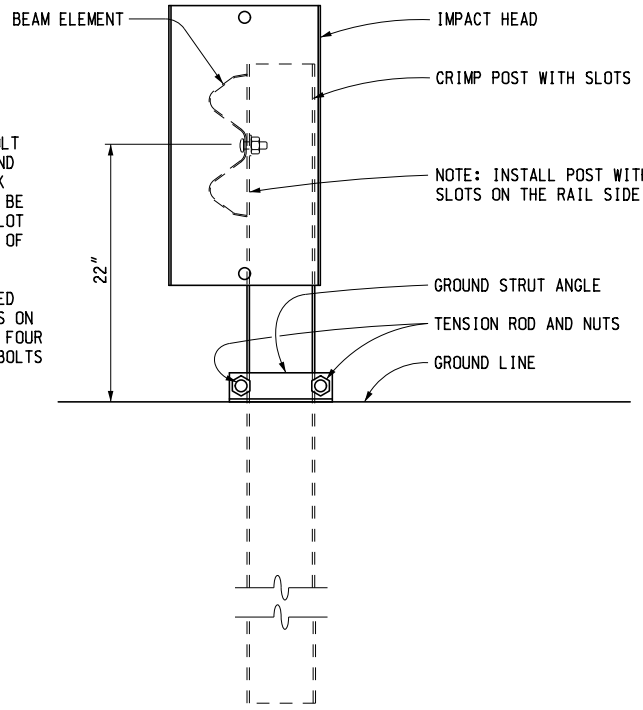
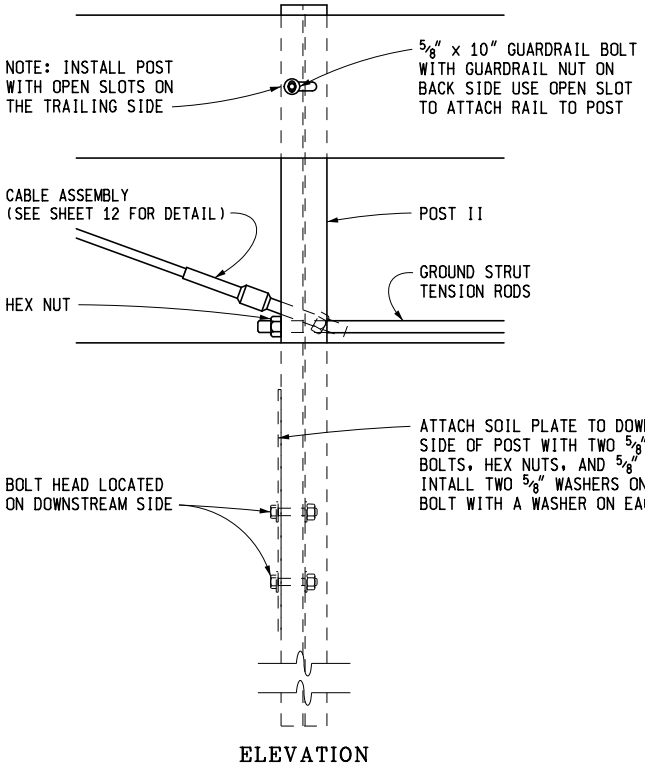
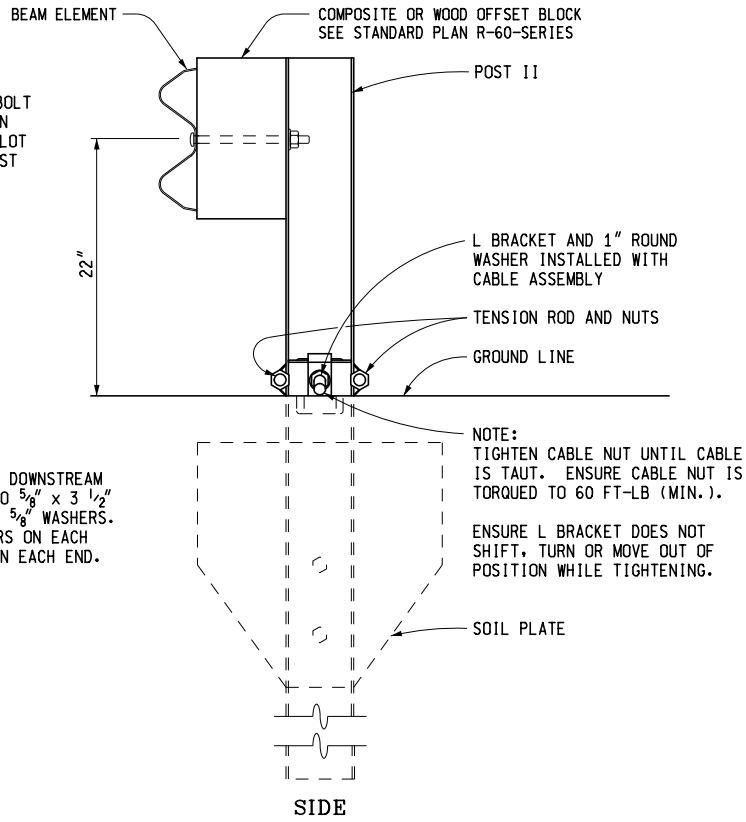
15 OF 20





POST 1 DETAIL





POST 2 DETAIL

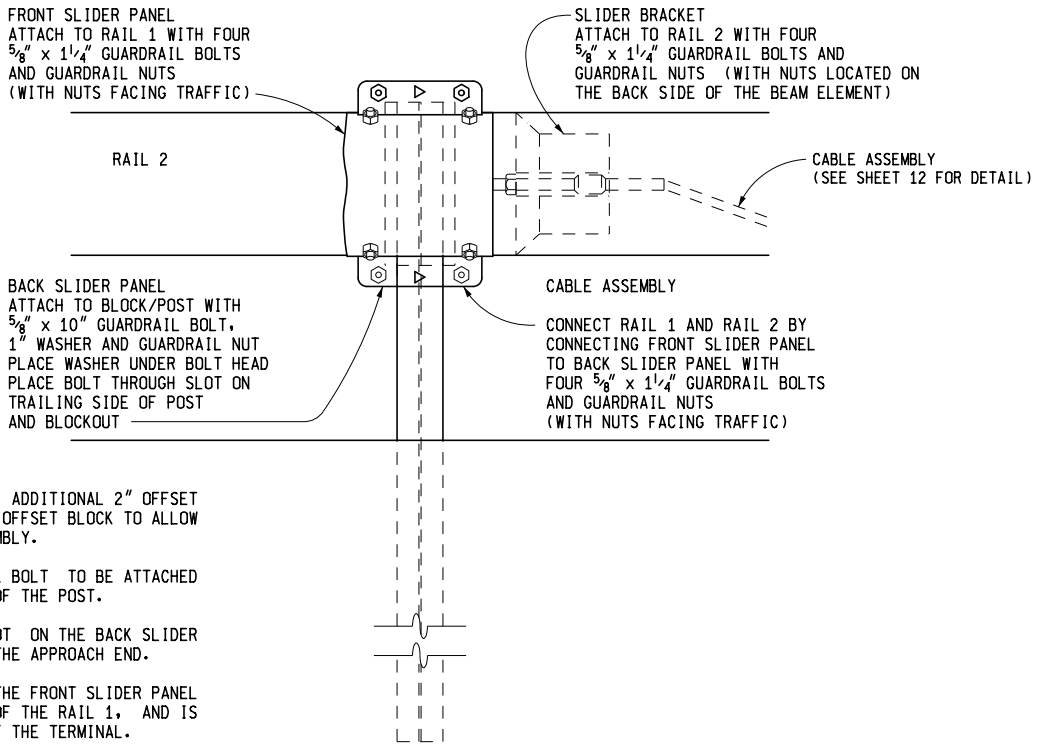
NOTE:

DETAILS ON THIS SHEET ONLY APPLY TO "X-LITE-FLARED".

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 16 OF 20



NOTES:

POST 3 REQUIRES UP TO AN ADDITIONAL 2" OFFSET BETWEEN THE RAIL AND THE OFFSET BLOCK TO ALLOW SPACE FOR THE SLIDER ASSEMBLY.

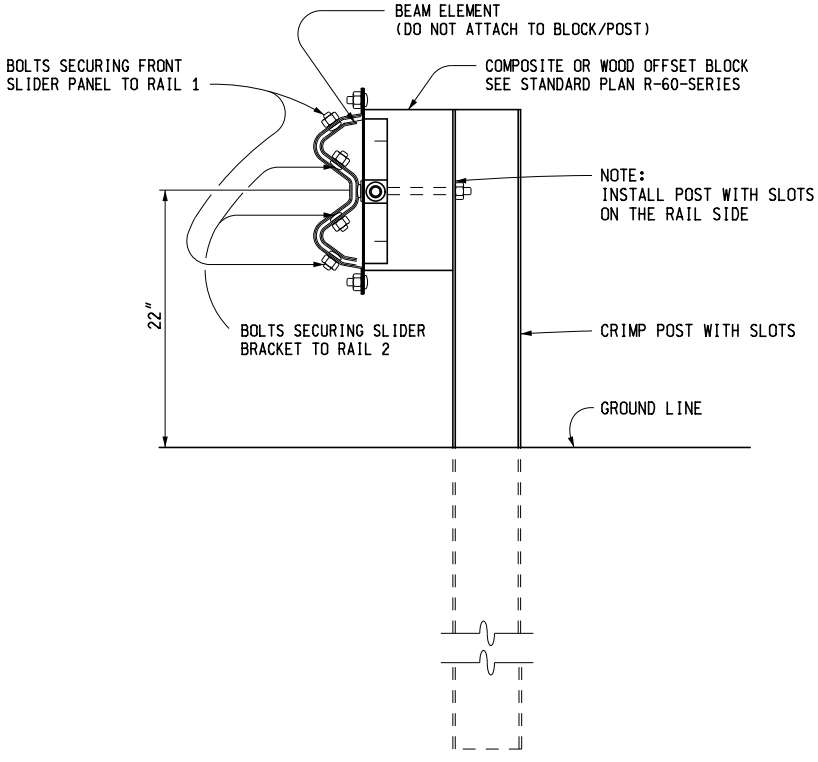
POST 3 REQUIRES GUARDRAIL BOLT TO BE ATTACHED TO SLOT ON TRAILING SIDE OF THE POST.

ENSURE OPEN END OF THE SLOT ON THE BACK SLIDER PANEL IS POINTING TOWARD THE APPROACH END.

ENSURE ANGLED PORTION OF THE FRONT SLIDER PANEL EXTENDS BEYOND THE END OF THE RAIL 1, AND IS FACING THE TRAILING END OF THE TERMINAL.

ARROWS ON FRONT AND BACK SLIDER PANELS NEED TO POINT TOWARD THE APPROACH END OF THE TERMINAL.

ELEVATION



SIDE

POST 3 DETAIL

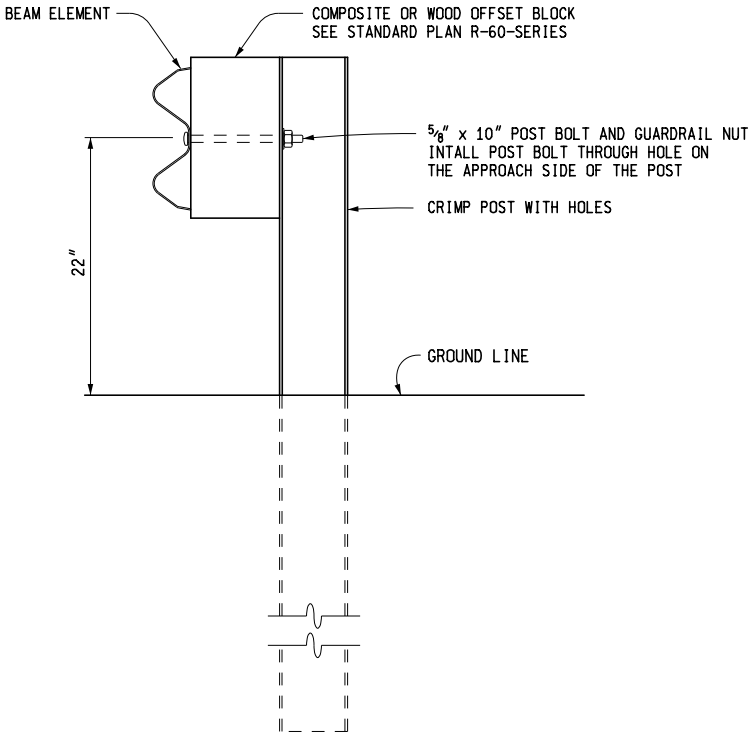
NOTE:

DETAILS ON THIS SHEET ONLY APPLY TO "X-LITE-FLARED".

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

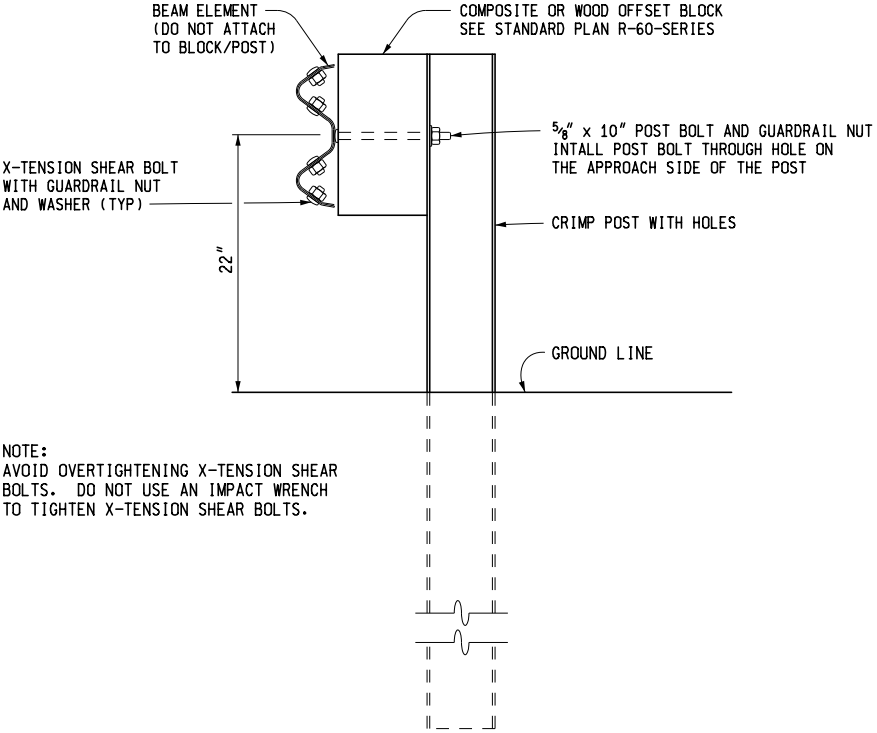
GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 17 OF 20



POST 4 AND 6 DETAIL

NOTE:
OVERLAP BEAM ELEMENTS WITH ELEMENTS
ON THE APPROACH END OVER ELEMENTS
ON THE TRAILING END.



NOTE:
AVOID OVERTIGHTENING X-TENSION SHEAR
BOLTS. DO NOT USE AN IMPACT WRENCH
TO TIGHTEN X-TENSION SHEAR BOLTS.

POST 5

NOTE:
POST 7 IS A STANDARD LINE POST.

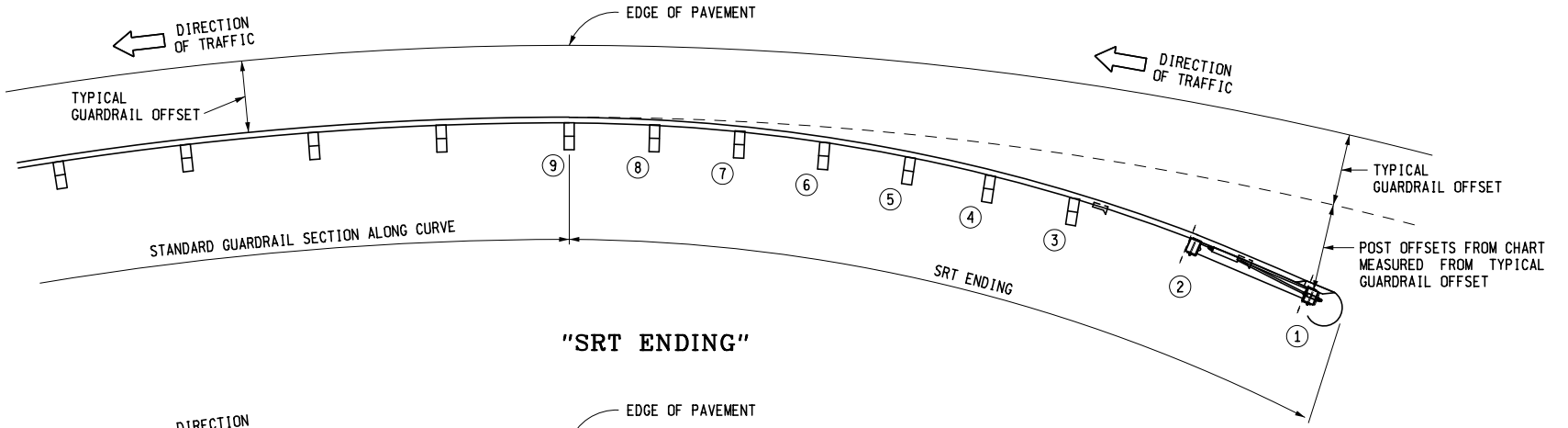
NOTE:

DETAILS ON THIS SHEET ONLY APPLY TO "X-LITE-FLARED".

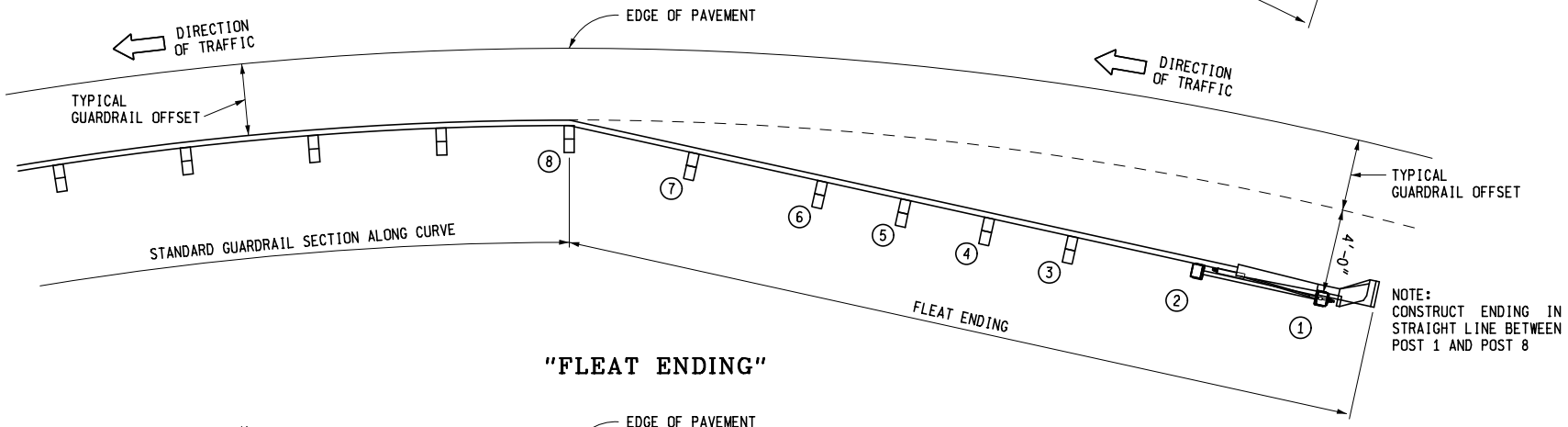
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

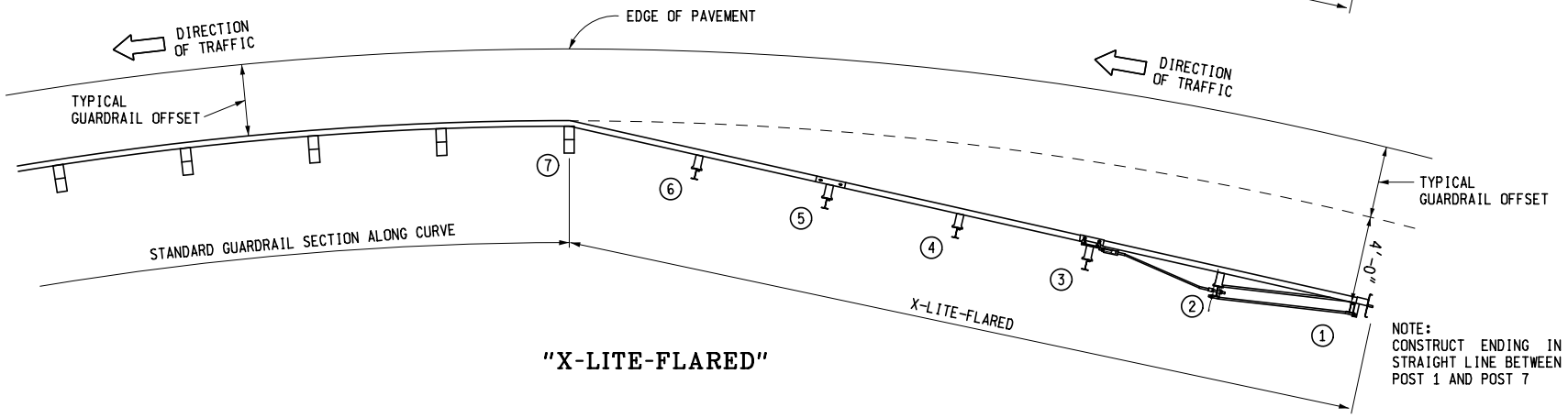
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 18 OF 20



"SRT ENDING"



"FLEAT ENDING"



"X-LITE-FLARED"

LOCATION OF APPROACH GUARDRAIL ON CURVES

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

F.H.W.A. APPROVAL

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NOTES:

ALL POSTS, OFFSET BLOCKS, BEAM ELEMENTS, AND HARDWARE (INCLUDING BOLTS, NUTS, AND WASHERS) SHALL CONFORM TO THE CURRENT STANDARD SPECIFICATIONS AND TO THE CURRENT STANDARD PLAN R-60-SERIES, WHERE APPLICABLE, EXCEPT AS SPECIFIED ON THIS STANDARD.

ALL 1:10 SLOPES SHALL BE GRADED TO CLASS A SLOPE TOLERANCES.

GUARDRAIL REFLECTORS AND OTHER ATTACHMENTS ARE NOT TO BE USED ON THE GUARDRAIL APPROACH TERMINAL. PLACE REFLECTORS BEGINNING ON STANDARD RUN OF GUARDRAIL.

USE REFLECTIVE SHEETING ACCORDING TO THE FOLLOWING TRAFFIC CONDITIONS:
(NOTE: ALTERNATE 3" BLACK AND 3" YELLOW STRIPES ON A 45° ANGLE)

TRAFFIC PASSING ON THE LEFT SIDE

TRAFFIC PASSING ON BOTH SIDES

TRAFFIC PASSING ON THE RIGHT SIDE

ON THE "SRT", THE CURVED PORTION OF THE TERMINAL END SHOE FACING TRAFFIC (HALF CIRCLE) SHALL BE COMPLETELY COVERED WITH HIGH INTENSITY ADHESIVE REFLECTIVE SHEETING.

ON THE "FLEAT" AND "X-LITE-FLARED", THE PORTION OF THE IMPACT HEAD ASSEMBLY FACING TRAFFIC SHALL BE COMPLETELY COVERED WITH HIGH INTENSITY ADHESIVE REFLECTIVE SHEETING.

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & X-LITE-FLARED)

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MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

R-72-D	SHEET 1 OF 11

5-11-2016 PLAN DATE

F.H.W.A. APPROVAL

APPROVED BY: _____ DIRECTOR, BUREAU OF DEVELOPMENT

APPROVED BY: _____ DIRECTOR, BUREAU OF FIELD SERVICES

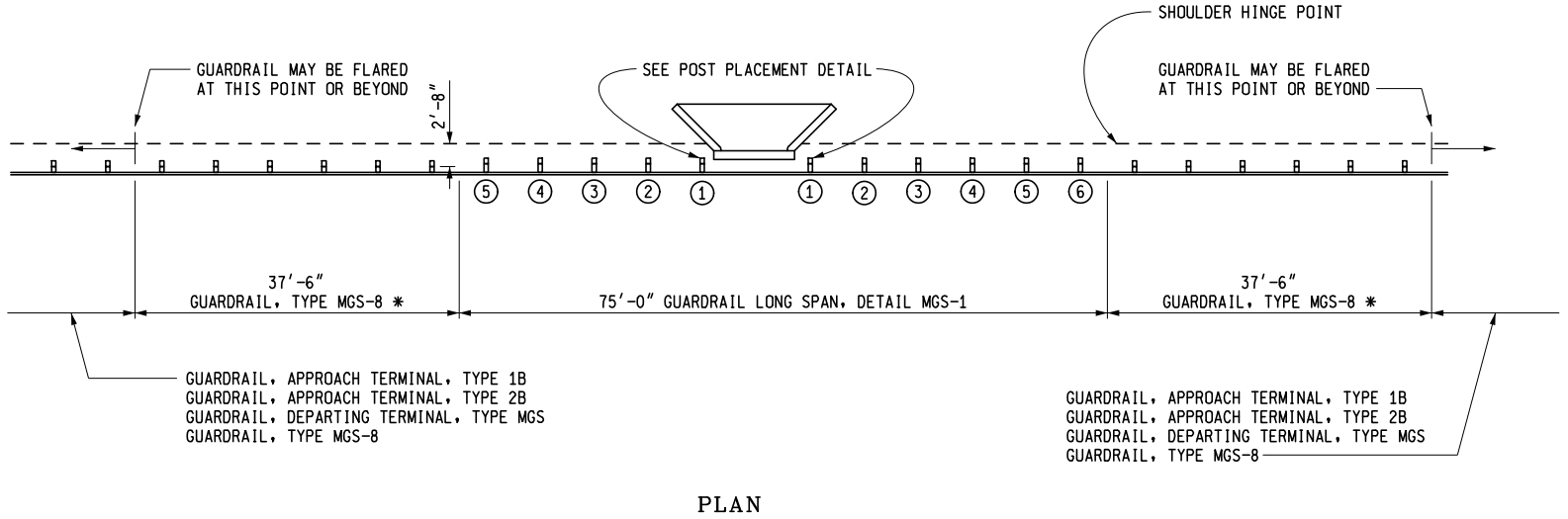
DEPARTMENT DIRECTOR
Kirk T. Steudle

PREPARED BY DESIGN DIVISION

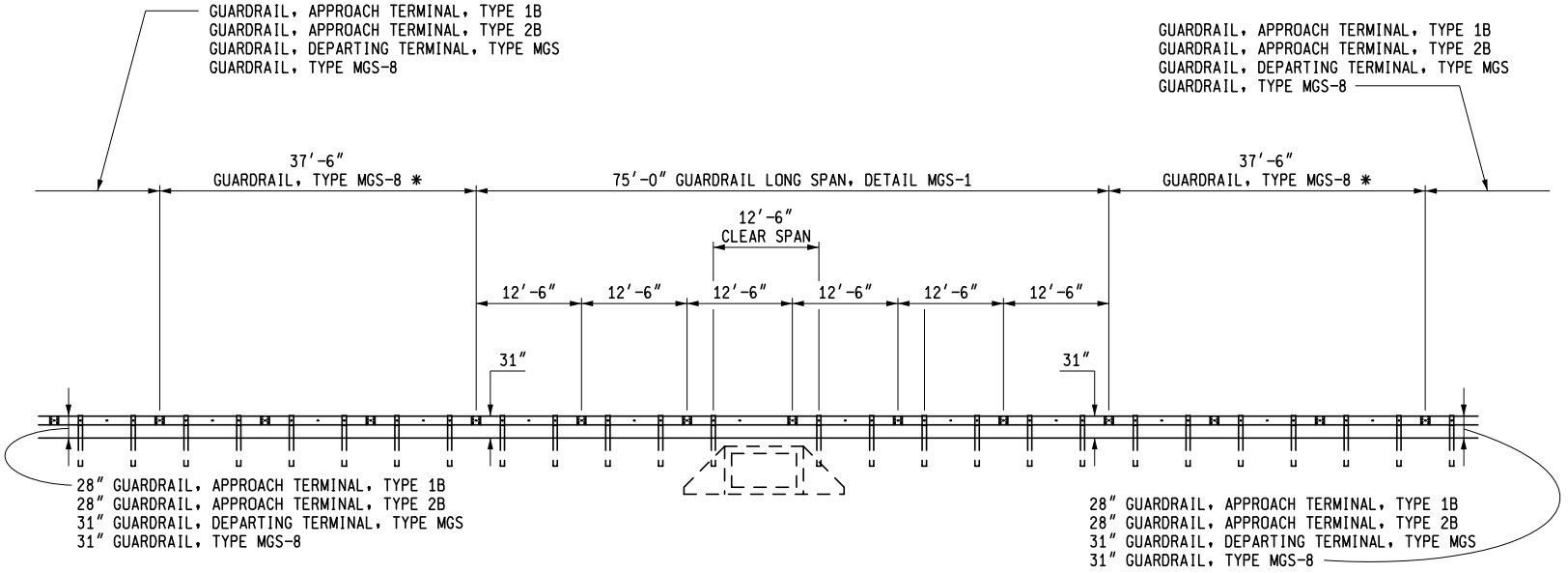
DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

* SEE STANDARD PLAN R-60-SERIES FOR POST SPACING AND GUARDRAIL LAYOUT TO TRANSITION FROM GUARDRAIL, TYPE MGS-8 TO GUARDRAIL APPROACH TERMINAL, TYPE 1B OR GUARDRAIL APPROACH TERMINAL, TYPE 2B.



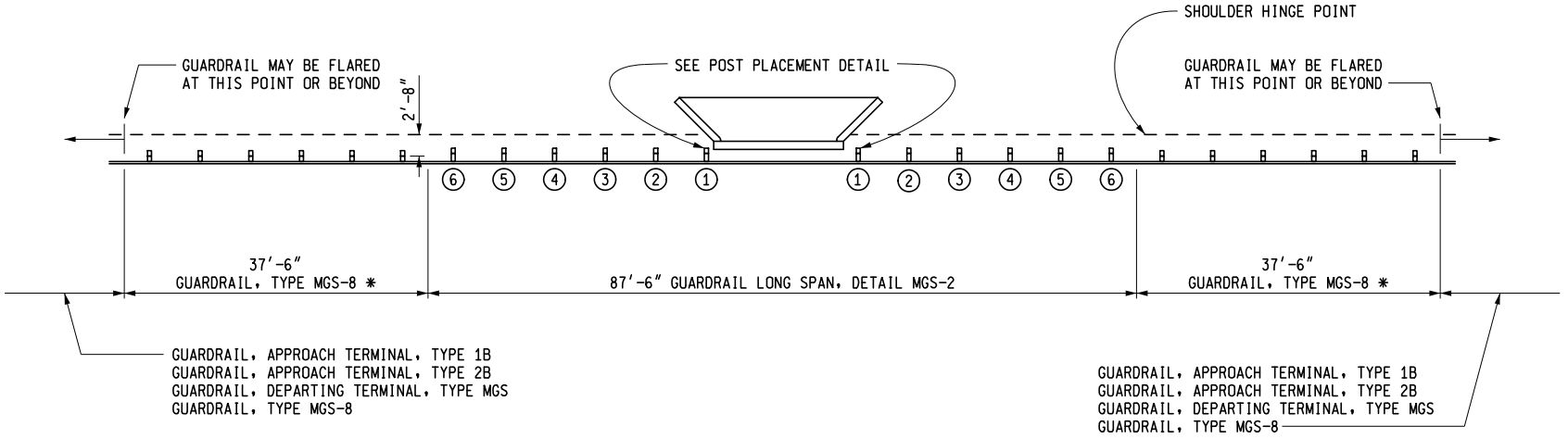
PLAN



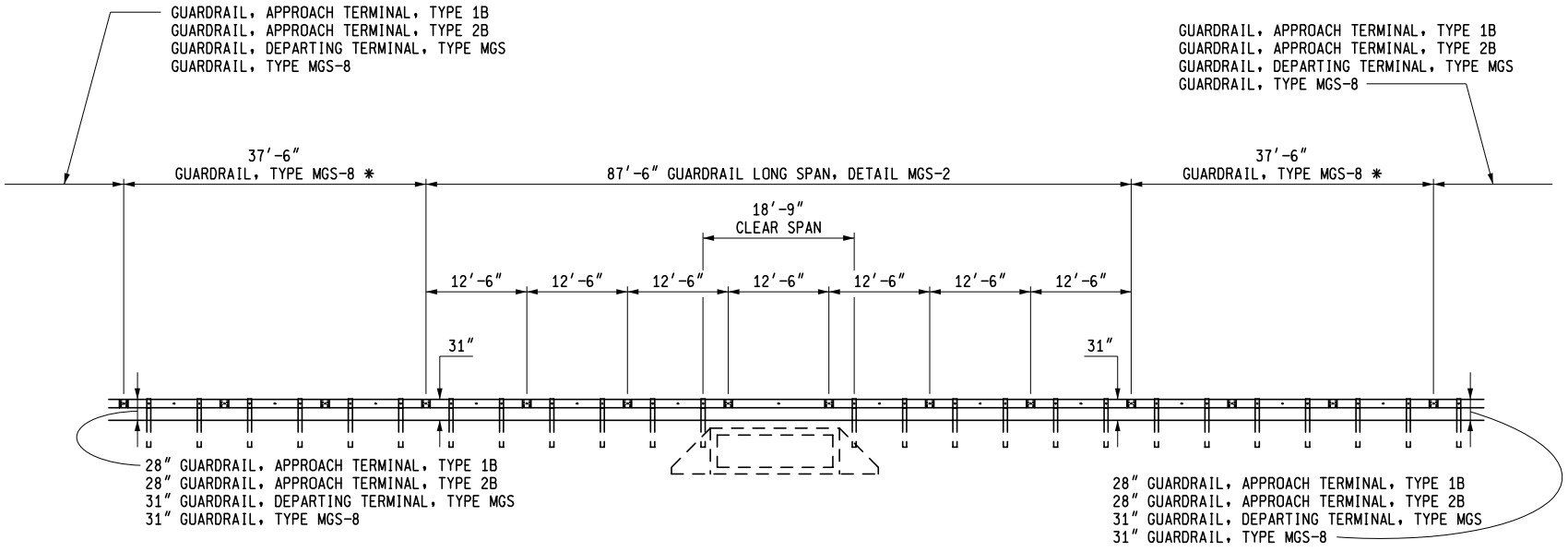
ELEVATION

GUARDRAIL LONG SPAN, DETAIL MGS-1

* SEE STANDARD PLAN R-60-SERIES FOR POST SPACING AND GUARDRAIL LAYOUT TO TRANSITION FROM GUARDRAIL, TYPE MGS-8 TO GUARDRAIL APPROACH TERMINAL, TYPE 1B OR GUARDRAIL APPROACH TERMINAL, TYPE 2B.



PLAN



ELEVATION

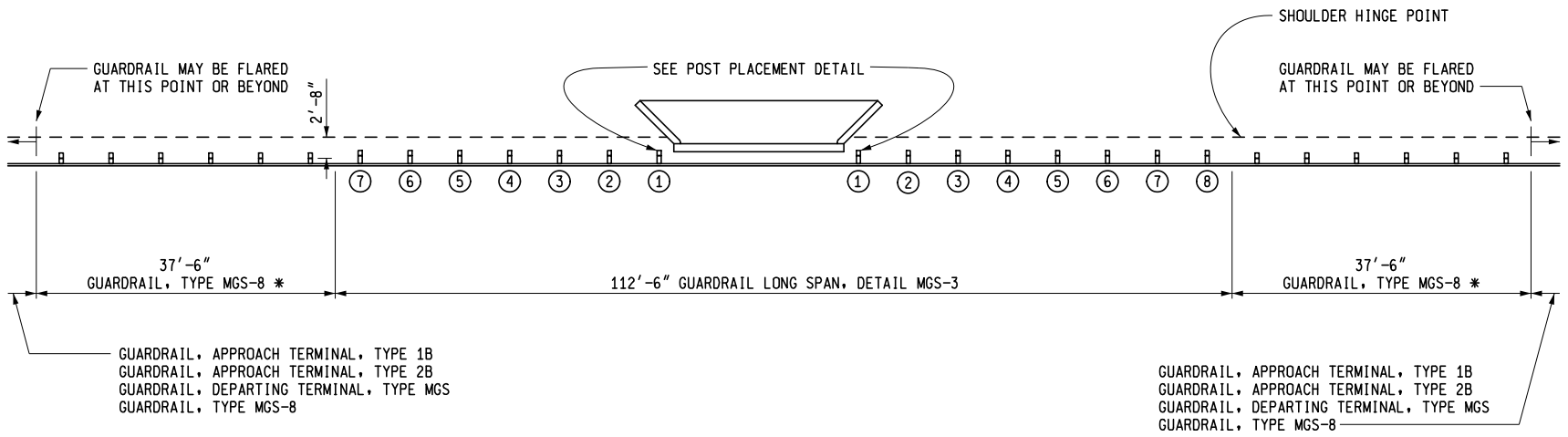
GUARDRAIL LONG SPAN, DETAIL MGS-2

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

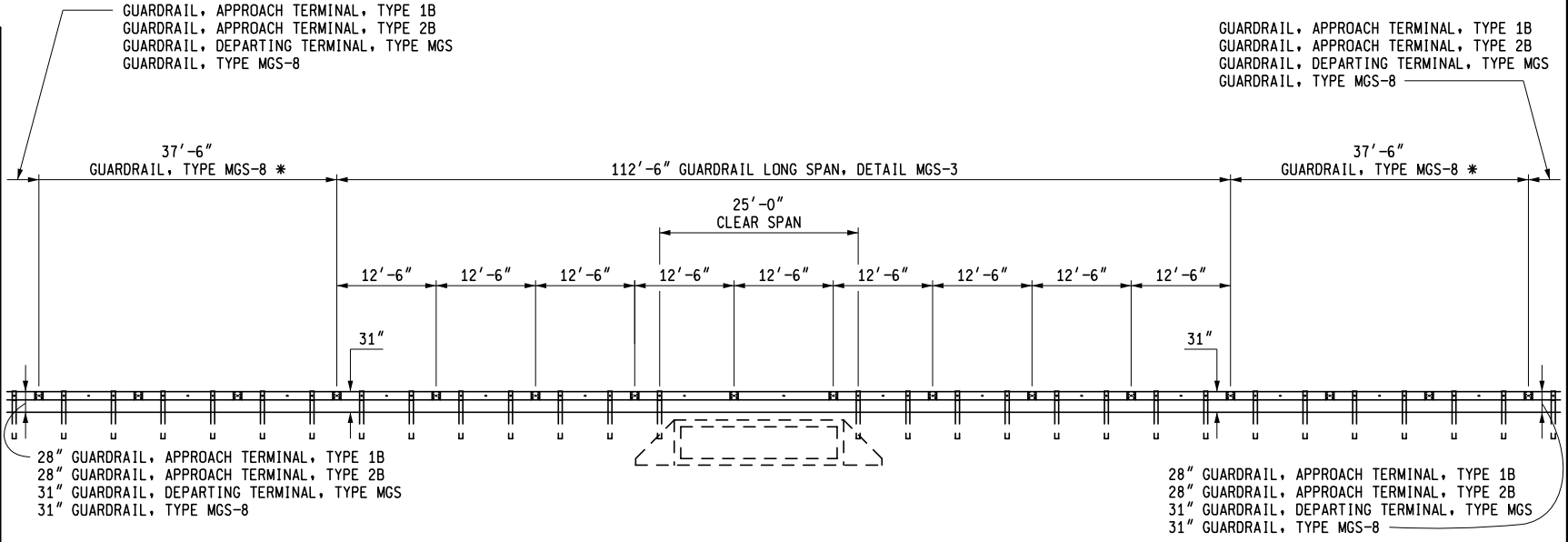
W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

F.H.W.A. APPROVAL	5-11-2016 PLAN DATE	R-72-D	SHEET 2 OF 11

* SEE STANDARD PLAN R-60-SERIES FOR POST SPACING AND GUARDRAIL LAYOUT TO TRANSITION FROM GUARDRAIL, TYPE MGS-8 TO GUARDRAIL APPROACH TERMINAL, TYPE 1B OR GUARDRAIL APPROACH TERMINAL, TYPE 2B.



PLAN



ELEVATION

GUARDRAIL LONG SPAN, DETAIL MGS-3

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

F.H.W.A. APPROVAL

5-11-2016
PLAN DATE

R-72-D

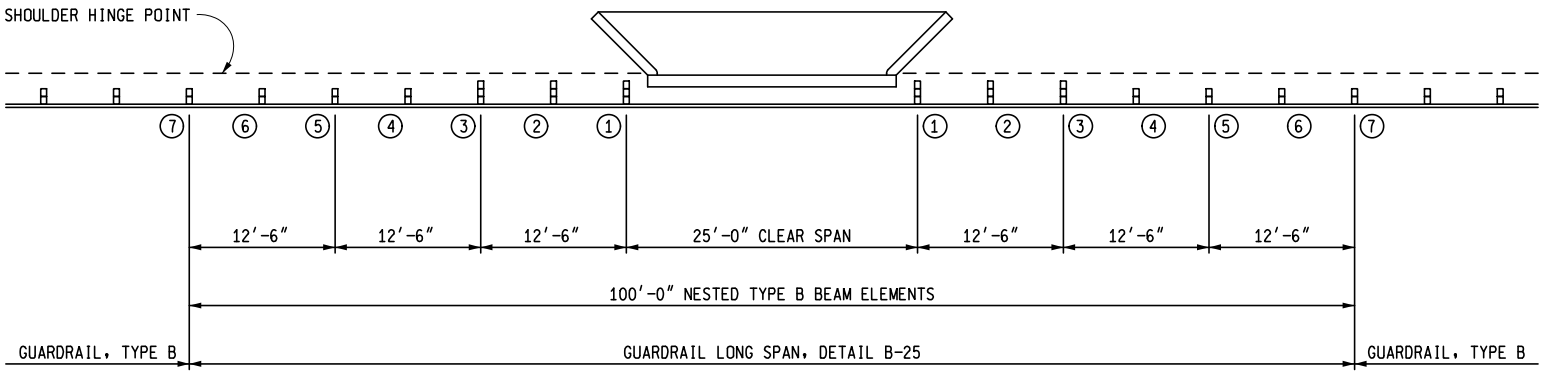
SHEET 3 OF 11

NOTES:

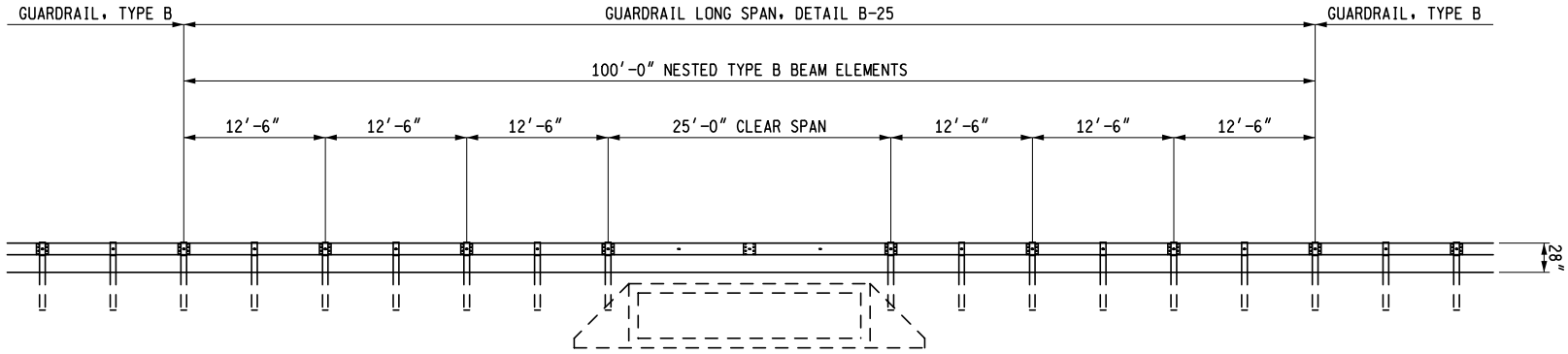
POSTS 1, 2, AND 3 ARE CRT POSTS WITH TWO STANDARD WOOD OFFSET BLOCKS ATTACHED TO THE POST. SEE SHEET 10 FOR CRT POST DETAIL.

POSTS 4, 5, 6, AND 7 ARE STANDARD STEEL OR WOOD TYPE B POSTS WITH OFFSET BLOCK. SEE STANDARD PLAN R-60-SERIES.

INSTALL A MINIMUM OF 12'-6" OF TYPE B GUARDRAIL BETWEEN POST 7 AND GUARDRAIL TERMINAL.



PLAN



ELEVATION

GUARDRAIL LONG SPAN, DETAIL B-25

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

F.H.W.A. APPROVAL

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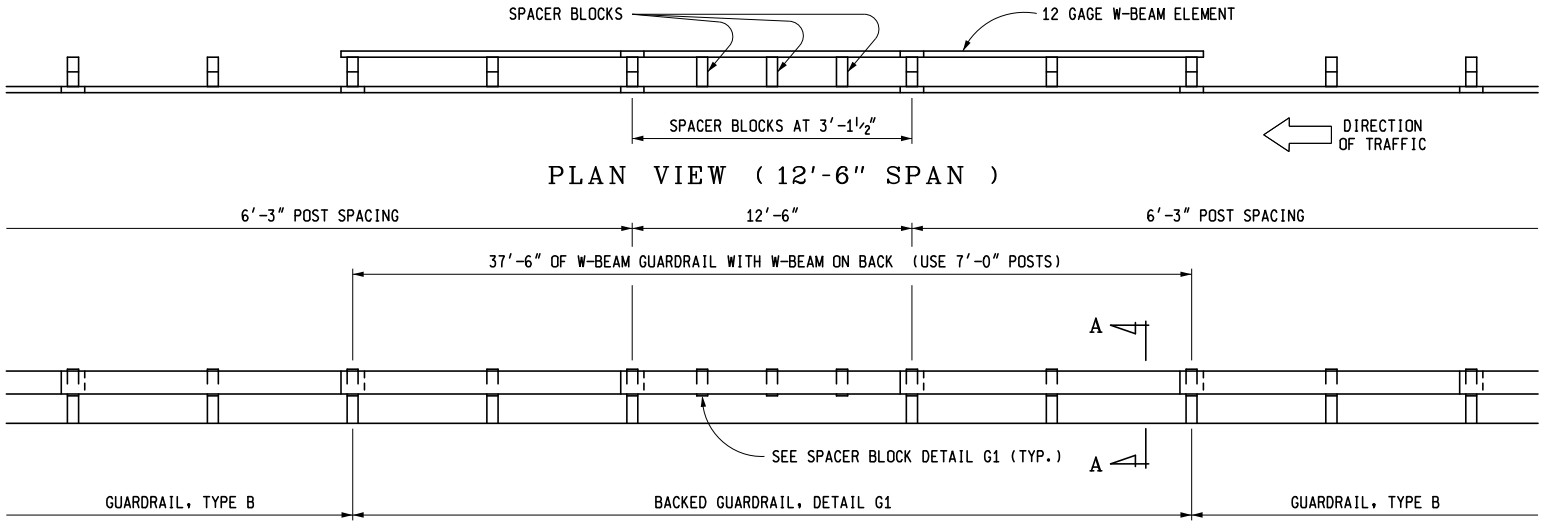
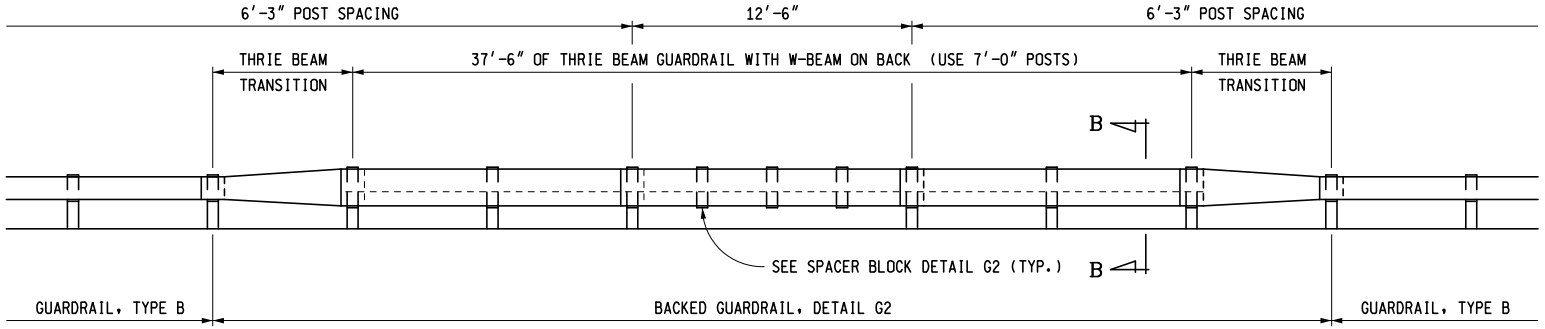
4 OF 11



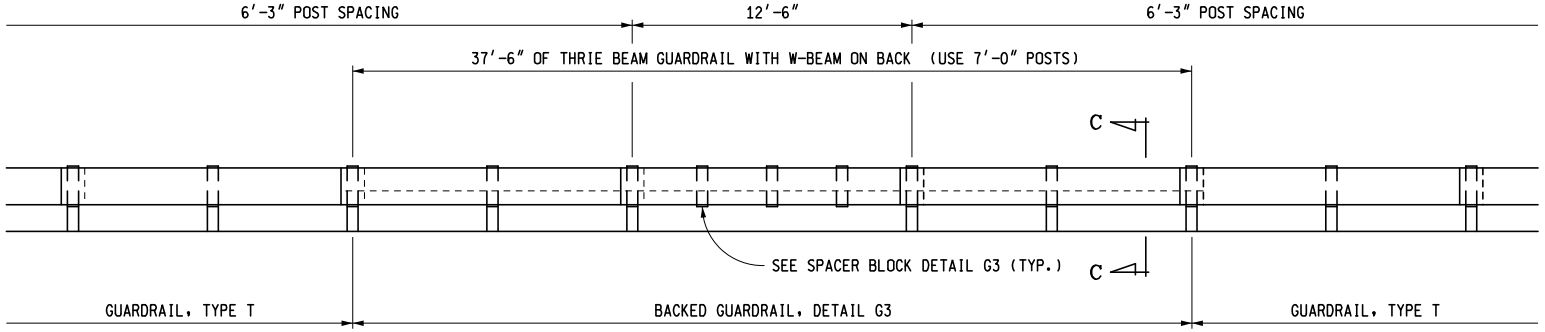
PLAN VIEW (12′-6″ SPAN)

W-BEAM BACKED GUARDRAIL, TYPE B (12′-6″ SPAN)



W-BEAM BACKED GUARDRAIL, TYPE T (12′-6″ SPAN)

(USE AT DEEP THROATED DOWNSPOUT HEADERS)



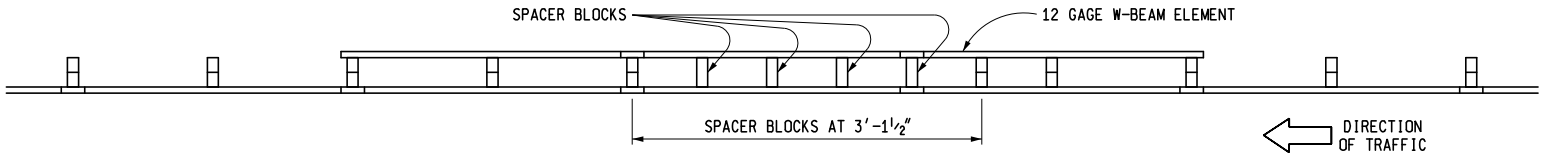
W-BEAM BACKED GUARDRAIL, TYPE T (12′-6″ SPAN)

MICHIGAN DEPARTMENT OF TRANSPORTATION

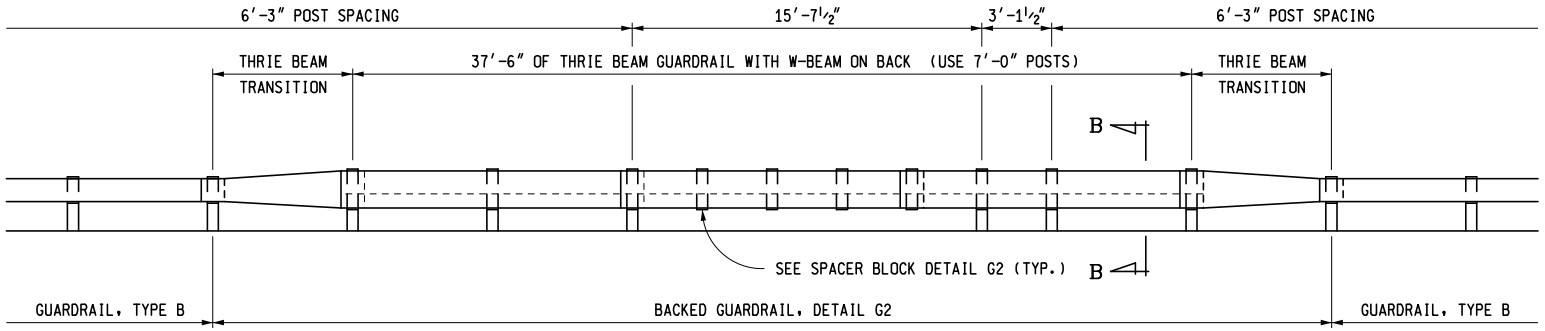
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

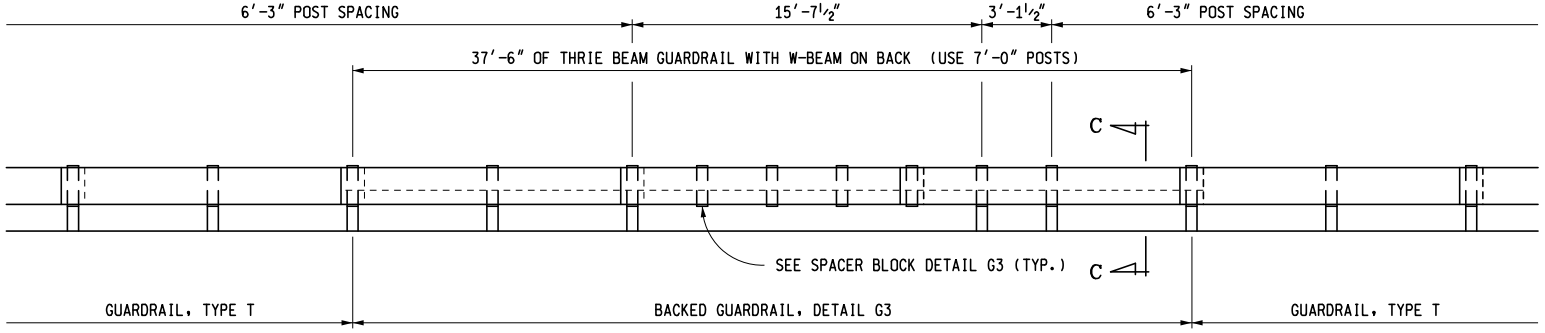
F.H.W.A. APPROVAL	5-11-2016 PLAN DATE	R-72-D	SHEET 5 OF 11



PLAN VIEW (15′-7½″ SPAN)



W-BEAM BACKED GUARDRAIL, TYPE T (15′-7½″ SPAN)



W-BEAM BACKED GUARDRAIL, TYPE T (15′-7½″ SPAN)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

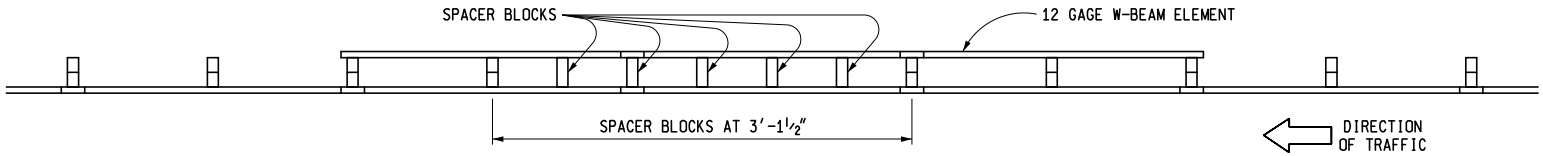
W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

F.H.W.A. APPROVAL

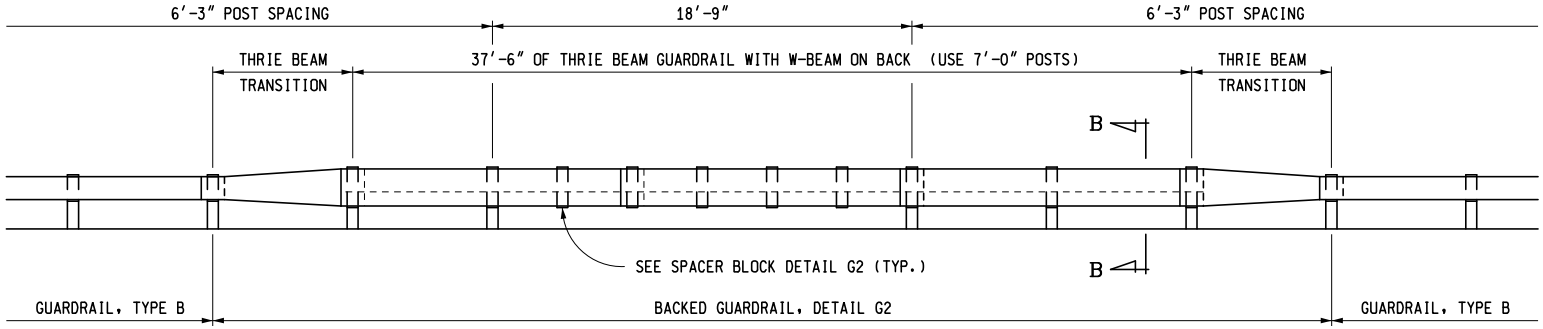
5-11-2016
PLAN DATE

R-72-D

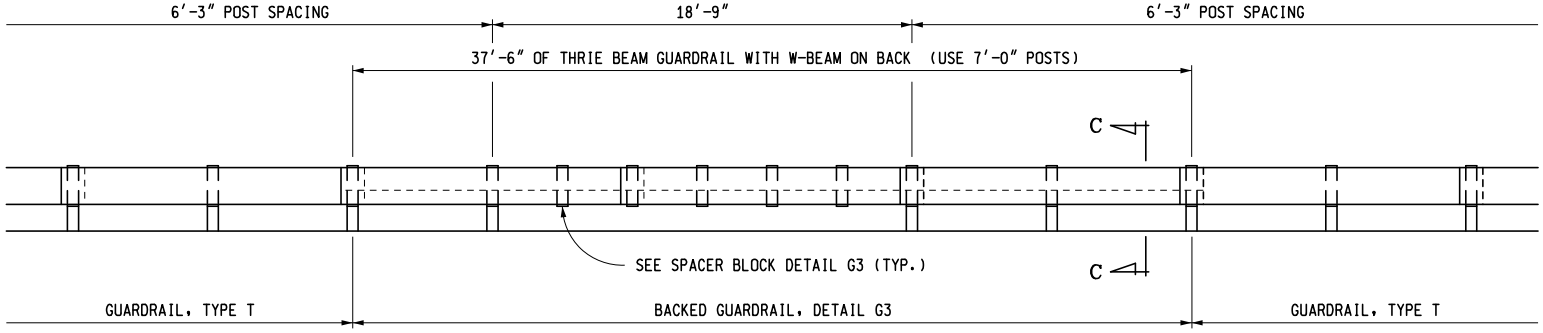
SHEET 6 OF 11



PLAN VIEW (18′-9″ SPAN)



W-BEAM BACKED GUARDRAIL, TYPE T (18′-9″ SPAN)

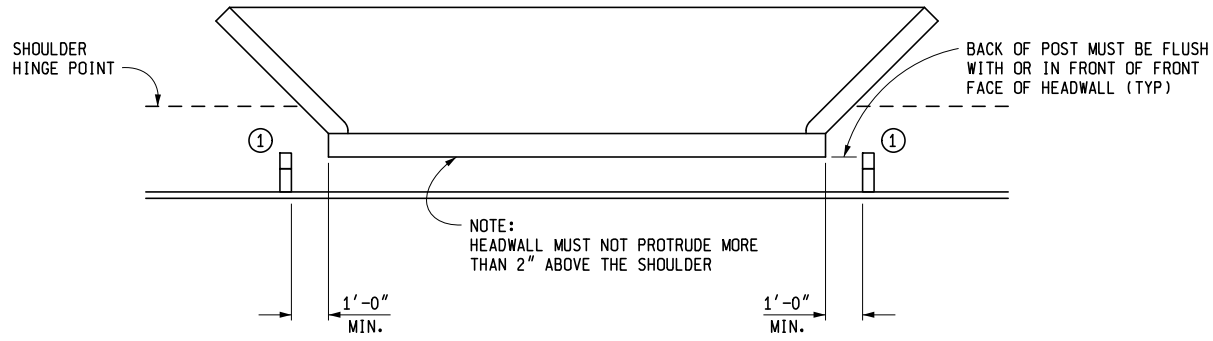


W-BEAM BACKED GUARDRAIL, TYPE T (18′-9″ SPAN)

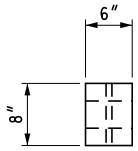
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

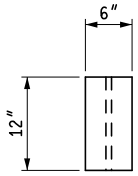
F.H.W.A. APPROVAL	5-11-2016 PLAN DATE	R-72-D	SHEET 7 OF 11



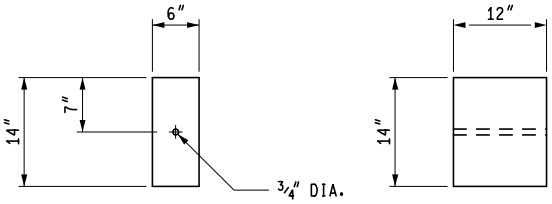
POST PLACEMENT DETAIL



PLAN



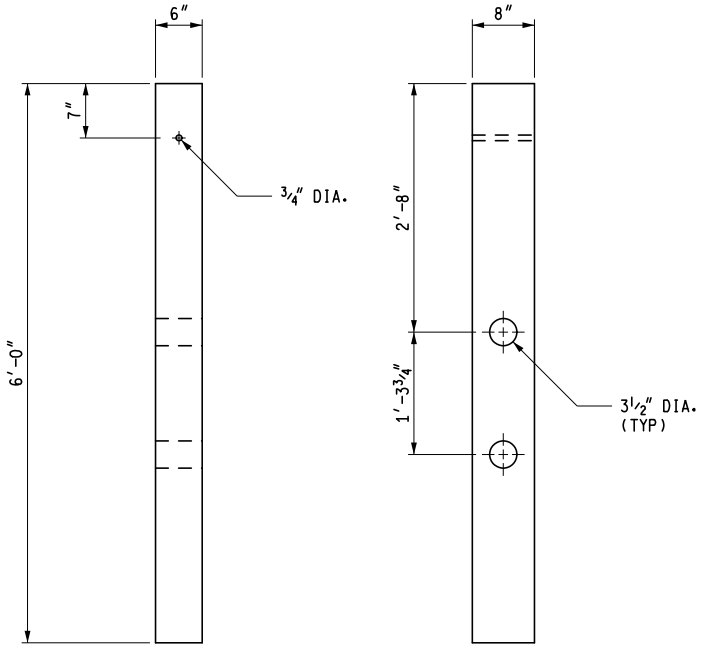
TOP



FRONT SIDE

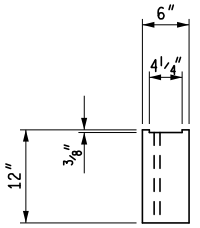
MGS 12" OFFSET BLOCK

FOR USE ON WOOD POSTS

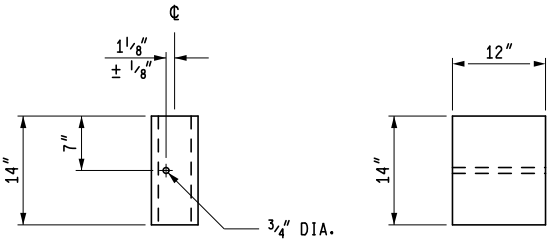


FRONT SIDE

MGS-CRT POST



TOP



FRONT SIDE

MGS 12" OFFSET BLOCK

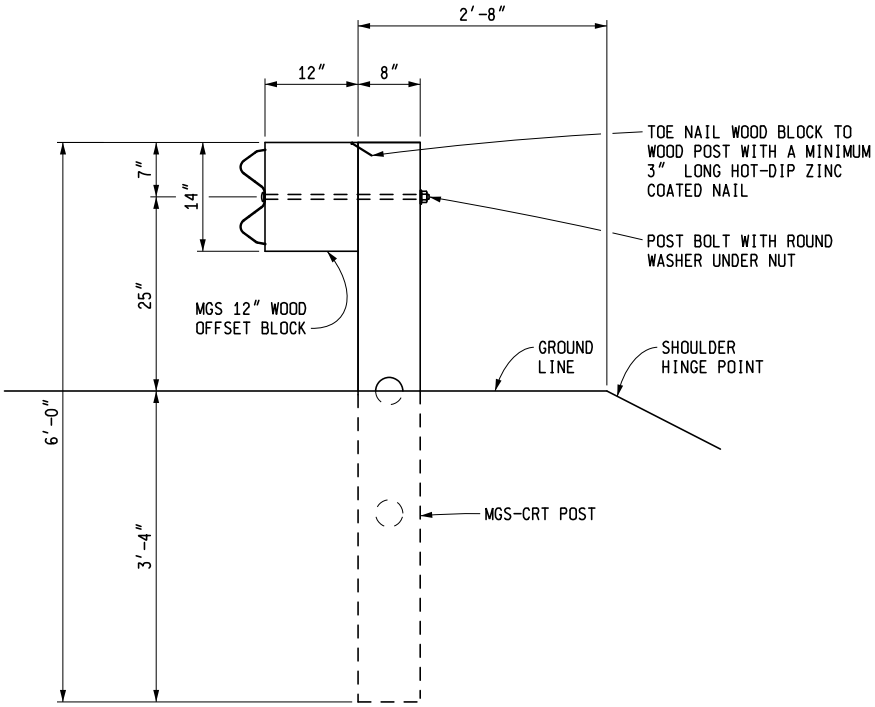
FOR USE ON STEEL POSTS

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

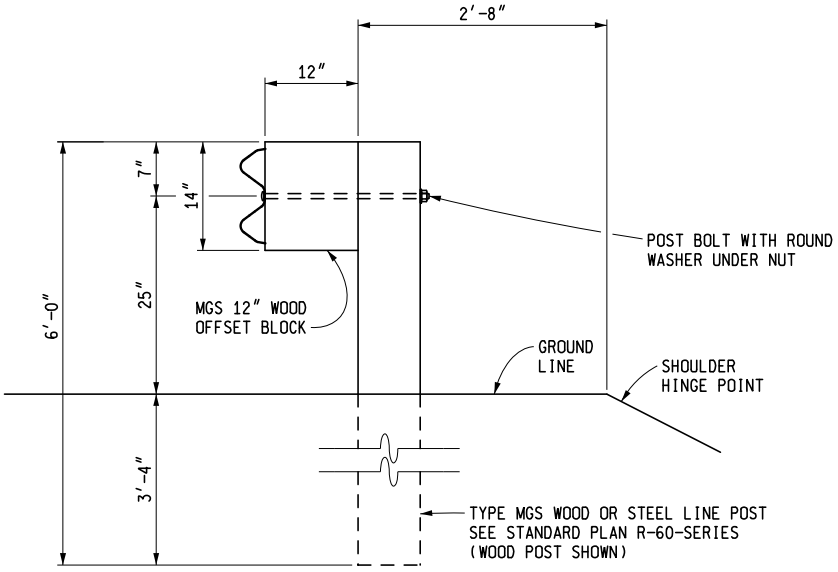
W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

F.H.W.A. APPROVAL	5-11-2016 PLAN DATE	R-72-D	SHEET 8 OF 11



POST 1 THROUGH 3 DETAIL

GUARDRAIL LONG SPAN DETAILS MGS-1, MGS-2, & MGS-3



POST 4 THROUGH 6 DETAIL

GUARDRAIL LONG SPAN DETAILS MGS-1 & MGS-2

POST 4 THROUGH 8 DETAIL

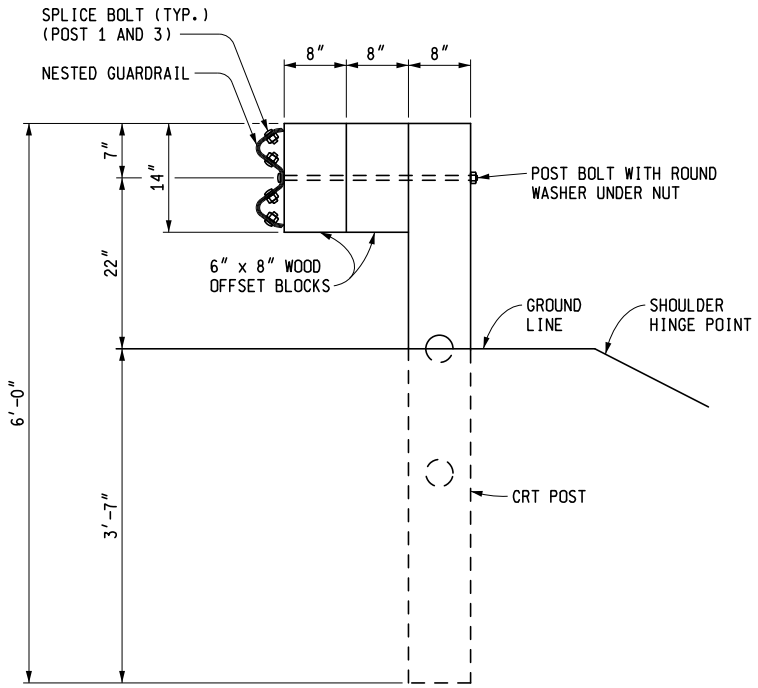
GUARDRAIL LONG SPAN DETAIL MGS-3

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

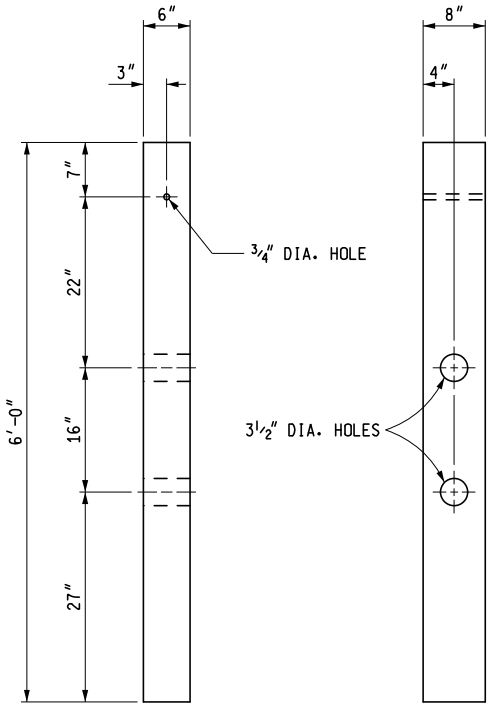
W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

F.H.W.A. APPROVAL	5-11-2016 PLAN DATE	R-72-D	SHEET 9 OF 11

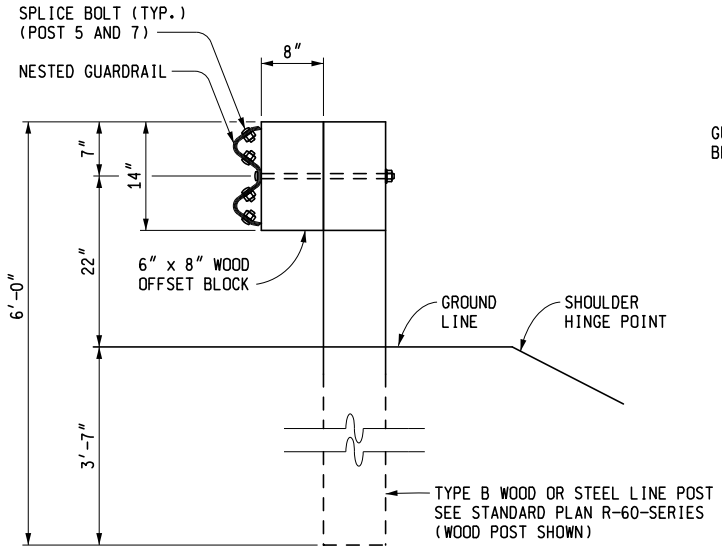


POST 1 THROUGH 3 DETAIL

GUARDRAIL LONG SPAN DETAIL B-25

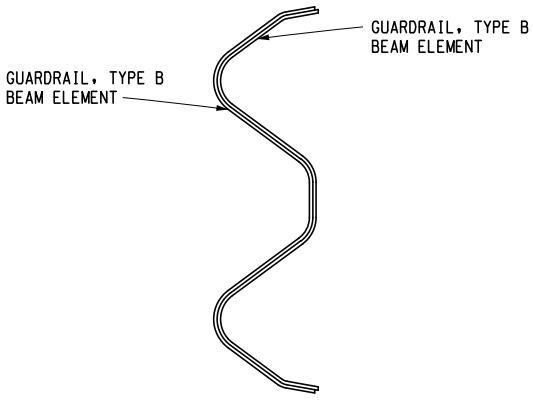


CONTROLLED RELEASING
TERMINAL POST
(CRT)



POST 4 THROUGH 7 DETAIL

GUARDRAIL LONG SPAN DETAIL B-25



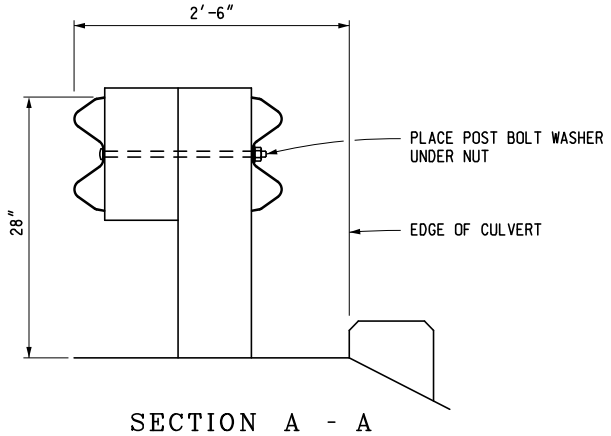
NESTED GUARDRAIL
DETAIL

MICHIGAN DEPARTMENT OF TRANSPORTATION

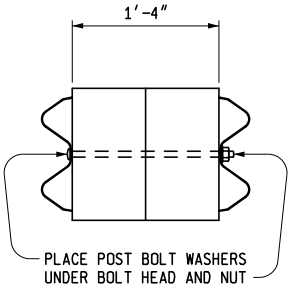
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

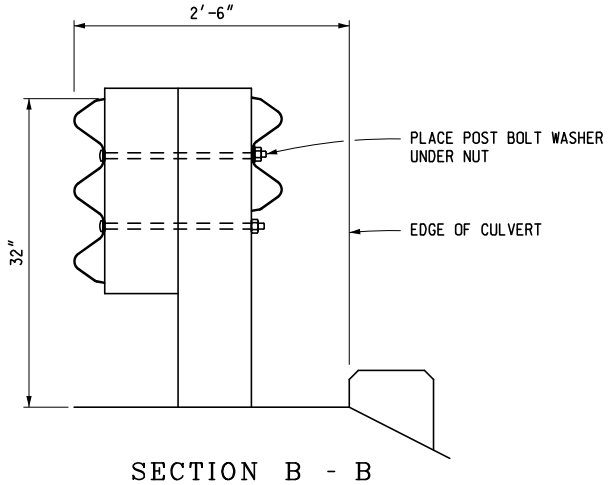
F.H.W.A. APPROVAL	5-11-2016 PLAN DATE	R-72-D	SHEET 10 OF 11



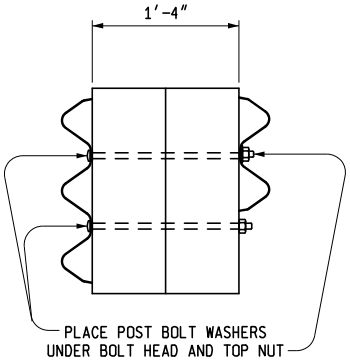
SECTION A - A



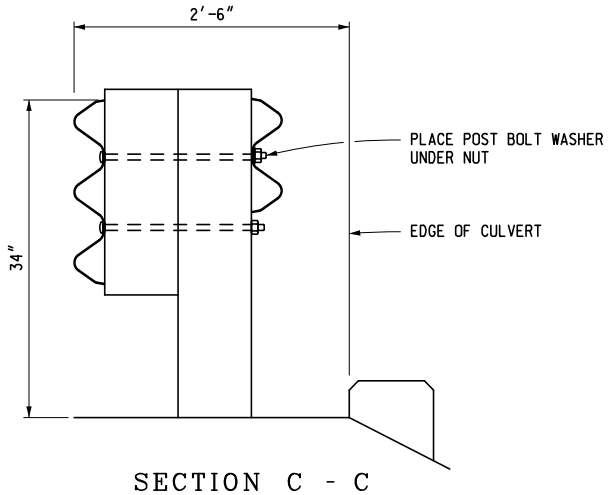
SPACER BLOCK DETAIL G1



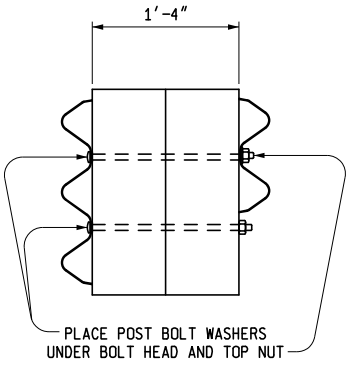
SECTION B - B



SPACER BLOCK DETAIL G2



SECTION C - C



SPACER BLOCK DETAIL G3

NOTES:

ALL POSTS, OFFSET BLOCKS, BEAM ELEMENTS, AND HARDWARE (INCLUDING BOLTS, NUTS, AND WASHERS) SHALL BE ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS AND THE CURRENT STANDARD PLAN R-60-SERIES, WHERE APPLICABLE, EXCEPT WHERE NOTED ON THIS STANDARD.

THE GUARDRAIL MODIFICATIONS DETAILED ON THIS STANDARD SHOULD ONLY BE USED WHERE 6′-3″ POST SPACING AND POST EMBEDMENT CANNOT BE MET. WHEN THE SPANNING DISTANCE BETWEEN POSTS IS 15′-7½″, THE 3′-1½″ POST SPACING SHOULD BE PLACED ON THE APPROACH END.

IF USE OF THIS DESIGN WOULD INTERFERE WITH THE POST SPACING WITHIN A GUARDRAIL BRIDGE ANCHORAGE AS SPECIFIED ON STANDARD PLAN R-67-SERIES, OTHER OPTIONS SHOULD BE INVESTIGATED AND USED.

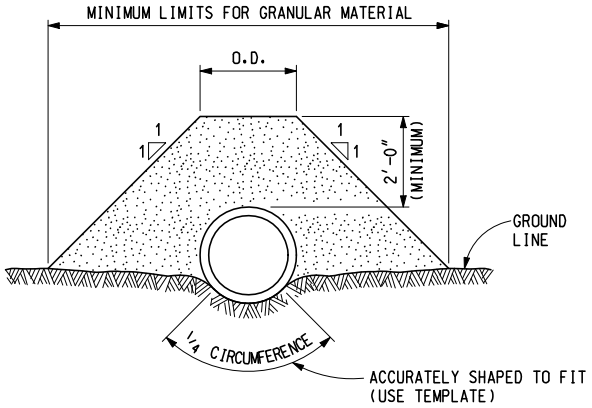
MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

F.H.W.A. APPROVAL	5-11-2016 PLAN DATE	R-72-D	SHEET 11 OF 11

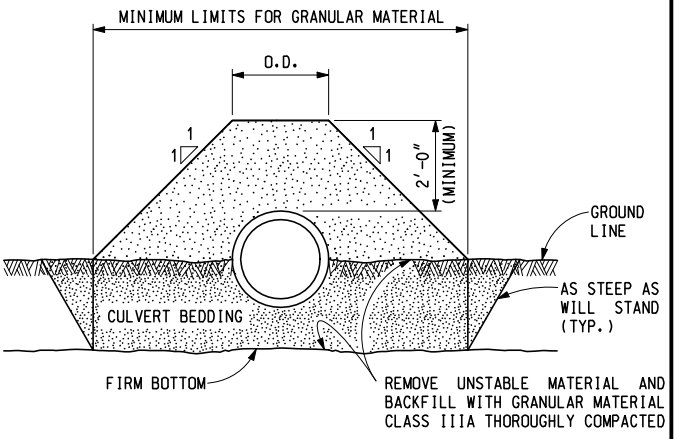
EMBANKMENT BETWEEN GROUND LINE AND 2′-0″ MINIMUM ABOVE TOP OF PIPE CULVERT SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA COMPACTED TO 95% OF ITS MAXIMUM UNIT WEIGHT. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10″ IN THICKNESS.



NOTE:
TRENCH MAY BE UNDERCUT BELOW CULVERT AND THE UNDERCUT MATERIAL REPLACED WITH GRANULAR MATERIAL.

CROSS-SECTION SHOWING CULVERT INSTALLATION IN STABLE SOIL

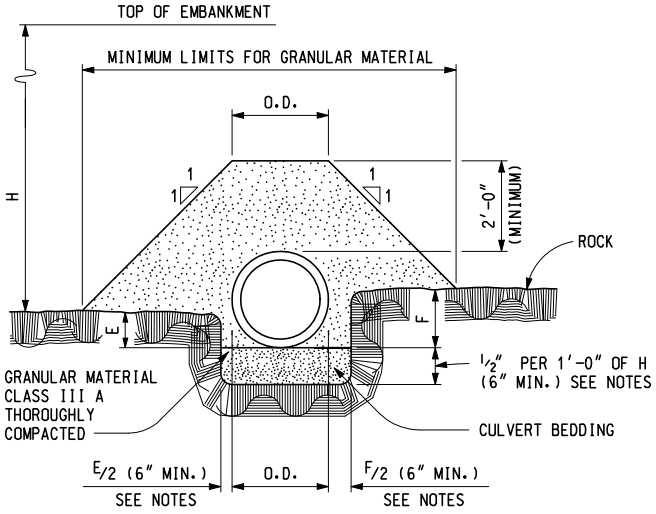
EMBANKMENT BETWEEN GROUND LINE AND 2′-0″ MINIMUM ABOVE TOP OF PIPE CULVERT SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA COMPACTED TO 95% OF ITS MAXIMUM UNIT WEIGHT. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10″ IN THICKNESS.



NOTE:
PLACE AND COMPACT CULVERT BEDDING TO THE LEVEL OF 1/4 THE DIAMETER OF THE PIPE CULVERT AND THEN EXCAVATE AND SHAPE A TRENCH TO FIT THE PIPE. AFTER PLACING CULVERT, CONTINUE FILLING WITH CULVERT BEDDING TO GROUND LINE.

CROSS-SECTION SHOWING CULVERT INSTALLATION IN UNSTABLE SOIL

EMBANKMENT BETWEEN GROUND LINE AND 2′-0″ MINIMUM ABOVE TOP OF PIPE CULVERT SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA COMPACTED TO 95% OF ITS MAXIMUM UNIT WEIGHT. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10″ IN THICKNESS.



NOTE:
PLACE AND COMPACT GRANULAR MATERIAL CLASS IIIA TO THE LEVEL OF 1/4 THE DIAMETER OF THE PIPE CULVERT AND THEN EXCAVATE AND SHAPE A TRENCH TO FIT THE PIPE.

CROSS-SECTION SHOWING CULVERT INSTALLATION IN ROCK

NOTES:

CORRUGATED STEEL PIPE, CORRUGATED POLYETHYLENE, AND ALUMINUM ALLOY PIPE SHALL HAVE A MINIMUM OF 12″ OF GRANULAR MATERIAL CLASS IIIA PLACED COMPLETELY AROUND THE PIPE FOR ITS FULL LENGTH EXCEPT FOR BEDDING.

THE ENGINEER SHALL DESIGNATE THE REQUIRED DETAIL BASED ON SOIL CONDITIONS ENCOUNTERED.

UNSTABLE SOIL IS SOIL TOO SOFT OR SPONGY TO PROVIDE A FIRM BED FOR THE PIPE CULVERT.

NO REDUCTION SHALL BE MADE IN THE REGULAR EMBANKMENT QUANTITY FOR THE SPACE OCCUPIED BY THE CULVERT.

PIPE CULVERTS IN CUT SECTIONS SHALL BE PLACED ACCORDING TO THE DETAILS SPECIFIED ON STANDARD PLAN R-83-SERIES.

WHEN AN END SECTION IS USED IN LIEU OF A HEADWALL, A STABLE FOUNDATION SHALL BE PROVIDED FOR THE END SECTION COMPARABLE TO THAT PROVIDED BY THE CULVERT.

WHEN BELL AND SPIGOT PIPE IS USED IN A ROCK TRENCH, A MINIMUM OF 4″ OF CULVERT BEDDING WILL BE REQUIRED UNDER THE BELL.

MDOT Michigan Department of Transportation

PREPARED BY DESIGN SUPPORT AREA

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

ENGINEER OF CONSTRUCTION & TECHNOLOGY

ENGINEER OF MAINTENANCE

ENGINEER OF TRAFFIC AND SAFETY

ENGINEER OF DESIGN SUPPORT AREA

DEPARTMENT DIRECTOR
Gloria J. Jeff

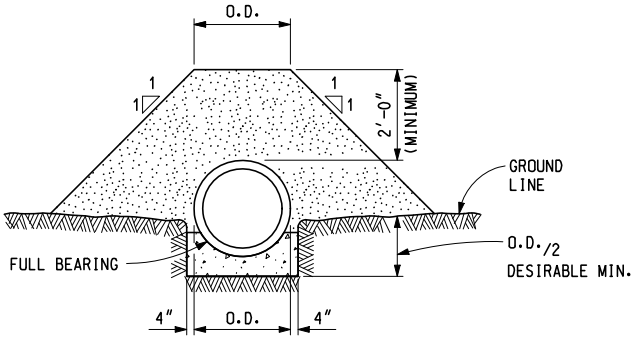
ENGINEER OF DEVELOPMENT

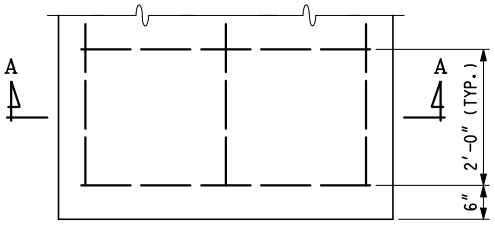
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

BEDDING AND FILLING AROUND PIPE CULVERTS

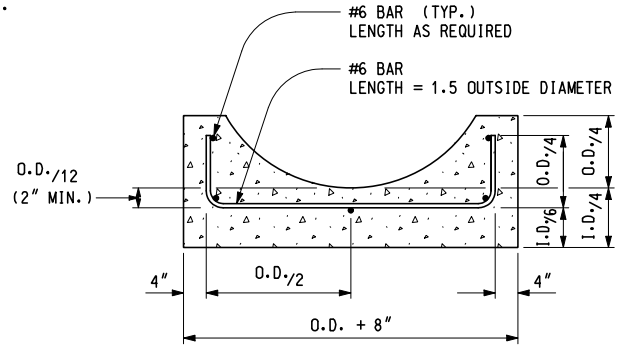
11-14-2003	6-25-2002	R-82-D	SHEET 1 OF 2
F.H.W.A. APPROVAL	PLAN DATE		

EMBANKMENT BETWEEN GROUND LINE AND 2′-0″ MINIMUM ABOVE TOP OF PIPE CULVERT SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA COMPACTED TO 95% OF ITS MAXIMUM UNIT WEIGHT. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10″ IN THICKNESS.





PLAN



SECTION A - A

TABLE OF QUANTITIES BASED ON THE OUTSIDE DIAMETER (O.D.) OF PIPE			
INSIDE DIAMETER OF PIPE	OUTSIDE DIAMETER OF PIPE	CYD CONCRETE PER LFT	LBS STEEL PER LFT
18″	1.916′	0.061	9.7
24″	2.500′	0.096	10.3
30″	3.083′	0.140	11.0
36″	3.667′	0.191	11.6
42″	4.250′	0.250	12.3

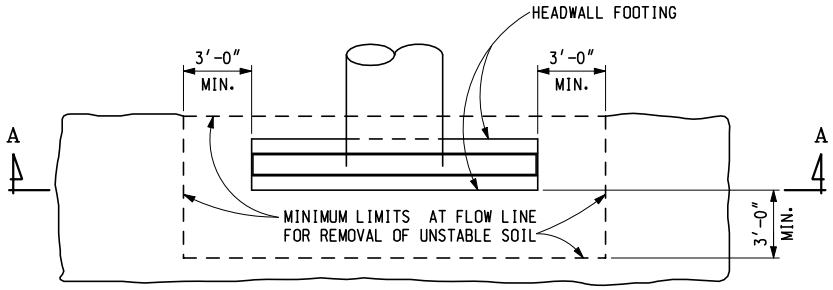
ALL CONCRETE SHALL BE GRADE M.

ALL EXCAVATION AND FORMS NECESSARY TO CONSTRUCT THE CONCRETE CRADLE SHALL BE INCLUDED IN THE UNIT PRICE PER CYD FOR CONCRETE.

THE CONCRETE CRADLE SHALL BE CONTINUOUS THROUGH THE ENTIRE LENGTH OF THE PIPE CULVERT.

LAP LONGITUDINAL BARS 2′-0″ MINIMUM AT ALL SPLICES.

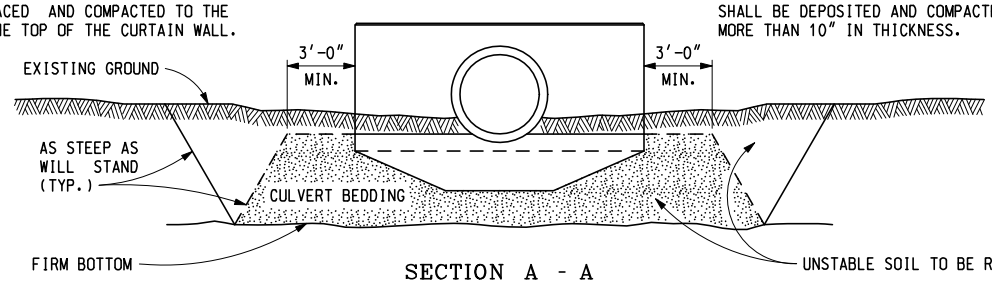
CULVERT INSTALLATION WITH CONCRETE CRADLE



PLAN

NOTE:
THE TRENCH FOR THE CURTAIN WALL SHALL BE EXCAVATED AFTER THE GRANULAR MATERIAL CLASS II IS PLACED AND COMPACTED TO THE ELEVATION OF THE TOP OF THE CURTAIN WALL.

BACKFILL SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA THOROUGHLY COMPACTED. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10″ IN THICKNESS.



SECTION A - A

CULVERT HEADWALL INSTALLATION IN UNSTABLE SOIL

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

BEDDING AND FILLING AROUND PIPE CULVERTS

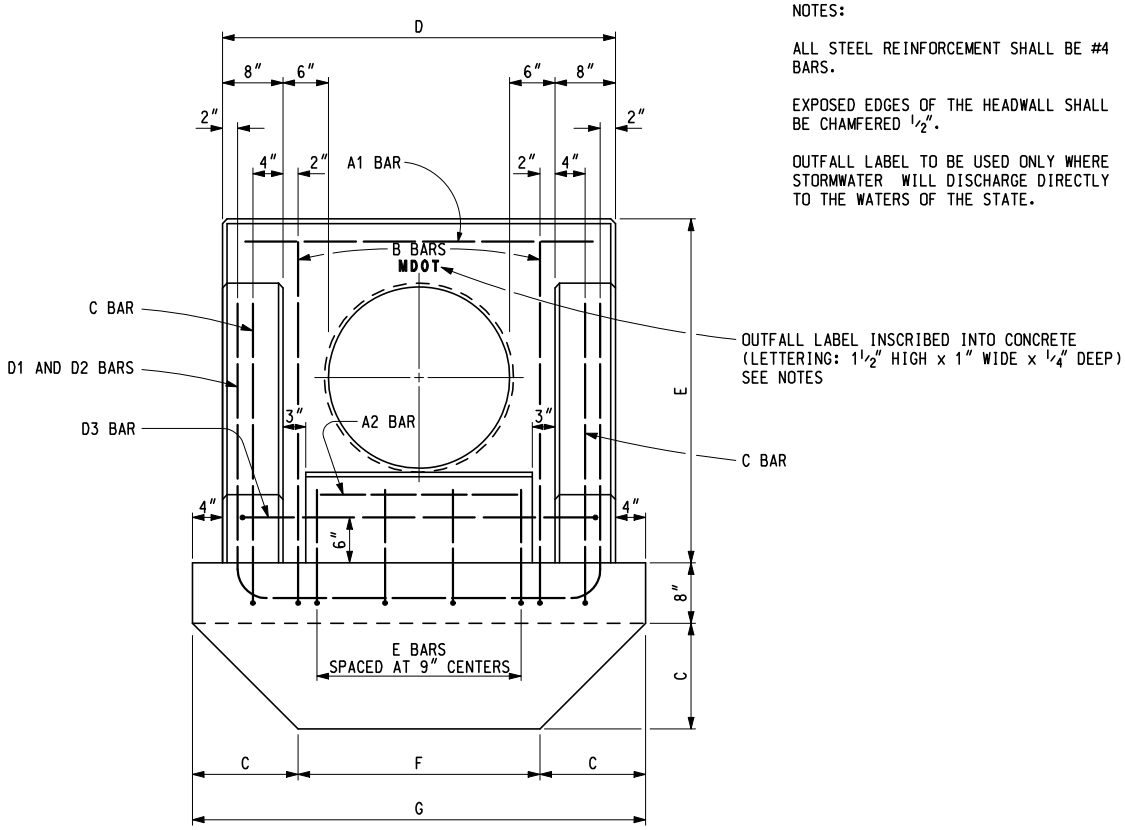
11-14-2003 F.H.W.A. APPROVAL	6-25-2002 PLAN DATE	R-82-D	SHEET 2 OF 2

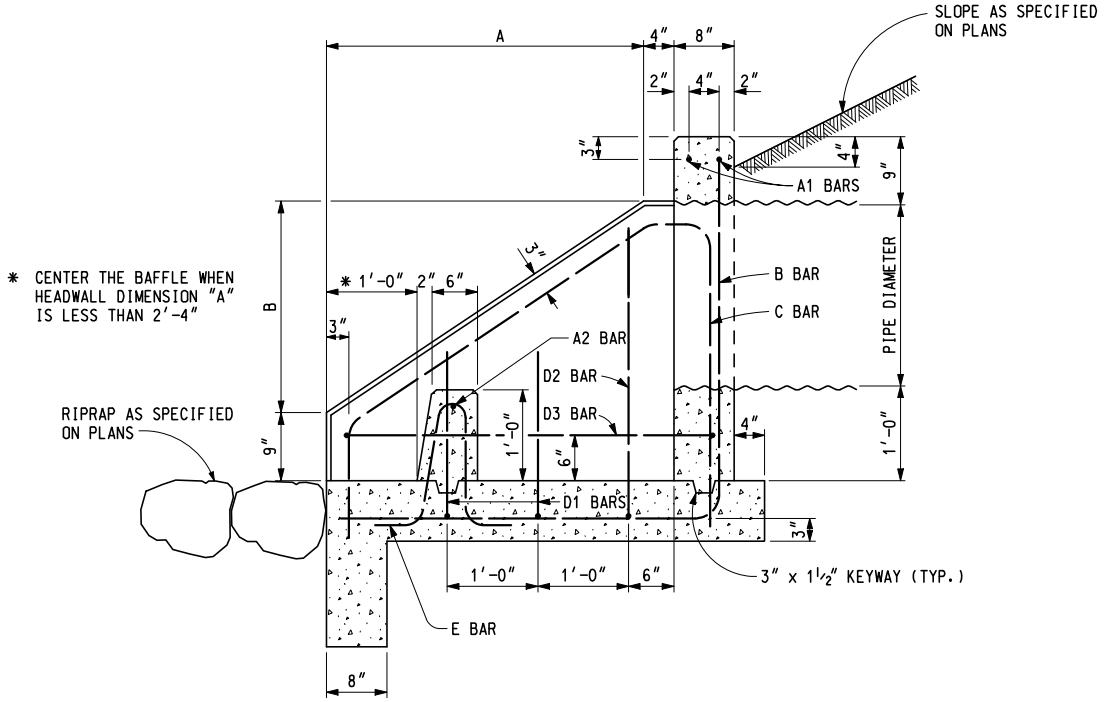
NOTES:

ALL STEEL REINFORCEMENT SHALL BE #4 BARS.

EXPOSED EDGES OF THE HEADWALL SHALL BE CHAMFERED 1/2".

OUTFALL LABEL TO BE USED ONLY WHERE STORMWATER WILL DISCHARGE DIRECTLY TO THE WATERS OF THE STATE.





* CENTER THE BAFFLE WHEN HEADWALL DIMENSION "A" IS LESS THAN 2'-4"

OUTLET HEADWALL
(SHOWN WITH BAFFLE)

PREPARED BY DESIGN SUPPORT AREA

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Gloria J. Jeff

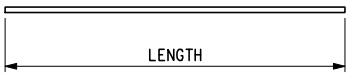
APPROVED BY: John C. Friend
ENGINEER OF DELIVERY

APPROVED BY:
ENGINEER OF DEVELOPMENT

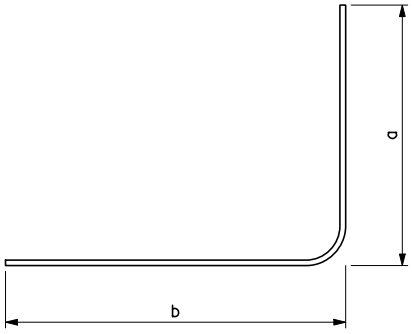
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

OUTLET HEADWALLS

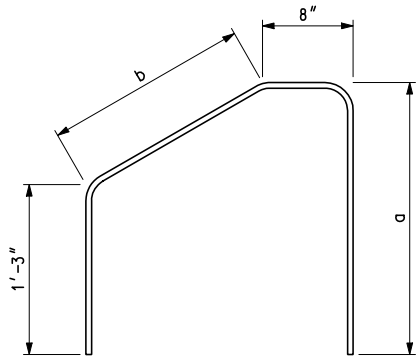
11-17-2005	4-21-2005	R-85-D	SHEET 1 OF 2
F.H.W.A. APPROVAL	PLAN DATE		



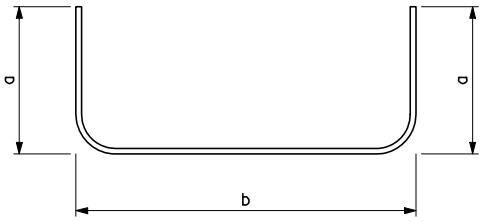
A BAR



B BAR

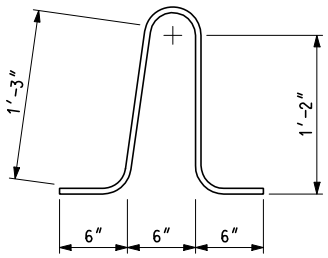


C BAR



D BAR

PIPE DIAMETER	HEADWALL DIMENSIONS							CONCRETE PER ONE HEADWALL (CYD)
	A	B	C	D	E	F	G	
6″	1′-3″	10″	10″	2′-10″	2′-3″	1′-10″	3′-6″	0.5
8″	1′-6″	1′-0″	10″	3′-0″	2′-5″	2′-0″	3′-8″	0.6
10″	1′-9″	1′-2″	10″	3′-2″	2′-7″	2′-2″	3′-10″	0.7
12″	2′-0″	1′-4″	10″	3′-4″	2′-9″	2′-4″	4′-0″	0.8
15″	2′-4″	1′-7″	11″	3′-7″	3′-0″	2′-5″	4′-3″	0.9
18″	2′-9″	1′-10″	1′-0″	3′-10″	3′-3″	2′-6″	4′-6″	1.0
24″	3′-6″	2′-4″	1′-1″	4′-4″	3′-9″	2′-10″	5′-0″	1.5
30″	4′-3″	2′-10″	1′-4″	4′-10″	4′-3″	2′-10″	5′-6″	1.8
36″	5′-0″	3′-4″	1′-4″	5′-4″	4′-9″	3′-4″	6′-0″	2.2



E BAR

STEEL QUANTITIES FOR ONE OUTLET HEADWALL WITH BAFFLE

STEEL QUANTITIES FOR ONE OUTLET HEADWALL WITHOUT BAFFLE

PIPE DIA.	A1 BAR		B BAR				C BAR				D1 BAR				D2 BAR				D3 BAR				TOTAL WEIGHT OF BARS (LBS)	A2 BAR		E BAR		TOTAL WEIGHT OF BARS (LBS)
	TOTAL LENGTH	NO.	DIMENSIONS		TOTAL LENGTH	NO.	DIMENSIONS		TOTAL LENGTH	NO.	DIMENSIONS		TOTAL LENGTH	NO.	DIMENSIONS		TOTAL LENGTH	NO.	DIMENSIONS		TOTAL LENGTH	NO.		TOTAL LENGTH	NO.	TOTAL LENGTH	NO.	
			a	b			a	b			a	b			a	b			a	b								
6″	2′-6″	2	1′-11″	2′-6″	4′-5″	2	1′-10″	1′-3″	5′-0″	2	1′-1″	2′-6″	4′-8″	1					1′-7″	2′-6″	5′-8″	1	23	8″	1	3′-8″	2	29
8″	2′-8″	2	2′-2″	2′-8″	4′-10″	2	2′-0″	1′-6″	5′-5″	2	1′-3″	2′-8″	5′-2″	1					1′-10″	2′-8″	6′-4″	1	26	10″	1	3′-8″	2	32
10″	2′-10″	2	2′-5″	2′-10″	5′-3″	2	2′-2″	1′-10″	5′-11″	2	1′-5″	2′-10″	5′-8″	1					2′-1″	2′-10″	7′-0″	1	28	1′-0″	1	3′-8″	2	34
12″	3′-0″	2	2′-8″	3′-0″	5′-8″	2	2′-4″	2′-1″	6′-4″	2	1′-7″	3′-0″	6′-2″	2					2′-4″	3′-0″	7′-8″	1	34	1′-2″	1	3′-8″	2	40
15″	3′-3″	2	3′-0″	3′-3″	6′-3″	2	2′-7″	2′-6″	7′-0″	2	1′-10″	3′-3″	6′-11″	2					2′-8″	3′-3″	8′-7″	1	38	1′-5″	1	3′-8″	3	46
18″	3′-6″	2	3′-5″	3′-6″	6′-11″	2	2′-10″	3′-0″	7′-9″	2	2′-1″	3′-6″	7′-8″	2					3′-1″	3′-6″	9′-8″	1	41	1′-8″	1	3′-8″	3	50
24″	4′-0″	2	4′-2″	4′-0″	8′-2″	2	3′-4″	3′-11″	9′-2″	2	1′-10″	4′-0″	7′-8″	2	3′-3″	4′-0″	10′-6″	1	3′-10″	4′-0″	11′-8″	1	54	2′-2″	1	3′-8″	4	65
30″	4′-6″	2	4′-11″	4′-6″	9′-5″	2	3′-10″	4′-10″	10′-7″	2	2′-4″	4′-6″	9′-2″	2	3′-8″	4′-6″	11′-10″	1	4′-7″	4′-6″	13′-8″	1	62	2′-8″	1	3′-8″	4	74
36″	5′-0″	2	5′-8″	5′-0″	10′-8″	2	4′-4″	5′-9″	12′-0″	2	2′-2″	5′-0″	9′-4″	2	3′-5″	5′-0″	11′-10″	2	5′-4″	5′-0″	15′-8″	1	76	3′-2″	1	3′-8″	5	90

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

OUTLET HEADWALLS

11-17-2005 F.H.W.A. APPROVAL	4-21-2005 PLAN DATE	R-85-D	SHEET 2 OF 2

APPLICABLE SOIL EROSION AND SEDIMENTATION CONTROL MEASURES

(COMPREHENSIVE DETAILS ARE LOCATED IN SECTION 6 OF THE SOIL EROSION & SEDIMENTATION CONTROL MANUAL)

A = SLOPES

B = STREAMS AND WATERWAYS

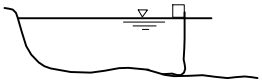
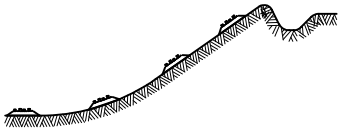
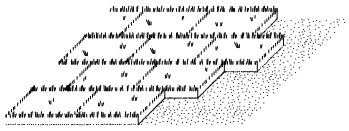
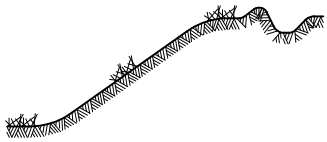
C = SURFACE DRAINAGEWAYS

D = ENCLOSED DRAINAGE (INLET & OUTFALL CONTROL)

E = LARGE FLAT SURFACE AREAS

F = BORROW AND STOCKPILE AREAS

G = DNRE PERMIT MAY BE REQUIRED

KEY	DETAIL	CHARACTERISTICS	A	B	C	D	E	F	G
1	 TURBIDITY CURTAIN	A Turbidity Curtain is used when slack water area is necessary to isolate construction activities from the watercourse. The still water area contains the sediments within the construction limits.		●					
2	 GRUBBING OMITTED	Retains existing root mat which assists in stabilizing slopes. Assists in the revegetation process by providing sprout growth. Reduces sheet flow velocities preventing rilling and gullying. Discourages off-road vehicle use.	●				●		
3	 PERMANENT/TEMPORARY SEEDING	Inexpensive but effective erosion control measure to stabilize flat areas and mild slopes. Permits runoff to infiltrate soil, reducing runoff volumes. Proper preparation of the seed bed, fertilizing, mulching and watering is critical to its success.	●		●		●	●	
4	 DUST CONTROL	Dust control can be accomplished by watering, and/or applying calcium chloride. The disturbed areas should be kept to a minimum. PERMANENT/TEMPORARY SEEDING (KEY 3) should be applied as soon as possible.	●				●	●	
5	 SODDING	Provides immediate vegetative cover such as at spillways and ditch bottoms. Proper preparation of the topsoil, placement of the sod, and watering is critical to its success.	●				●	●	
6	 VEGETATED BUFFER STRIPS	Reduces sheet flow velocities preventing rilling and gullying. Assists in the collection of sediments by filtering runoff. Assists in the establishment of a permanent vegetative cover.	●				●		

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

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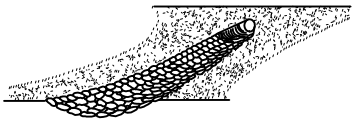
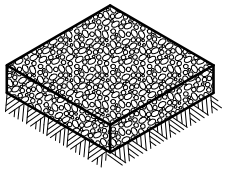
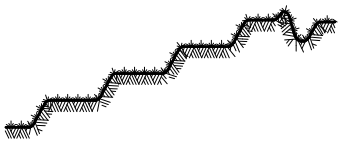
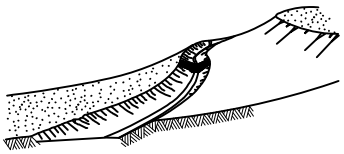
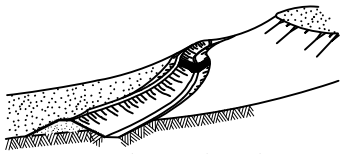
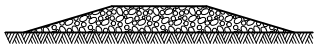
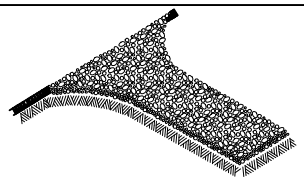
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SOIL EROSION & SEDIMENTATION CONTROL MEASURES

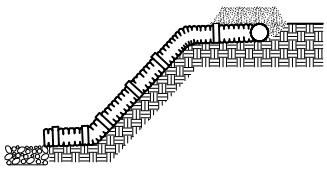
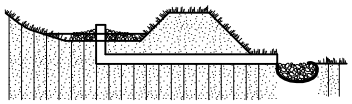
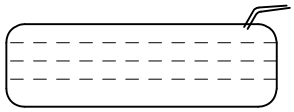
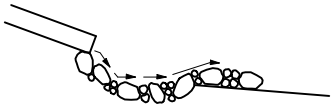
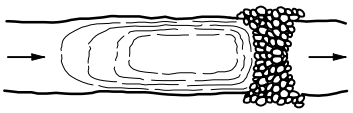
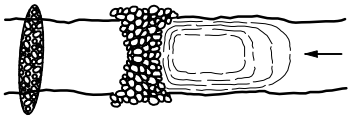
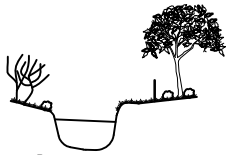
9-10-2010 F.H.W.A. APPROVAL	6-3-2010 PLAN DATE	R-96-E	SHEET 1 OF 6

KEY	DETAIL	CHARACTERISTICS	A	B	C	D	E	F	G
7	 RIPRAP	Used where vegetation cannot be established. Very effective in protecting against high velocity flows. Should be placed over a geotextile liner.	●	●	●	●			●
8	 AGGREGATE COVER	Can be used in any area where a stable condition is needed for construction operations, equipment storage or in heavy traffic areas. Reduces potential soil erosion and fugitive dust by stabilizing raw areas.	●				●	●	
9	 BENCHES	Reduces sheet flow velocities preventing rilling and gullying. Assists in the collection and filtering of sediments. Provides access for stabilizing slopes.	●					●	
10	 DIVERSION DIKE	Assists in the diversion of runoff to a stable outlet or sediment control device. Reduces sheet flow velocities preventing rilling and gullying. Collects and diverts runoff to properly stabilized drainage ways. Works well with INTERCEPTING DITCH (KEY 11)	●				●	●	
11	 INTERCEPTING DITCH	Assists in the diversion of runoff to a stable outlet or sediment control device. Reduces sheet flow velocities preventing rilling and gullying. Works well with DIVERSION DIKE (KEY 10)	●				●	●	
12	 INTERCEPTING DITCH AND DIVERSION DIKE	Assists in the diversion of runoff to a stable outlet or sediment control device. Reduces sheet flow velocities preventing rilling and gullying.	●				●	●	
13	 GRAVEL FILTER BERM	Useful in filtering flow prior to its reentry into a lake, stream or wetland. Works well with SEDIMENT TRAP (KEY 20) and TEMPORARY BYPASS CHANNEL (KEY 35). Not to be used in lieu of a CHECK DAM (KEY 37) in a ditch.	●		●			●	
14	 GRAVEL ACCESS APPROACH	Provides a stable access to roadways minimizing fugitive dust and tracking of materials onto public streets and highways.					●	●	

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SOIL EROSION & SEDIMENTATION CONTROL MEASURES

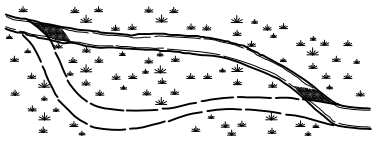
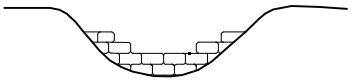
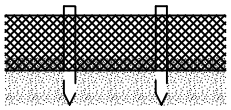
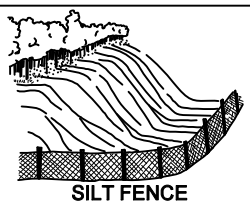
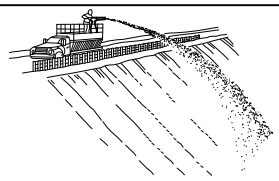
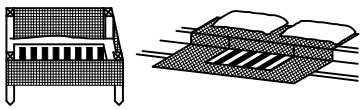
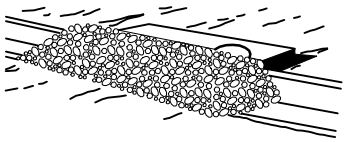
9-10-2010 F.H.W.A. APPROVAL	6-3-2010 PLAN DATE	R-96-E	SHEET 2 OF 6

KEY	DETAIL	CHARACTERISTICS	A	B	C	D	E	F	G
15	 SLOPE DRAIN SURFACE	Excellent device for carrying water down slopes without creating an erosive condition. Generally used in conjunction with DIVERSION DIKE (KEY 10), INTERCEPTING DITCH (KEY 11) and INTERCEPTING DITCH AND DIVERSION DIKE (KEY 12) to direct flow to a stable discharge area or SEDIMENT TRAP (KEY 20).	●		●				
16	 TREES, SHRUBS AND PERENNIALS	Trees, shrubs and perennials can provide low maintenance long term erosion protection. These plants may be particularly useful where site aesthetics are important along the roadside slopes.	●				●		
17	 PIPE DROP	Effective way to allow water to drop in elevation very rapidly without causing an erosive condition. Also works as a sediment collector device. May be left in place as a permanent erosion control device.	●		●				
18	 DEWATERING WITH FILTER BAG	It may be necessary to dewater from behind a cofferdam or construction dam to create a dry work site. Discharged water must be pumped to a filter bag. A GRAVEL FILTER BERM (KEY 13) may be placed downslope of the filter bag to provide additional filtration prior to entering any stream or wetland.		●					●
19	 ENERGY DISSIPATORS	A device to prevent the erosive force of water from eroding soils. Used at outlets of culverts, drainage pipes or other conduits to reduce the velocity of the water. Prevents structure scouring and undermining.	●	●	●	●			
20	 SEDIMENT TRAP	Used to intercept concentrated flows and prevent sediments from being transported off site or into a watercourse or wetland. The size of a Sediment Trap is 5 cubic yards or less. Works well when used with CHECK DAM (KEY 37).	●		●	●			
21	 SEDIMENT BASIN	A Sediment Basin is used to trap sediments from an upstream construction site. Requires periodic inspections, repairs, and maintenance. Where practical, sediments should be contained on site. A Sediment Basin should be the last choice of sediment control. The size of a Sediment Basin is greater than 5 cubic yards.		●					●
22	 VEGETATIVE BUFFER AT WATERCOURSE	This practice is used to maintain a vegetative buffer adjacent to a watercourse. When utilized with SILT FENCE (KEY 26) it will, under normal circumstances, prevent sediment from leaving the construction site.	●	●	●		●	●	

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SOIL EROSION & SEDIMENTATION CONTROL MEASURES

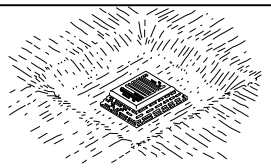
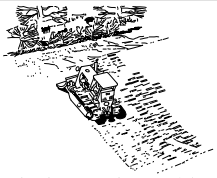
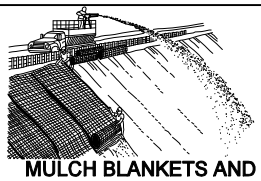
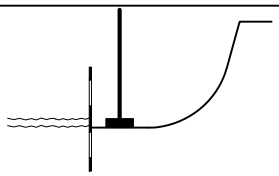
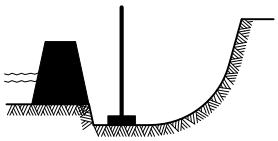
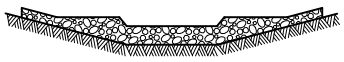
9-10-2010 F.H.W.A. APPROVAL	6-3-2010 PLAN DATE	R-96-E	SHEET 3 OF 6

KEY	DETAIL	CHARACTERISTICS	A	B	C	D	E	F	G
23	 STREAM RELOCATION	A detail depicting the proper procedures for stream relocation. Maintains same width, depth, and flow velocity as the natural stream. Revegetate banks with PERMANENT/TEMPORARY SEEDING (KEY 3), MULCHING AND MULCH ANCHORING (KEY 28), MULCH BLANKETS AND HIGH VELOCITY MULCH BLANKETS (KEY 33) and woody plants to shade the stream.		●					●
24	 SAND AND STONE BAGS	Sand and stone bags are a useful tool in the prevention of erosion. Can be used to divert water around a construction site by creating a DIVERSION DIKE (KEY 10). Works well for creating a CONSTRUCTION DAM (KEY 36) and temporary culvert end fill.	●	●	●	●	●	●	●
25	 SAND FENCE AND DUNE STABILIZATION	A Sand Fence traps blowing sand by reducing wind velocities. Can be used to prevent sand from blowing onto roads. Must be maintained until sand source is stabilized.	●				●	●	
26	 SILT FENCE	A permeable barrier erected below disturbed areas to capture sediments from sheet flow. Can be used to divert small volumes of water to stable outlets. Ineffective as a filter and should never be placed across streams or ditches where flow is concentrated.	●				●	●	
27	 PLASTIC SHEETS OR GEOTEXTILE COVER	Plastic Sheets can be used to create a liner in temporary channels. Can also be used to create a temporary cover to prevent erosion of stockpiled materials.	●	●	●			●	
28	 MULCHING AND MULCH ANCHORING	Anchored mulch provides erosion protection against rain and wind. Mulch must be used on seeded areas to promote water retention and growth. Should be inspected after every rainstorm and repaired as necessary until vegetation is well established.	●		●		●	●	
29	 INLET PROTECTION FABRIC DROP	Provides settling and filtering of silt laden water prior to its entry into the drainage system. Can be used in median and side ditches where vegetation will be disturbed. Allows for early use of drainage systems prior to project completion.			●		●		
30	 INLET PROTECTION GEOTEXTILE AND STONE	Provides settling and filtering of silt laden water prior to its entry into the drainage system. Should be used in paved areas where drainage structures are existing or proposed. Allows for early use of drainage systems prior to project completion.			●		●		

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SOIL EROSION & SEDIMENTATION CONTROL MEASURES

9-10-2010 F.H.W.A. APPROVAL	6-3-2010 PLAN DATE	R-96-E	SHEET 4 OF 6

KEY	DETAIL	CHARACTERISTICS	A	B	C	D	E	F	G
31	 INLET PROTECTION SEDIMENT TRAP	An Inlet Protection Sediment Trap is a temporary device that can be used in areas where medium flows are anticipated. Effective in trapping small quantities of sediments prior to water entering the drainage system. Can be used in areas such as median and side ditches.			●		●		
32	 SLOPE ROUGHENING AND SCARIFICATION	A simple and economical way to reduce soil erosion by wind and water. Can be accomplished by harrowing with a disk, back blading, or tracking with a dozer perpendicular to the slope.	●				●	●	
33	 MULCH BLANKETS AND HIGH VELOCITY MULCH BLANKETS	Mulch blankets provide an immediate and effective cover over raw erodible slopes affording excellent protection against rain and wind erosion. High velocity mulch blankets work well for stabilizing the bottom of ditches in waterways.	●		●		●	●	
34	 COFFERDAM	Used to create a dry construction area and protect the stream from raw erodible areas. Must be pumped dry or dewatered according to DEWATERING WITH FILTER BAG (KEY 18).		●					●
35	 TEMPORARY BYPASS CHANNEL	Utilized when a dry construction area is needed. Isolates stream flows from raw erodible areas minimizing erosion and subsequent siltation. Can incorporate SEDIMENT BASIN (KEY 21), CHECK DAM (KEY 37), and GRAVEL FILTER BERM (KEY 13) to remove sediments from water. Construction sequence of events may be necessary.		●					●
36	 CONSTRUCTION DAM	Used to create a dry or slack water area for construction. Isolates the stream from raw erodible areas. Can be created out of any non-erodible materials such as SAND AND STONE BAGS (KEY 24), a gravel dike with clay core or plastic liner, steel plates or plywood.		●					●
37	 CHECK DAM	Can be constructed across ditches or any area of concentrated flow. Protects vegetation in early stages of growth. A Check Dam is intended to reduce water velocities and capture sediment. A Check Dam is not a filtering device.	●		●			●	

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SOIL EROSION & SEDIMENTATION CONTROL MEASURES

9-10-2010 F.H.W.A. APPROVAL	6-3-2010 PLAN DATE	R-96-E	SHEET 5 OF 6

NOTES:

THIS STANDARD PLAN WILL SERVE AS A KEY IN THE SELECTION OF THE APPROPRIATE SOIL EROSION AND SEDIMENTATION CONTROL DETAILS. THIS PLAN ALSO PROVIDES THE KEY TO THE NUMBERED EROSION CONTROL ITEMS SPECIFIED ON THE CONSTRUCTION PLANS. REFER TO THE MDOT SOIL EROSION & SEDIMENTATION CONTROL MANUAL, SECTION 6 FOR SPECIFIC DETAILS, CONTRACT ITEMS (PAY ITEMS), AND PAY UNITS.

COLLECTED SILT AND SEDIMENT SHALL BE REMOVED PERIODICALLY TO MAINTAIN THE EFFECTIVENESS OF THE SEDIMENT TRAP, SEDIMENT BASIN, AND SILT FENCE. AGGREGATES PLACED IN STREAMS SHOULD CONTAIN A MINIMUM OF FINES.

TEMPORARY EROSION AND SEDIMENTATION CONTROL PROVISIONS SHALL BE COORDINATED WITH THE PERMANENT CONTROL MEASURES TO ASSURE EFFECTIVE CONTROL OF SEDIMENTS DURING CONSTRUCTION OF THE PROJECT.

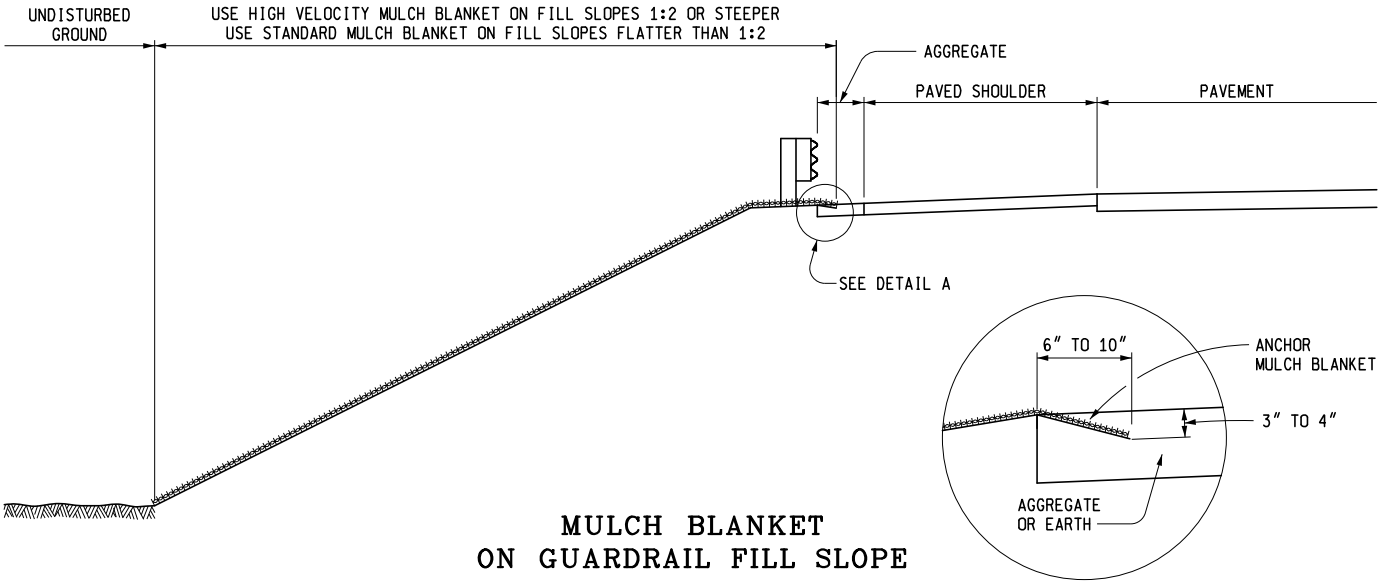
ALL TEMPORARY EROSION CONTROL DEVICES SHALL BE REMOVED AFTER VEGETATION ESTABLISHMENT OR AT THE DISCRETION OF THE ENGINEER. CARE SHALL BE TAKEN DURING REMOVAL TO MINIMIZE SILTATION IN NEARBY DRAINAGE COURSES.

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

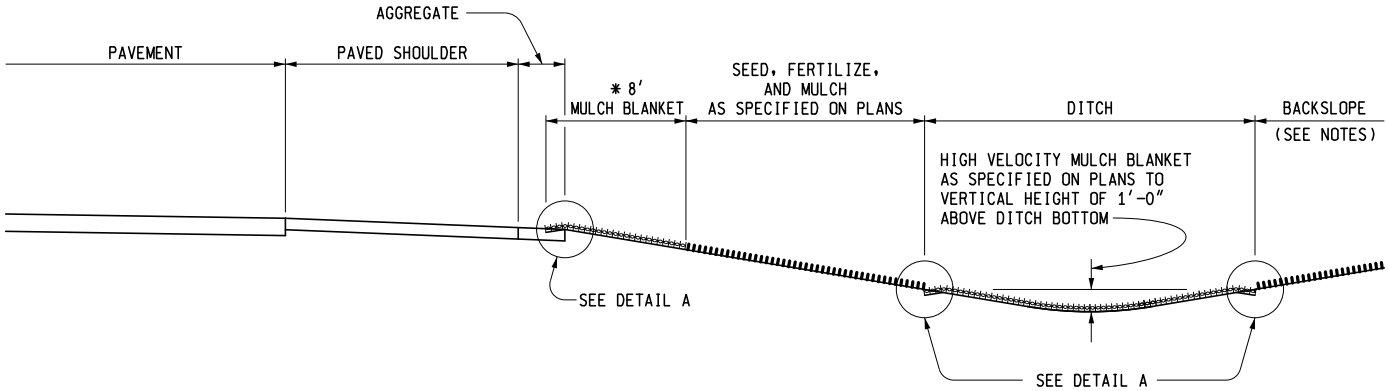
SOIL EROSION & SEDIMENTATION CONTROL MEASURES

9-10-2010 F.H.W.A. APPROVAL	6-3-2010 PLAN DATE	R-96-E	SHEET 6 OF 6

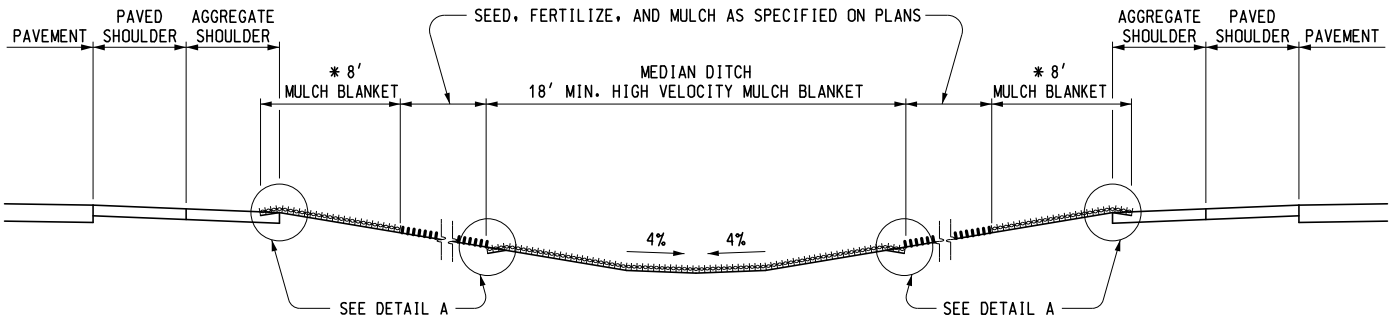


MULCH BLANKET ON GUARDRAIL FILL SLOPE

DETAIL A



TYPICAL SLOPE AND DITCH PROTECTION



MULCH BLANKET SPILLWAY DITCH

* NOTE:

MULCH BLANKET SHALL BE USED ON BOTH SIDES OF NORMAL SECTIONS, HIGH SIDES OF ALL SUPERELEVATED SECTIONS, AND LOW SIDES OF PAVEMENTS HAVING A SUPERELEVATION OF 5% OR LESS. HIGH VELOCITY MULCH BLANKET SHALL BE USED ON THE LOW SIDE OF PAVEMENTS HAVING A RATE OF SUPERELEVATION GREATER THAN 5%.

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Steudle

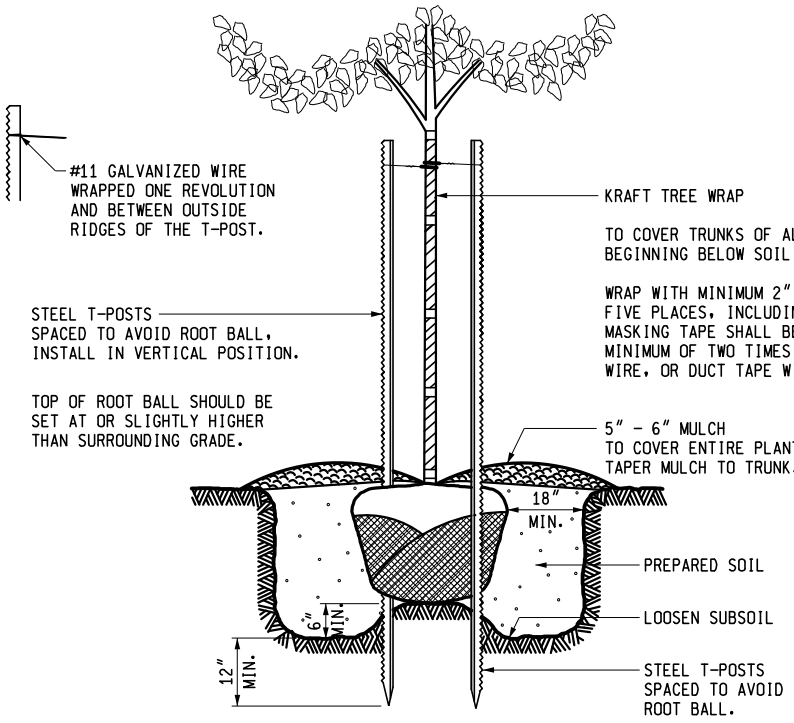
APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

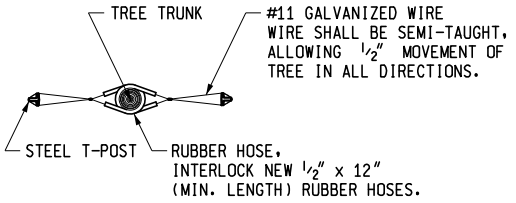
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SEEDING AND TREE PLANTING

9-30-2014	9-26-2013	R-100-H	SHEET 1 OF 4
F.H.W.A. APPROVAL	PLAN DATE		



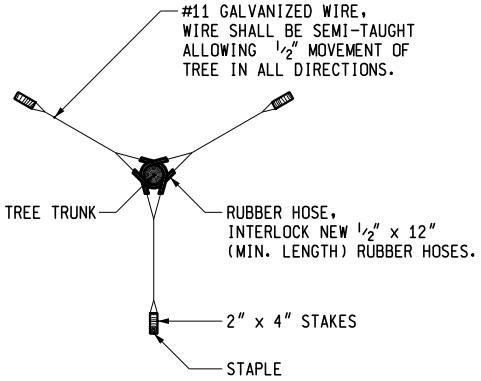
BRACING - VERTICAL STAKES



BRACING DETAIL

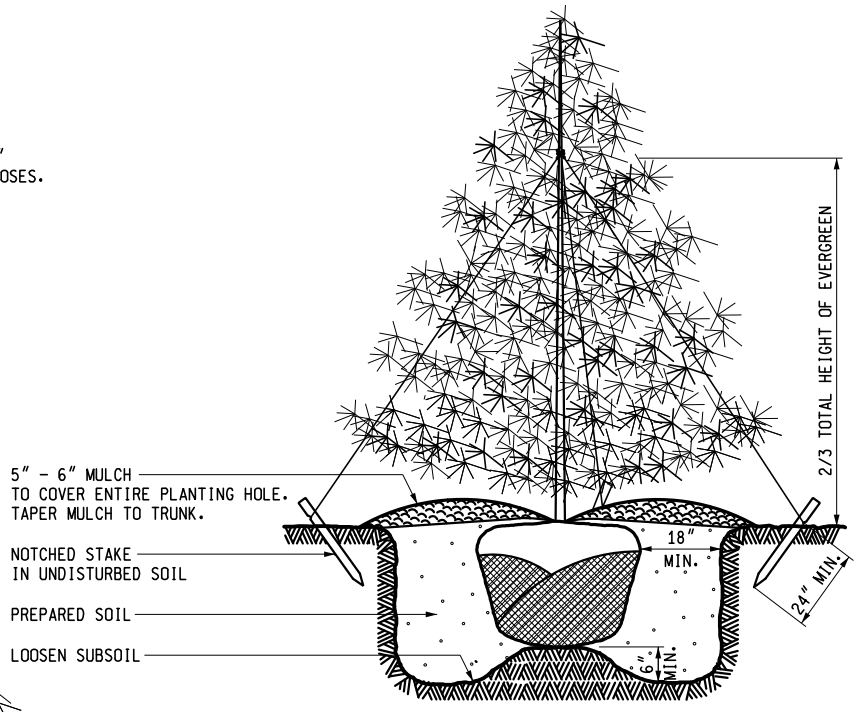
BRACE DECIDUOUS TREES 2" TO 4" IN CALIPER OR 8' OR MORE IN HEIGHT WITH TWO STAKES.

BRACE DECIDUOUS TREES LESS THAN 2" IN CALIPER OR 8' IN HEIGHT WITH ONE STAKE ON THE WESTERLY SIDE OF THE PLANT.

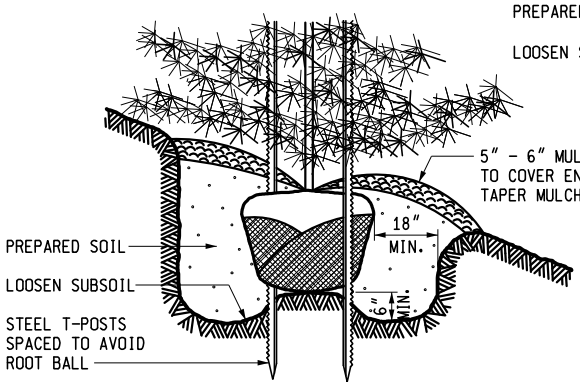


TRIPOD GUYING DETAIL

GUY EVERGREENS OVER 4" IN CALIPER OR 6' IN HEIGHT WITH THE TRIPOD METHOD AND UNDER 6' IN HEIGHT WITH TWO STAKES.



GUYING - TRIPOD METHOD



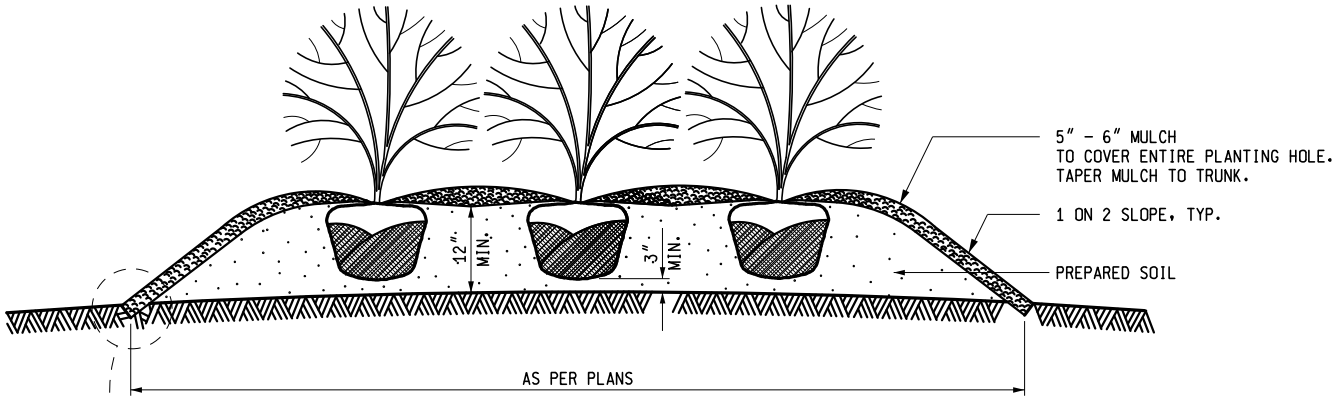
SLOPE PLANTING

MICHIGAN DEPARTMENT OF TRANSPORTATION

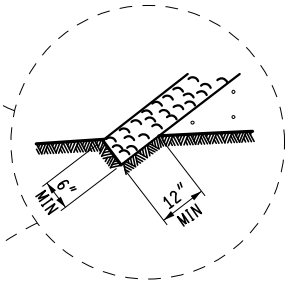
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SEEDING AND TREE PLANTING

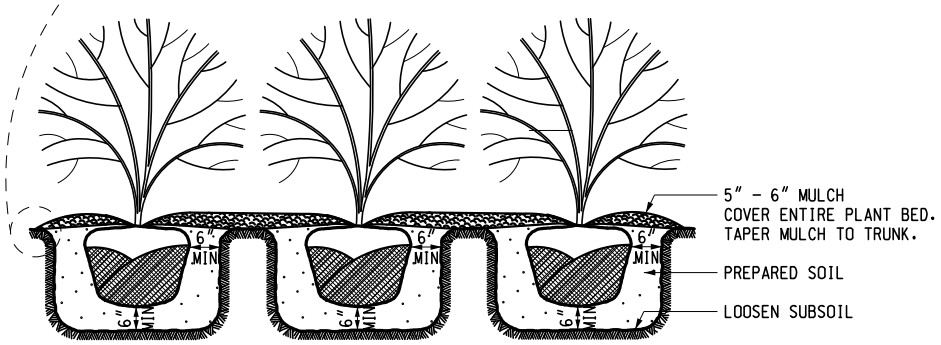
9-30-2014 F.H.W.A. APPROVAL	9-26-2013 PLAN DATE	R-100-H	SHEET 2 OF 4



RAISED SHRUB BED DETAIL



SHRUB BED EDGING DETAIL



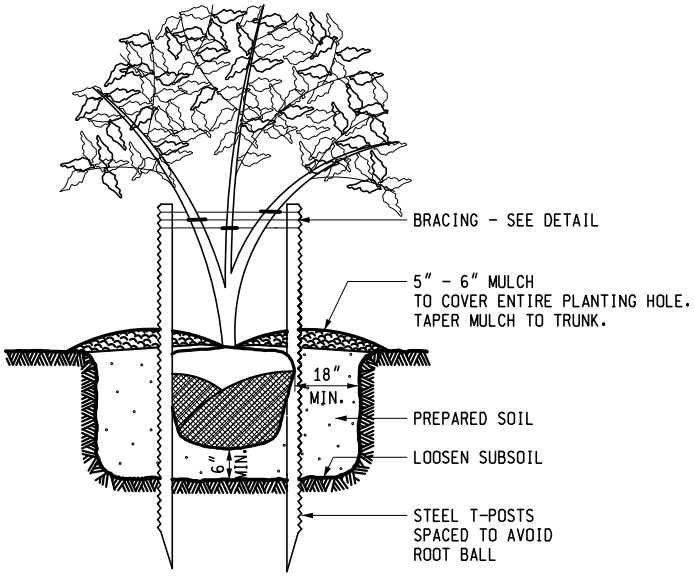
SHRUB BED DETAIL

FIRST AND SECOND WATERING AND CULTIVATION SHALL INCLUDE SHRUB BEDS.

CUT 6″ X 12″ (MIN.) EDGING AROUND THE PERIMETER OF ALL SHRUB BEDS SHOWN ON THE PLANS. SPRAY A NON-PERSISTANT GLYPHOSATE HERBICIDE TO ENTIRE SHRUB BEDS PRIOR TO PLANTING AND BARK PLACEMENT.

SHRUB BEDS ARE TO BE PAID FOR BY THE PAY ITEM 'SITE PREPARATION'.

ALL PLANTS SHALL BE SET PLUMB AND HAVE THE BEST SIDE OF PLANT FACING THE MAIN VIEWING DIRECTION.



MULTIPLE STEM TREES

PLANTING NOTES:

ALL EXCAVATED MATERIAL SHALL BE REMOVED FROM THE SITE – IMMEDIATELY.

LOOSEN SUBSOIL TO A DEPTH OF 4″. LOOSEN EARTH ON SIDES OF PLANT POCKET TO BREAK ANY GLAZING CAUSED BY DIGGING.

FILL PREPARED SOIL TO $^1/_2$ THE DEPTH OF THE ROOT BALL, PACK FIRMLY, AND PUDDLE WITH WATER.

BACKFILL WITH PREPARED SOIL WHICH, AFTER COMPACTION, IS FLUSH WITH SURROUNDING GROUND LEVEL.

COVER ENTIRE PLANT POCKET AREA WITH 5″–6″ MULCH. PRUNE, WRAP, AND BRACE AND GUY.

WHEN PLANTS ARE FURNISHED IN CONTAINERS, CONTAINERS SHALL BE COMPLETELY REMOVED AT THE TIME OF PLANTING.

TREE HEIGHTS ARE SHOWN BEFORE PRUNING. TREE PLANTING DEPTHS ARE SHOWN AFTER SETTLING.

TREES AND SHRUBS SHALL NOT BE PLANTED WITHIN 50′ AND 30′ RESPECTIVELY OF THE NEAREST EDGE OF METAL – EXCEPT WHERE INACCESSIBLE TO VEHICLES.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SEEDING AND TREE PLANTING

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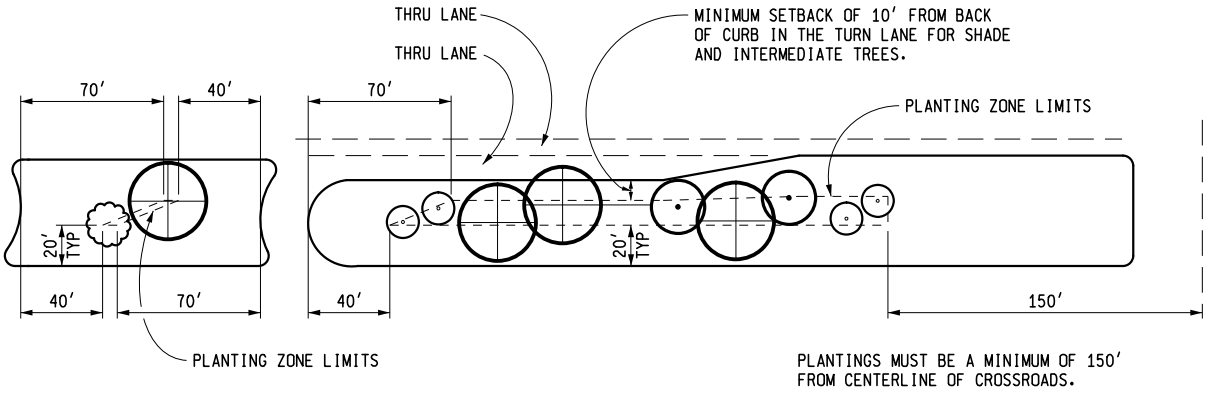
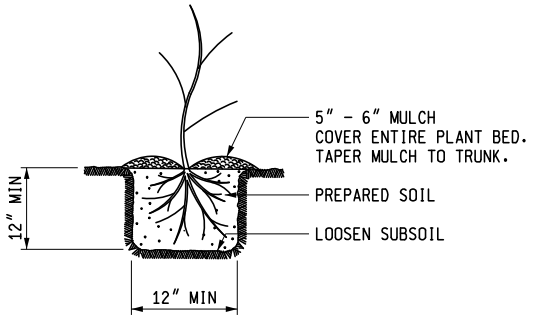


MEDIAN PLANTING
NOT TO SCALE



BARE ROOT PLANTS

PLANTING BARE ROOT PLANT MATERIAL

REFER TO THE "SPECIAL PROVISIONS FOR BARE ROOT PLANTING" FOR SHIPPING, STORAGE AND HANDLING REQUIREMENTS.

MAINTAIN ROOT MOISTURE BY KEEPING ROOTS IMMERSED IN WATER PRIOR TO PLANTING.

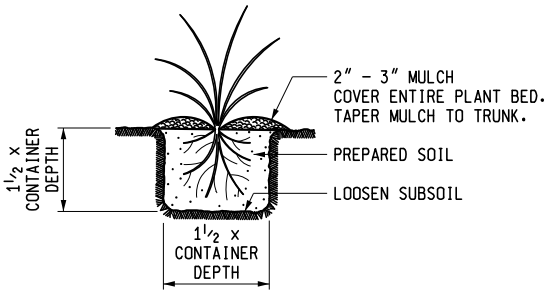
ROOT PRUNE AS NECESSARY TO REMOVE ALL DAMAGED OR BROKEN ROOTS, AND AS REQUIRED BY THE DISTRICT FORESTER OR RESOURCE SPECIALIST.

DIG PLANTING HOLES AT LEAST 12″ WIDE AND 12″ DEEP TO ACCOMODATE ROOT MASS.

SET PLANTS PLUMB WITH THE ROOTS SPREAD PUT IN A NATURAL POSITION AT A DEPTH EQUAL TO THE DEPTH AT THE NURSERY.

HOLD PLANT FIRMLY AND PUDDLE (NOT TAMP) THE BACKFILL AROUND THE ROOTS WITH WATER. SUFFICIENT WATER SHALL BE USED TO ENSURE SATURATION OF THE BACKFILL, BUT CARE SHOULD BE TAKEN NOT TO OVERWATER, CAUSING A FLOATING SOIL MASS THAT PREVENTS COMPACTION AND MAY RESULT IN AIR POCKETS ADJACENT TO THE ROOTS. BACKFILL SHOULD BE FLUSH WITH THE GROUND AFTER COMPACTION.

COVER ENTIRE PLANT POCKET AREA WITH 5″ – 6″ MULCH AS SHOWN.



PERENNIAL PLANTS

FIRST AND SECOND WATERING AND CULTIVATION SHALL INCLUDE PERENNIAL BEDS.

PERENNIALS ARE TO BE FULLY DEVELOPED TWO YEAR #2 CONTAINER PLANTS.

ENTIRE PERENNIAL BED SHALL BE EXCAVATED DOWN 12″ AND REPLACED WITH 12″ OF PREPARED SOIL.

PERENNIAL BEDS ARE TO BE PAID FOR BY THE PAY ITEM 'SITE PREPARATION'.

SEEDING NOTES:

THIS STANDARD ILLUSTRATES THE TYPICAL USE OF SEEDING WITH MULCH, AS THESE ITEMS RELATE TO ROADWAY CONSTRUCTION. THE ACTUAL DESIGN AND MATERIALS USED TO CONSTRUCT THE COMPLETE SECTION, WHICH INCLUDES SEEDING WITH MULCHING, WILL BE ACCORDING TO THE PLANS AND CURRENT SPECIFICATIONS.

ITEMS CALLED FOR ON THIS STANDARD MAY ALSO BE USED DURING CONSTRUCTION AS AN EROSION CONTROL MEASURE. SEE STANDARD PLAN R-96-SERIES.

ALL DITCHES SHOULD HAVE HIGH VELOCITY MULCH BLANKET FOR EROSION CONTROL.

THE FIRST 6′ BEHIND THE CURB OR SHOULDER IN URBAN MEDIAN AREAS WILL BE SEEDED, FERTILIZED, AND MULCHED WITH MULCH BLANKET. THE REMAINING AREAS WILL BE SEEDED, FERTILIZED, AND MULCHED WITH MULCH BLANKET OR STANDARD MULCH ANCHORED IN PLACE WITH A MULCH ADHESIVE OR WITH A MULCH NET.

ALL AREAS WHERE MULCH BLANKET IS CALLED FOR SHALL BE SEEDED, FERTILIZED, AND TOPSOILED AS SPECIFIED ON PLANS. NO MULCH OR ANCHORING MULCH IS REQUIRED WHERE MULCH BLANKET IS INSTALLED.

BACKSLOPE RESTORATION TREATMENT SHALL BE THE SAME AS THE FRONT SLOPE.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SEEDING AND TREE PLANTING

9-30-2014 F.H.W.A. APPROVAL	9-26-2013 PLAN DATE	R-100-H	SHEET 4 OF 4

SIGN MATERIAL SELECTION TABLE

	SIGN MATERIAL TYPE		
SIGN SIZE	TYPE I	TYPE II	TYPE III
≤ 36" X 36"		X	X
>36" X 36" ≤ 96" TO WIDE		X	
> 96" WIDE TO 144" WIDE	X	X	
> 144" WIDE	X		

TYPE I ALUMINUM EXTRUSION
TYPE II PLYWOOD
TYPE III ALUMINUM SHEET

ROUNDING OF CORNERS IS NOT REQUIRED FOR TYPE I OR II SIGNS.
VERTICAL JOINTS ARE NOT PERMITTED.
HORIZONTIAL JOINTS THROUGH SIGN LEGEND OR SYMBOLS ARE NOT PERMITTED.

POST SIZE REQUIREMENTS TABLE

	POST TYPE		
SIGN AREA (ft^2)	U-CHANNEL STEEL	SQUARE TUBULAR STEEL	WOOD
≤9	1 - 3 lb/ft*	1 - 2" 12 or 14 GA*	N/A
9 ≤ 20	2 - 3 lb/ft	2 - 2" 12 or 14 GA	1 - 4" X 6"*
> 20 ≤ 30	N/A	N/A	2 - 4" X 6"
> 30 ≤ 60	N/A	N/A	2 - 6" X 8"
> 60 ≤ 84	N/A	N/A	3 - 6" X 8"

*SIGNS 4 FEET AND GREATER IN WIDTH REQUIRE 2 POSTS.
SIGNS GREATER THAN 8 FEET IN WIDTH REQUIRE 2 OR 3 WOOD POSTS DEPENDING ON AREA OF SIGN.
A MAXIMUM OF 2 POSTS WITHIN A 7' PATH IS PERMITTED.

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: CON/ECH

CHECKED BY: AUG

DEPARTMENT DIRECTOR
Kirk T. Steudle

APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

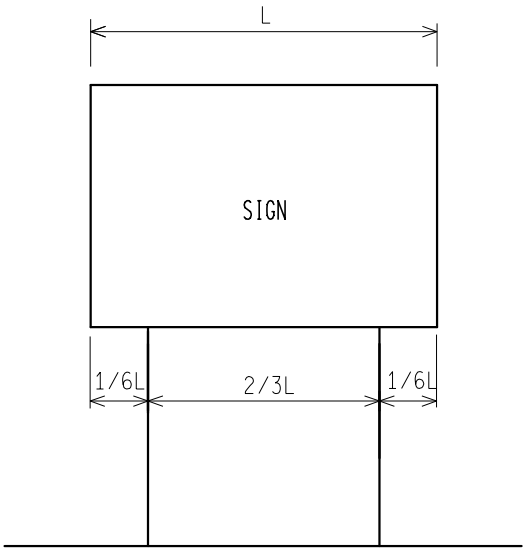
APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

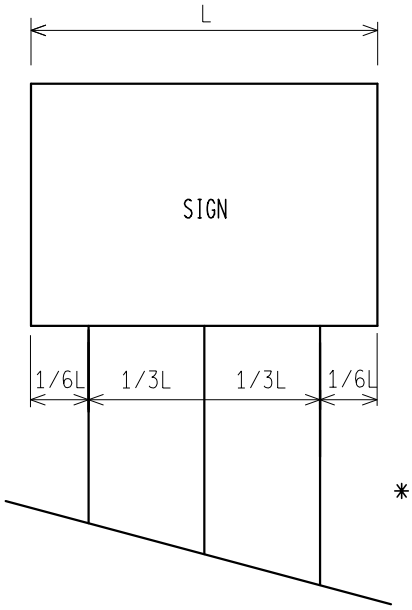
GROUND DRIVEN SIGN SUPPORTS FOR TEMP SIGNS

F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 1 OF 11

2 POST SIGN SUPPORT SPACING

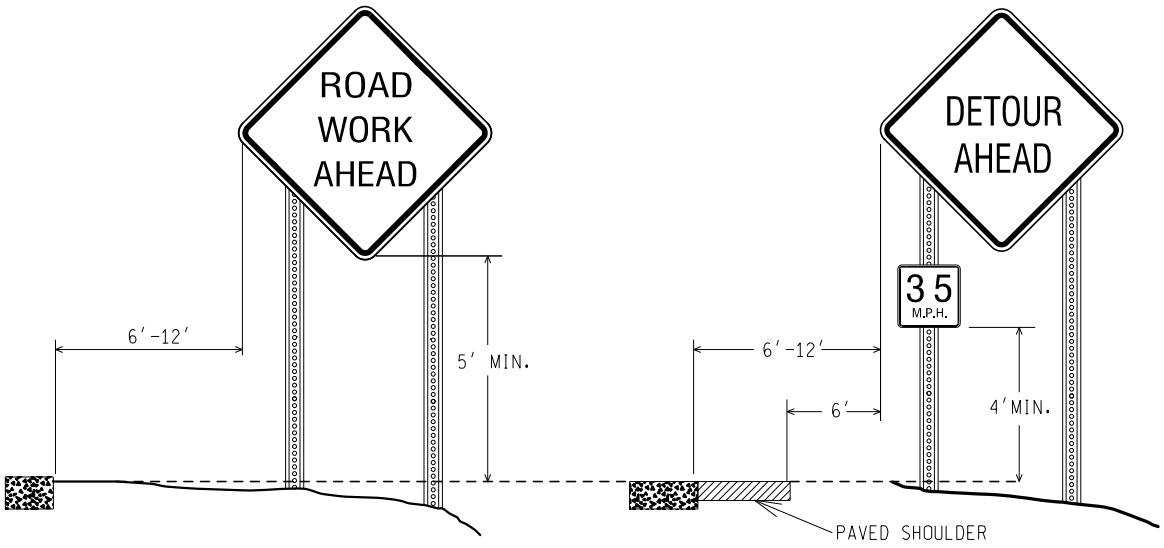


3 POST SIGN SUPPORT SPACING



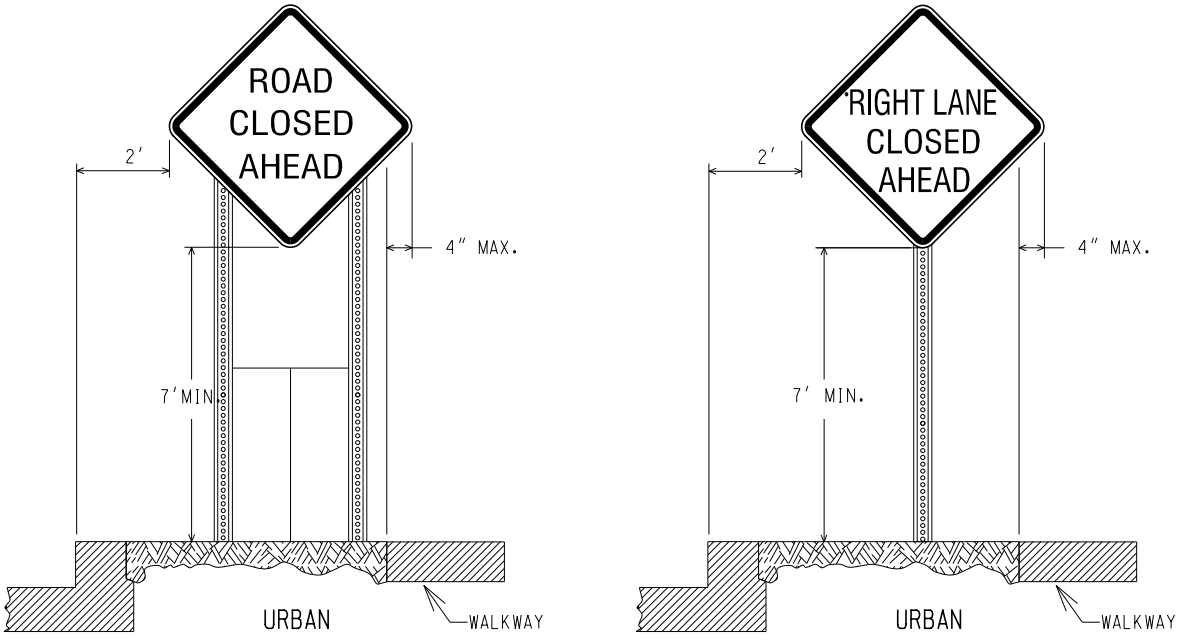
* FOR ALL 11' AND 12' LONG SIGNS ON 3 WOOD SUPPORTS, SPREAD POSTS SO AS TO HAVE A 8' MIN. TO 9' MAX. DISTANCE BETWEEN OUTSIDE POSTS.

NOT TO SCALE



RURAL

RURAL WITH ADVISORY
SPEED PLATE



(CURBED AREAS OR WHERE
WALKWAYS ARE PRESENT)

(CURBED AREAS OR WHERE
WALKWAYS ARE PRESENT)

BOTTOM HEIGHT AND OFFSET

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 3 OF 11

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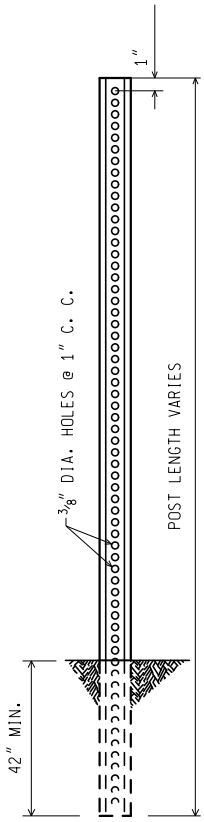

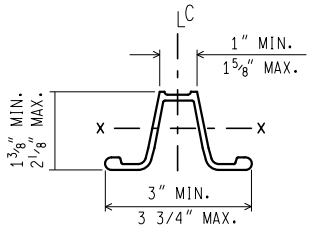

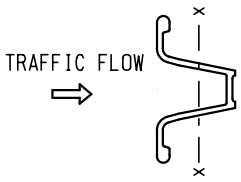

WEIGHT = 3 lbs/ft
SECT. MOD. X.-X. = 0.31 CUBIC INCHES MIN.

3 lb. U - CHANNEL STEEL POST
(NO SPLICE)

MOUNT SIGN ON OPEN FACE OF
U - CHANNEL STEEL POST

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 4 OF 11

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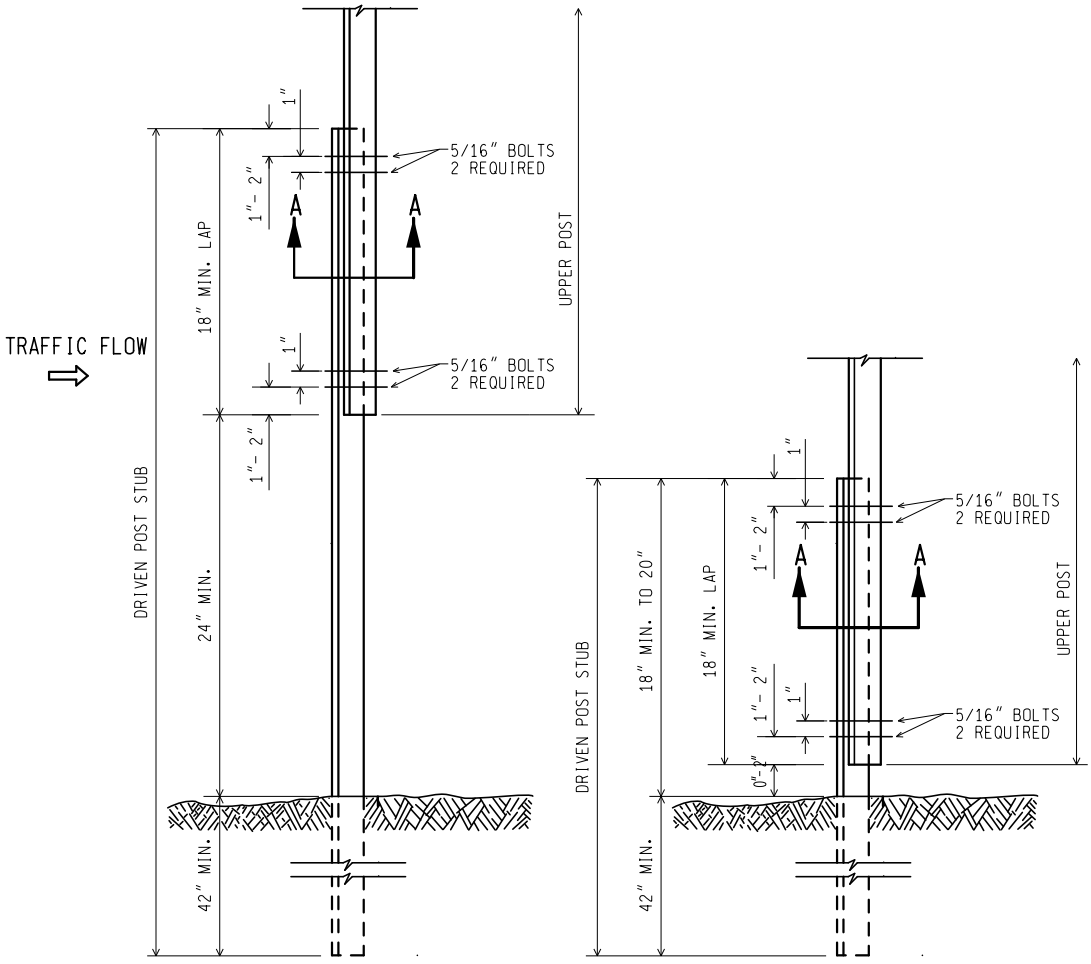


UPPER SPLICE

LOWER SPLICE

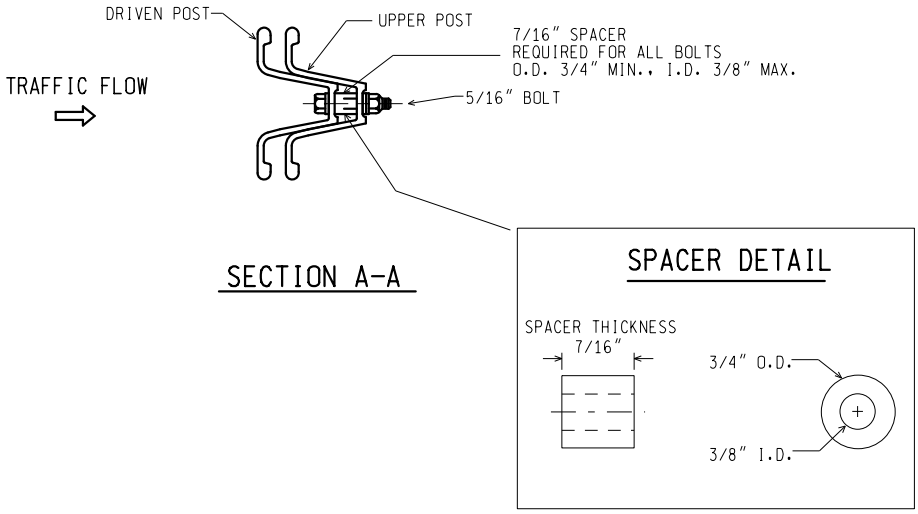
3 lb. U - CHANNEL STEEL POST
(WITH SPLICE)

MOUNT SIGN ON OPEN FACE OF
UPPER U - CHANNEL STEEL POST

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 5 OF 11

NOTE: THE ORIGINAL SIGNED COPY IS KEPT ON FILE AT THE MICHIGAN DEPARTMENT OF TRANSPORTATION.



NOTES:

1. THE SPACER THICKNESS SHALL BE 1/16" LESS THAN THE GAP BETWEEN THE POST WHEN POSITIONED IN THE UNBOLTED CONFIGURATION.

2. THE EXTERIOR BOLT (CLOSEST TO LAP), SPACER, WASHER, AND NUT SHALL BE INSTALLED IN A PREPUNCHED HOLE 1" to 2" FROM THE END OF THE LAP.

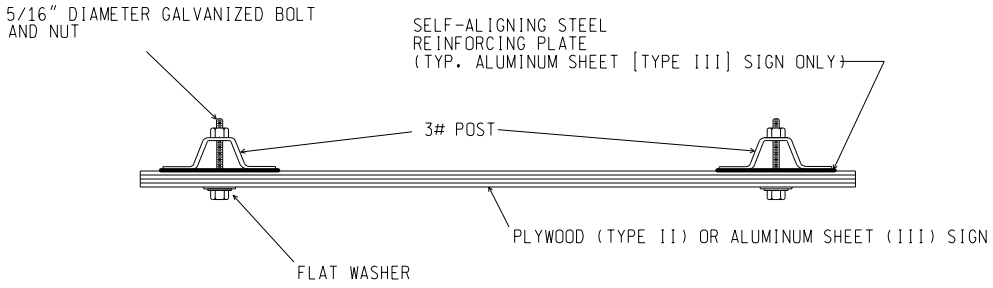
3. THE INTERIOR BOLT (FARTHEST FROM LAP), SPACER, WASHER, AND NUT SHALL BE INSTALLED IN THE NEXT PREPUNCHED HOLE.

4. THE DRIVEN POST SHALL ALWAYS BE MOUNTED IN FRONT OF THE UPPER POST WITH RESPECT TO THE ADJACENT ONCOMING TRAFFIC, REGARDLESS OF THE DIRECTION THE SIGN IS FACING.

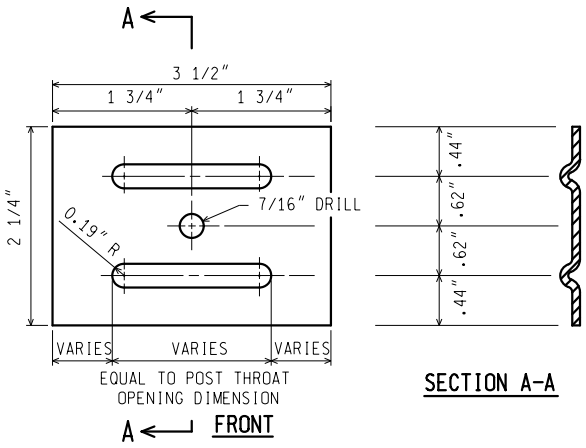
5. THE SPLICE LAP SHALL BE FASTENED BY FOUR-5/16" DIA. GALVANIZED A449 BOLTS (SAE J429 GRADE 5) OR GALVANIZED A325 BOLTS.

3 lb. U - CHANNEL STEEL POST
(WITH SPLICE)

NOT TO SCALE



SIGN TO 3 lb. POST CONNECTION



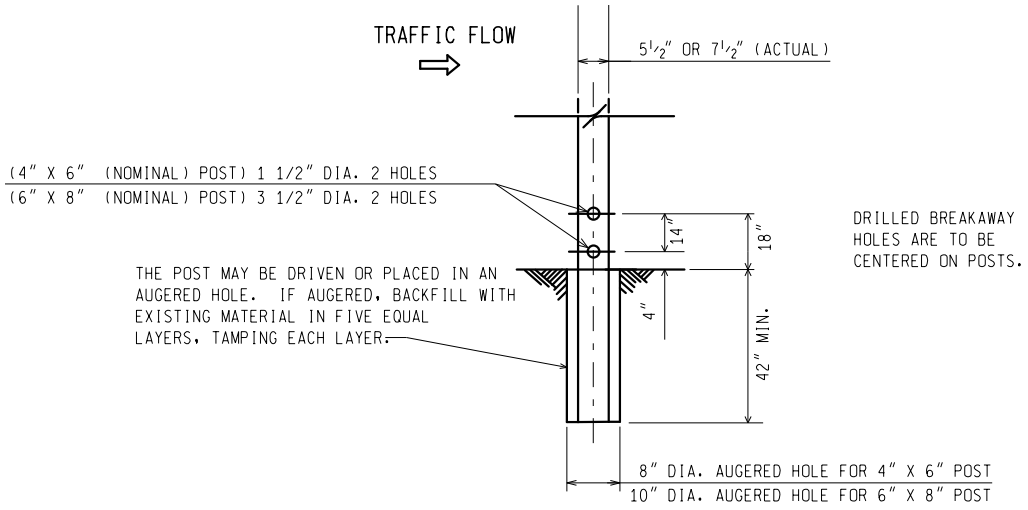
NOTES: (FOR STEEL SIGN REINF' PLATE)

1. MATERIAL: 12 GAUGE CARBON STEEL.
2. TOLERANCE ON ALL DIMENSIONS ± 0.0625"
3. FINISH-AFTER STAMPING AND PUNCHING, GALVANIZE ACCORDING TO CURRENT SPECIFICATIONS FOR ZINC (HOT GALVANIZE) COATINGS ON PRODUCTS FABRICATED FROM PLATES OR STRIPS

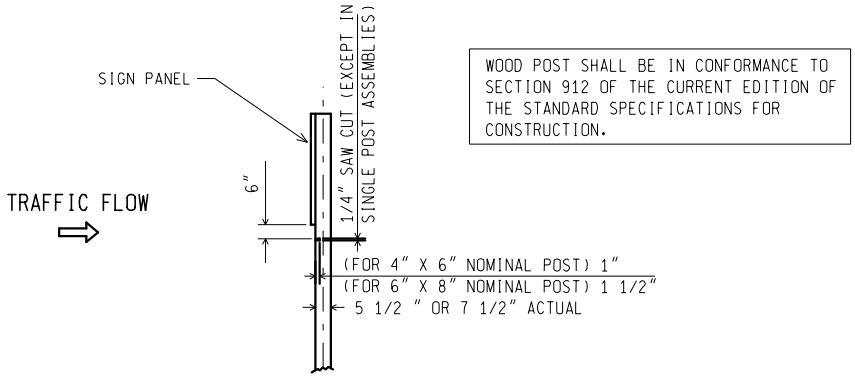
STEEL SIGN REINFORCING PLATE
REQUIRED FOR TYPE III SIGNS ONLY

3 lb. U - CHANNEL STEEL POST SIGN CONNECTION

NOT TO SCALE



WOOD POST BREAKAWAY HOLES/ DIRECT EMBEDMENT DETAILS



SAW CUT DETAIL (MULTIPLE POST INSTALLATIONS)

WOOD POST DETAILS

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 8 OF 11

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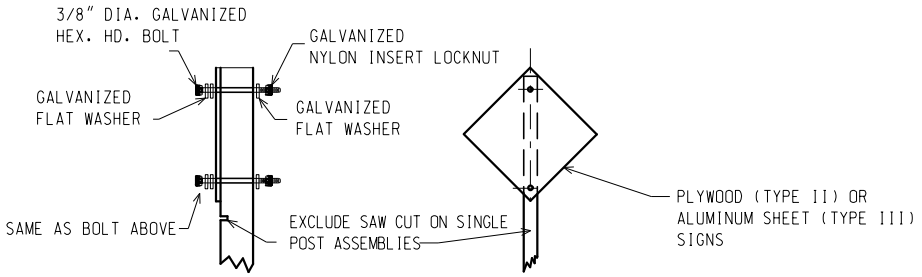
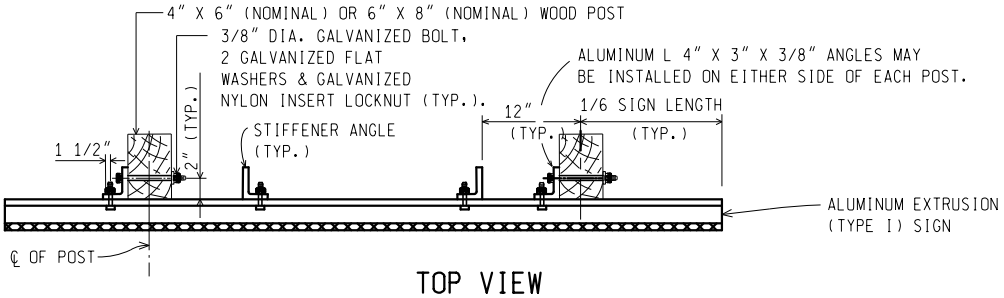
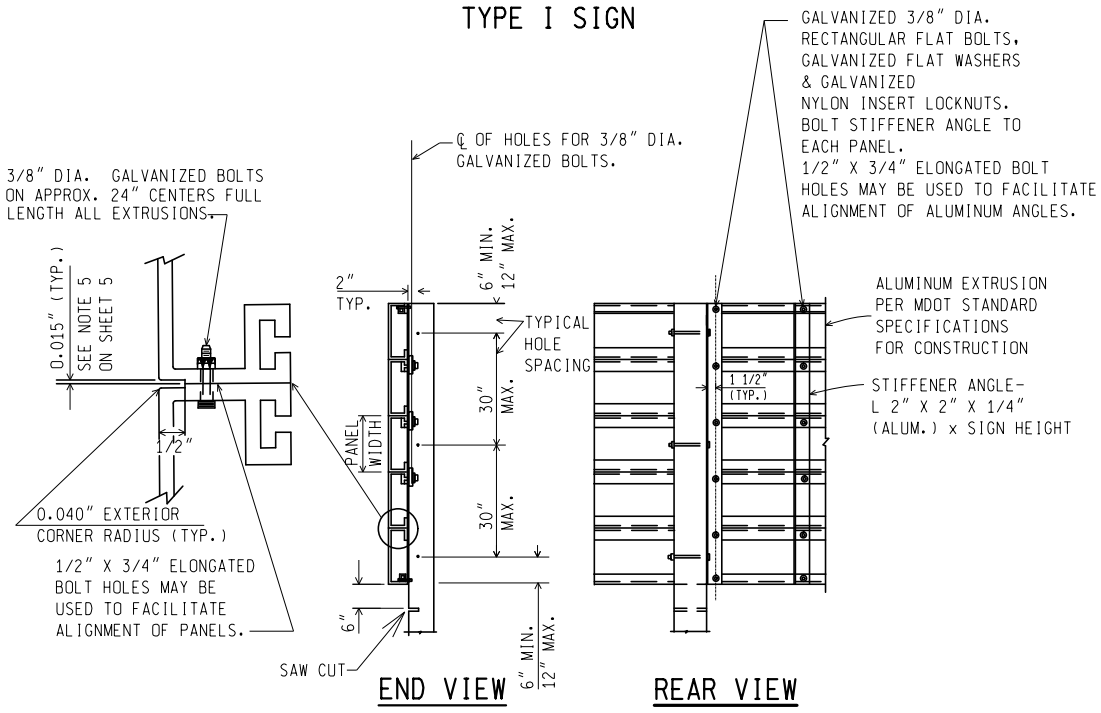


TYPE II AND TYPE III SIGNS



TOP VIEW
TYPE I SIGN



END VIEW
REAR VIEW

TYPE I SIGN - ERECTION DETAILS

WOOD POST CONNECTIONS

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 9 OF 11

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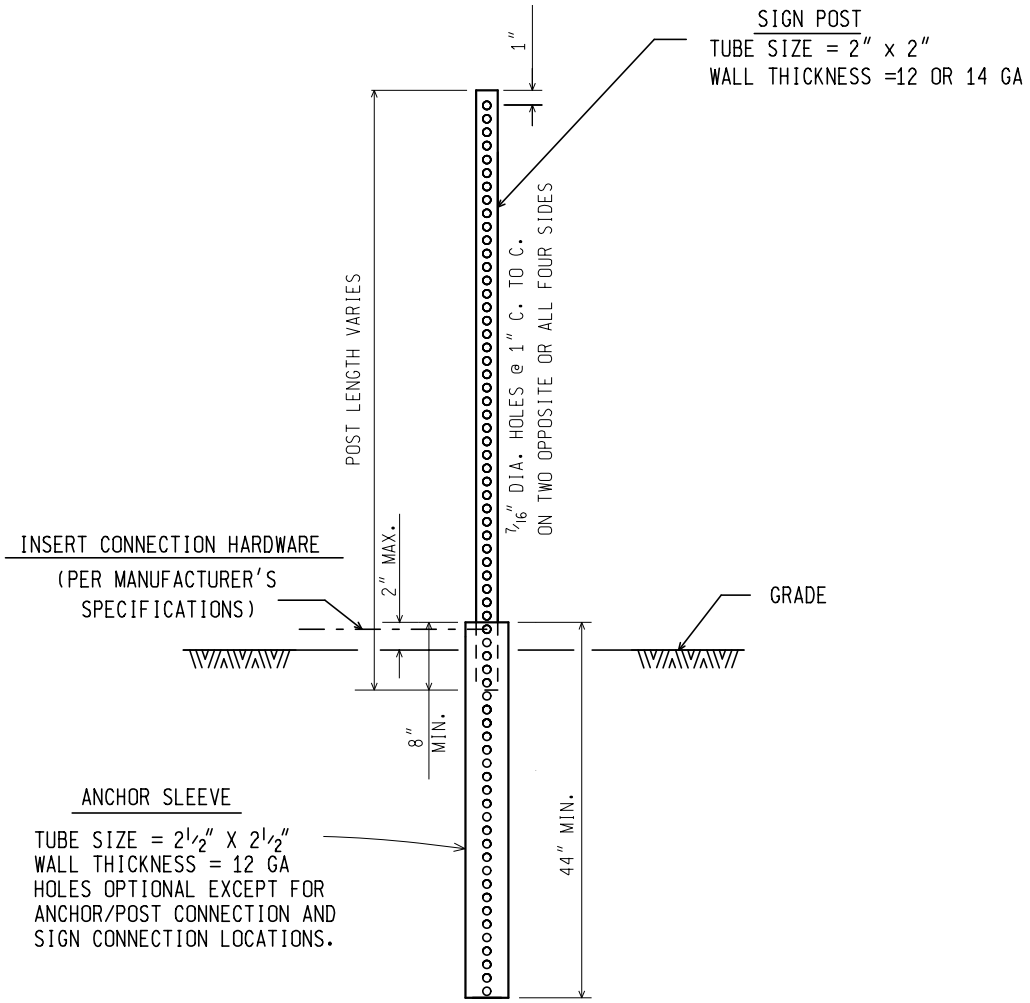

SQUARE TUBULAR STEEL POST

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 10 OF 11

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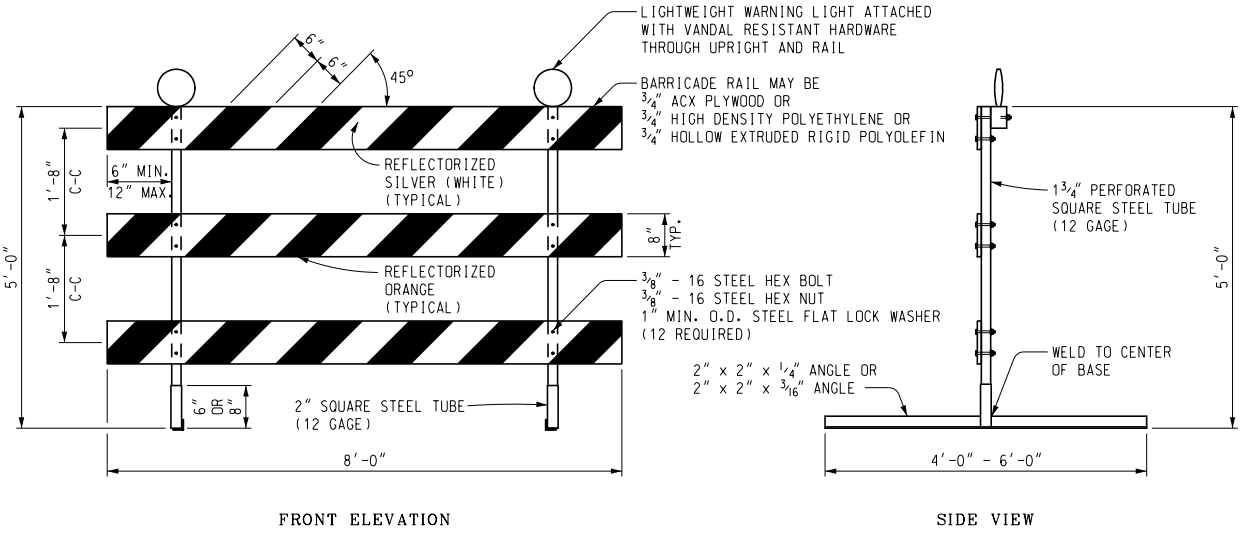
GENERAL NOTES:

1. A MAXIMUM OF TWO POSTS WITHIN A 7 FOOT PATH IS PERMITTED.
2. ALL SIGN POSTS SHALL COMPLY WITH NCHRP 350.
3. ALL POSTS SHALL BE EMBEDDED A MINIMUM OF 42".
4. BRACING OF POST IS NOT PERMITTED.
5. SIGN SHALL BE LEVEL, AND UPRIGHT FOR THE DURATION OF INSTALLATION.
6. ERECT POSTS SO THE SIGN FACE AND SUPPORTS DO NOT VARY FROM PLUMB BY MORE THAN 3/16" IN 3'. PROVIDE A CENTER-TO-CENTER DISTANCE BETWEEN POSTS WITHIN 2 PERCENT OF PLAN DISTANCE.
7. NO MORE THAN ONE SPLICE PER POST, AS SHOWN, WILL BE PERMITTED.
8. POST TYPES SHALL NOT BE MIXED WITHIN A SIGN SUPPORT INSTALLATION.
9. NO VERTICAL JOINTS ARE PERMITTED IN SIGN. NO HORIZONTIAL JOINTS THROUGH SIGN LEGEND OR SYMBOLS ARE PERMITTED IN SIGN
10. REMOVE SIGN POSTS AND/OR POST STUBS IN THEIR ENTIRETY WHEN NO LONGER REQUIRED.
11. ALL LABOR, MATERIALS, AND EQUIPMENT, INCLUDING TEMPORARY SUPPORTS REQUIRED TO INSTALL, MAINTAIN, RELOCATE, AND/OR REMOVE THE TEMPORARY SIGN, INCLUDING SUPPORTS, ARE CONSIDERED TO BE INCLUDED IN THE COST OF THE TEMPORARY SIGN.
12. SAW CUTS IN WOOD POSTS ARE TO BE PARALLEL TO THE BOTTOM OF THE SIGN.
13. POSTS SHALL NOT EXTEND MORE THAN 4" ABOVE TOP OF SIGN.
14. TEMPORARY WOOD SUPPORTS DO NOT REQUIRE PRESERVATIVE TREATMENT.

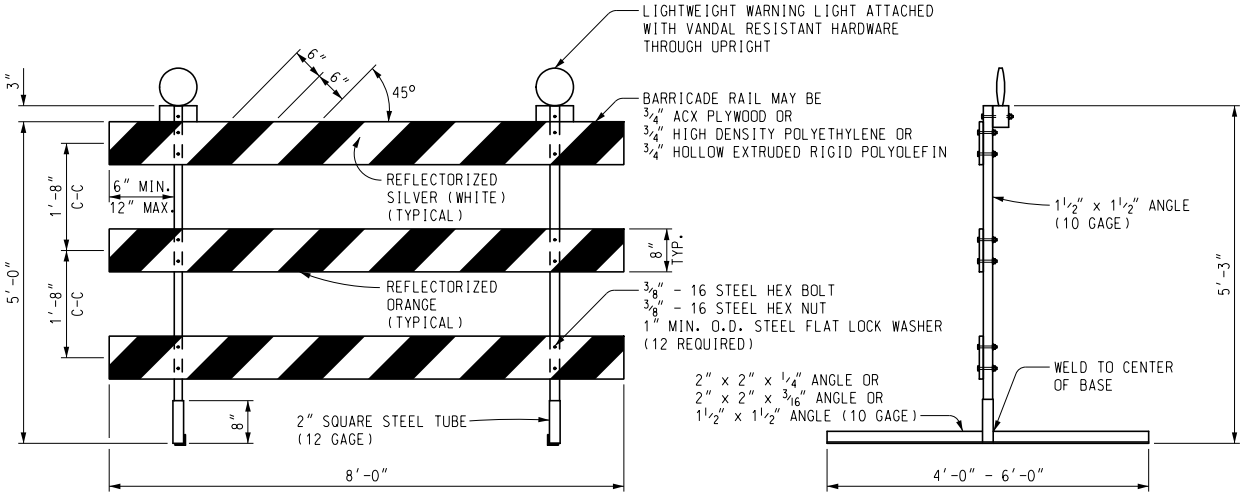
NOT TO SCALE



FRONT ELEVATION

SIDE VIEW

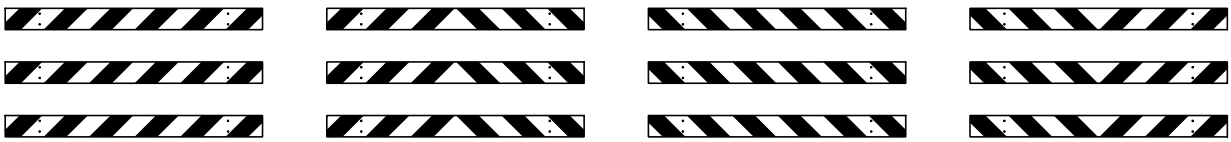
PERFORATED SQUARE STEEL TUBE OPTION



FRONT ELEVATION

SIDE VIEW

ANGLE IRON OPTION



LEFT DIRECTIONAL

BI-DIRECTIONAL

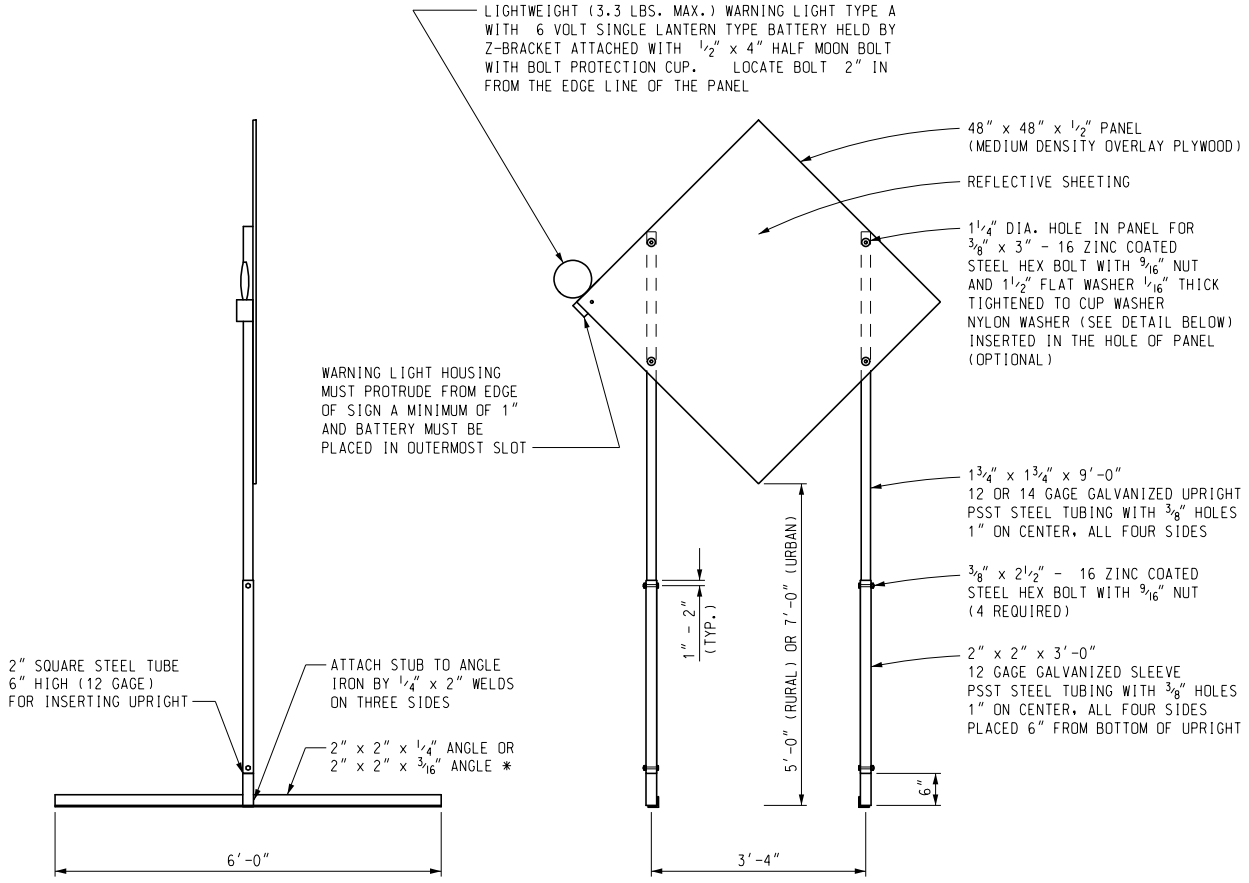
RIGHT DIRECTIONAL

CLOSURES

BARRICADE RAIL SHEETING OPTIONS
TYPE III BARRICADES

Other Type III Barricades meeting current NCHRP crash worthy criteria can be found on the FHWA Safety website at http://safety.fhwa.dot.gov/roadway_dept/road_hardware/wzd.htm

MDOT Michigan Department of Transportation PREPARED BY DESIGN DIVISION DRAWN BY: ECH CHECKED BY: MWB	DEPARTMENT DIRECTOR Kirk T. Steudle APPROVED BY: _____ DIRECTOR, BUREAU OF FIELD SERVICES ENGINEER OF DEVELOPMENT APPROVED BY: (SPECIAL DETAIL) DIRECTOR, BUREAU OF DEVELOPMENT	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR Temporary Traffic Control Devices F.H.W.A. APPROVAL | 1/18/11 PLAN DATE | WZD-125-E | SHEET 1 OF 3



SIDE VIEW

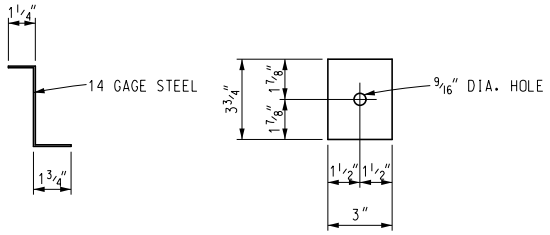
FRONT ELEVATION

TEMPORARY SIGN SUPPORT

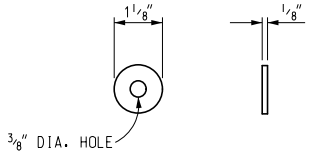
(WARNING LIGHT PLACED ON SIDE CLOSEST TO TRAFFIC)

* SIGN STAND IS BALLASTED WITH FOUR OR MORE 35 LB SANDBAGS. A MINIMUM OF ONE ON EACH END.

UPRIGHTS SHALL NOT EXTEND ABOVE THE SIGN PANEL.



Z-BRACKET DETAIL



OPTIONAL NYLON WASHER

Other temporary sign supports meeting current NCHRP crash worthy criteria can be found on the FHWA Safety website at http://safety.fhwa.dot.gov/roadway_dept/road_hardware/wzd.htm

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	SPECIAL DETAIL F.H.W.A. APPROVAL	1/18/11 PLAN DATE	WZD-125-E	SHEET 2 OF 3

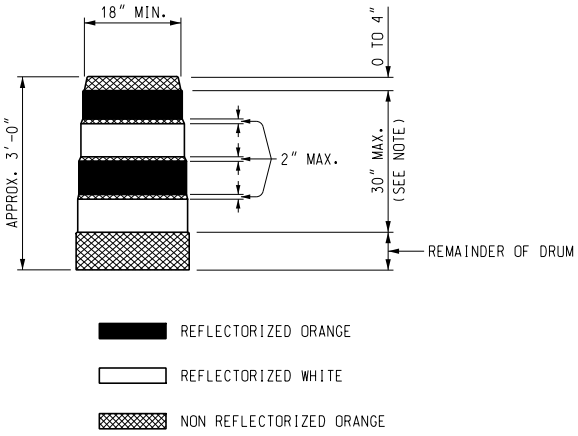
NOTE: THE ORIGINAL SIGNED COPY IS KEPT ON FILE AT THE MICHIGAN DEPARTMENT OF TRANSPORTATION.

PLASTIC DRUM

PROPOSED TYPE III BARRICADE

EXISTING TYPE III BARRICADE

SYMBOLS TO BE USED ON PLANS



NOTE:
DRUMS SHALL HAVE AT LEAST 4 HORIZONTAL REFLECTORIZED STRIPES (2 ORANGE AND 2 WHITE) OF 6" UNIFORM WIDTH, ALTERNATING IN COLOR WITH THE TOPMOST REFLECTORIZED STRIPE BEING ORANGE. NON REFLECTORIZED SPACES BETWEEN THE HORIZONTAL REFLECTORIZED ORANGE AND WHITE STRIPES SHALL BE ORANGE IN COLOR AND EQUAL IN WIDTH.

PLASTIC DRUM

NOTES:

2" PERFORATED SQUARE STEEL TUBES MAY BE USED TO FABRICATE THE HORIZONTAL BASE OF THE TYPE III BARICADE.

WARNING LIGHTS SHALL BE PLACED ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS FOR CONSTRUCTION AND ALL OTHER PROVISIONS IN THE CONTRACT ON TYPE III BARRICADES.

SEE ROAD STANDARD PLANS R-113-SERIES FOR TEMPORARY CROSSOVERS FOR DIVIDED ROADWAY, AND R-126-SERIES FOR TYPICAL LOCATION AND SPACING OF PLASTIC DRUMS FOR PLACEMENT OF TEMORARY CONCRETE BARRIER.

SIGNS, BARRICADES, AND PLASTIC DRUMS SHALL BE FACED WITH PRESSURE-SENSITIVE REFLECTIVE SHEETING ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS FOR CONSTRUCTION.

SANDBAGS SHALL BE USED WHEN SUPPLEMENTAL WEIGHTS ARE REQUIRED TO ACHIEVE STABILITY OF THE BARRICADE. THE SANDBAGS SHALL BE PLACED SO THEY WILL NOT COVER OR OBSTRUCT ANY REFLECTIVE PORTION OF THE TRAFFIC CONTROL DEVICE.

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	(SPECIAL DETAIL) F.H.W.A. APPROVAL	1/18/11 PLAN DATE	WZD-125-E	SHEET 3 OF 3

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
ADJUSTING OR RECONSTRUCTING GUARDRAIL

OPR:CT 1 of 4 C&T:APPR:JKG:DBP:06-27-06
FHWA:APPR:06-01-11

a. Description. The work of reconstructing guardrail when called for on the plans includes placing existing steel beams and certain existing fittings on new or existing posts. The work of adjusting guardrail when called for on the plans includes adjusting the height of rail on existing posts. All work must be completed in accordance with section 807 of the Standard Specifications for Construction, except as stated in this special provision, as shown on the plans or in the contract, and as directed by the Engineer.

b. Materials. Provide beam elements, anchorages and fittings that have a galvanized surface finish.

Use existing beam elements and guardrail approach terminals for reconstructing guardrail provided that these materials are reusable in their present condition (unbent, galvanized, rust free, proper radius if curved rail). Existing guardrail approach terminals used for reconstructing guardrail must meet current standards. Re-use existing posts, offset/spacer blocks, and wood blockouts in good condition, as determined by the Engineer, for reconstructing guardrail. Do not import old posts, beam elements, offset/spacer blocks, or wood blockouts from outside the project for incorporation into this work.

If the quantities of reusable beam elements or curved beam elements of the proper radius are insufficient to complete the reconstructing beam guardrail called for, additional new elements, posts, bolts, reflectors, offset blocks, spacer blocks, wood blockouts, and other pertinent fittings must be furnished and installed at the contract unit price for the applicable new guardrail or curved guardrail pay items. If existing guardrail approach and departing terminals do not meet current standards, furnish and install new standard terminals at the contract unit price for new guardrail approach terminals and departing terminals, respectively. If existing guardrail anchorages do not meet current standards, furnish and install new guardrail anchorages at the contract unit price for new guardrail anchorages.

Unless otherwise specified, conform to the post length specified in Standard Plan R-60 Series for reconstructing beam guardrail and guardrail post furnished and installed.

The requirements of subsection 908.12 of the Standard Specifications for Construction do not apply to reused elements and fittings from the project. However, these requirements do apply to all new rail elements, terminals, hardware, and fittings furnished by the Contractor.

New posts furnished for the work must meet the requirements of section 912 (for wood) or 908 (for steel) of the Standard Specifications for Construction.

New offset blocks, spacer blocks, and wood blockouts must meet the requirements of section 912 of the Standard Specifications for Construction.

c. Construction.

1. Disassemble the existing guardrail beam elements and stockpile the reusable beams. Remove concrete anchor blocks at the end of turned-down guardrail anchorages, and concrete footings for old guardrail cable anchorages.

Take ownership of unusable posts, beam elements and hardware and excess reusable beam elements and hardware, unless otherwise specified in the plans, and remove from the project.

Dismantle, separate, and stockpile beam elements and endings designated as property of the Department at an approved location(s) on the project for eventual pick up by the Department or local agency forces.

2. For standard guardrail, drill new 3/4 inch by 2 1/2 inch post bolt slots in the beam elements, if necessary, at 6 foot 3 inch intervals (3 foot 1 1/2 inch spacing where indicated).

3. For W-beam backed guardrail, the Contractor may drill new slots in the beam elements as needed. Applicable criteria from Standard Plan R-72 Series applies.

4. For a thrie-beam retrofit, the Contractor may drill new slots in the beam elements as needed. If necessary, the Contractor may drill new holes in the bridge railing for anchoring the guardrail. Applicable criteria from Standard Plan B-22 and B-23 Series, respectively, apply.

5. For a guardrail anchorage, the Contractor may drill new slots in the beam elements as needed. If necessary, the Contractor may drill new holes in the bridge railing, concrete barrier, or other concrete structure for anchoring the guardrail. Applicable criteria from Standard Plan R-67, R-71, B-22, and B-23 Series, respectively, apply.

6. Repair zinc coating on beam elements, steel posts, and fittings damaged in transporting, handling, or erection. Apply zinc coating to bare metal surfaces after drilling holes/slots on beam elements. Repair zinc coating according to subsection 716.03.E of the Standard Specifications for Construction.

7. Re-erect the reusable beams on new or existing posts and offset/spacer blocks at the required spacing. Install the face of the rail at the specified distance from the edge of pavement.

8. Re-erect standard guardrail as specified in Standard Plan R-60 Series, and re-erect sections of W-beam backed guardrail as specified in Standard Plan R-72 Series.

9. Re-erect thrie-beam retrofit with reusable or new beams, wood blockouts, and miscellaneous hardware, as specified in Standard Plan B-22 and B-23 Series, respectively.

10. Re-erect guardrail anchorage with reusable or new beams, offset blocks, and miscellaneous hardware, as specified in Standard Plan R-67, R-71, B-22, and B-23 Series, respectively.

11. Backfill old postholes and voids caused by removal of concrete anchor blocks and footings using approved material and compaction methods.

12. Adjust guardrail heights as shown on Standard Plan R-60 Series. Make height adjustments in the block mounting location only. Lifting existing posts to adjust rail height is not allowed. The post bolt (for Guardrail, Type B) or upper post bolt (for Guardrail, Type T) must not be closer than 2 inches from the top of the wood or steel post. Field drill new holes in existing post if necessary.

Make height adjustments to usable existing guardrail approach terminals by reconstruction (complete removal and reinstallation) only. Replace unusable and substandard terminals with new standard terminals.

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

Pay Item	**Pay Unit**
Guardrail, Reconst, Type __	Foot
Guardrail Post, Furn and Install, __ inch	Each
Guardrail Height, Adj	Foot

Guardrail constructed using new or existing posts and reused beam elements will be measured as **Guardrail, Reconst, Type** __ of the type specified, by length in feet along the face of the rail, including reused existing terminals. The work includes all materials, labor, and equipment required for:

1. Removal of existing guardrail, w-beam backed guardrail, guardrail approach terminals, guardrail departing terminals, thrie-beam retrofits, and guardrail anchorages.

2. Furnishing, as necessary, new posts, offset blocks, spacer blocks, wood blockouts, bolts, reflectors, and other pertinent fittings.

3. Backfilling old postholes.

4. Field drilling beam elements and repairing damaged galvanized surfaces.

5. Drilling holes in bridge railings, concrete barriers, and other concrete structures.

6. Transporting beam elements within the project limits.

7. Dismantling, separating and stockpiling elements and disposing of waste or scrap material.

Curved beam guardrail, if constructed of reused material, will be included as regular **Guardrail, Reconst, Type** __ and will not be paid for separately.

Guardrail, Type __ and **Guardrail, Curved, Type** __ of the type specified, will be paid for separately if it is necessary for the Contractor to furnish new beam elements due to insufficient quantities of reusable elements available on the project.

Installing posts within existing guardrail post intervals to modify the guardrail will be measured as units of **Guardrail Post, Furn and Install**, __ **inch** of the post length specified. The pay item includes furnishing and installing posts, offset blocks, bolts, and necessary fittings.

If the Engineer directs that an occasional beam element be replaced in a run being measured as **Guardrail, Reconst**, **Type** __, such removal and replacement will be considered as part of **Guardrail, Reconst, Type** __ if the effective length (6 foot 3 inches, 12 foot 6 inches, 25 foot, etc.) of the rail replacement does not exceed five percent of the length of that run of guardrail. If the beam replacement exceeds five percent, all of the beam removal and replacement in that run will be measured and paid for separately.

Guardrail Height, Adj will be measured in feet along the face of the rail adjusted and includes all necessary field drilling of existing posts. Pay quantities will be in increments of the post spacing called for on the plans, excluding anchorages and end shoes.

Reconstructed guardrail anchorages will be paid for as **Guardrail, Reconst, Type** __ when rebuilt with existing beam elements. Otherwise, guardrail anchorages constructed with all new components will be paid for as **Guardrail Anch, Bridge, Det** __ or **Guardrail Anch, Median**.

Reconstructed thrie-beam retrofit will be measured and paid for as **Guardrail, Reconst, Type** __ when rebuilt with existing beam elements. **Bridge Railing, Thrie Beam Retrofit** will be paid for separately if it is necessary for the Contractor to furnish new thrie-beam retrofit installations due to insufficient quantities of reusable elements available on the project.

Reconstructed w-beam backed guardrail will be measured and paid for as **Guardrail, Reconst, Type** __ when rebuilt with existing beam elements. **Guardrail, Backed, Det** __, of the type specified, will be paid for separately if it is necessary for the Contractor to furnish new w-beam backed guardrail installations due to insufficient quantities of reusable elements available on the project.

Reconstruction of reusable existing guardrail approach and departing terminals that meet current standard will be measured and paid for as **Guardrail, Reconst, Type** __.

Guardrail Approach Terminal, Type __, of the type specified, will be paid for separately when required to replace unusable or substandard existing approach terminals. **Guardrail Departing Terminal, Type** __, of the type specified, will be paid for separately when required to replace unusable or substandard existing departing terminals.

Payment for removal of existing buried ends is included in the item of **Guardrail, Reconst, Type** __. Where only the existing terminal or anchorage is removed in a run that is otherwise not reconstructed, the removal will be paid for as **Guardrail, Rem**.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
SLOPE RESTORATION, FREEWAY

a. Description. This work consists of preparing all areas designated for slope restoration on the plans or as directed by the Engineer and applying topsoil, fertilizer, seed, mulch with mulch anchor, mulch blanket, high velocity mulch blanket and permanent turf reinforcement mat to those areas. Turf establishment must be in accordance with section 816 of the Standard Specifications for Construction and Standard Plan R-100 Series, except as modified herein or otherwise directed by the Engineer.

b. Materials. The materials and application rates specified in sections 816 and 917 of the Standard Specifications for Construction apply unless modified by this special provision or otherwise directed by the Engineer. The following materials must be used on this project:

1. Seeding mixture as called for on the plans

2. Fertilizer, Chemical Nutrient, Class A

3. Topsoil Surface, Furnished or Salvaged, 4 inch

4. Mulch and Mulch Anchoring, Mulch Blanket and High Velocity Mulch Blanket

5. Permanent Turf Reinforcement Mat (TRM) must be 100 percent synthetic and consist of 100 percent ultraviolet (UV) stabilized polyolefin fibers sewn between two layers of black UV stabilized polypropylene netting with polyolefin thread. The TRM must meet the following "minimum average roll value" requirements:

Property	Test Method	Requirement
Mass/Unit Area	ASTM D 6566	10 oz/syd
Ultraviolet Stability @ 1000 hrs	ASTM D 4355	80 percent
Tensile Strength (MD)	ASTM D 6818	165 lbs/ft

Acceptance. Supply a Test Data Certification for the permanent TRM from one of the following manufacturers:

Recyclex - American Excelsior Co., Arlington, TX (800) 777-7645
P300 - North American Green, Poseyville, IN (800) 772-2040
Landlok 450 - Propex, Inc., Chattanooga, TN (800) 621-1273
PP5-10 - Western Excelsior, Mancos, CO (800) 833-8573

c. Construction. Construction methods must be in accordance to subsection 816.03 of the Standard Specifications for Construction. Begin this work as soon as possible after final grading of the areas designated for slope restoration but no later than the maximum time frames stated in subsection 208.03 of the Standard Specifications for Construction. It may be necessary, as

directed by the Engineer, to place materials by hand.

Shape, compact and assure all areas to be seeded are weed free prior to placing topsoil. Place topsoil to the minimum depth indicated above, to meet proposed finished grade. If the area being restored requires more than the minimum depth of topsoil to meet finished grade, this additional depth must be filled using topsoil or, at the Contractor's option, embankment. Furnishing and placing this additional material is included in this item of work.

Topsoil must be weed and weed seed free and friable prior to placing seed. Apply seed mixture and fertilizer to prepared soil surface. Seed must be incorporated into top 1/2 inch of topsoil.

Mulch must be applied at a rate of 2 tons per acre. Place Mulch Anchoring over the mulch at a rate specified in subsection 816.03.F of the Standard Specifications for Construction. Mulch Blanket and High Velocity Mulch Blanket must be placed in accordance with subsection 816.03.H of the Standard Specifications for Construction and as shown on Standard Plan R-100 Series.

Areas constructed with the TRM must be installed on prepared (seeded) grades as shown on the plans in strict accordance with the manufacturer's published installation guidelines. The top edge of the TRM must be anchored in a minimum 6 inch deep trench. Operation of equipment on the slope will not be allowed after placement of the TRM. No credit for splices, overlaps, tucks or wasted material will be made.

If an area washes out after this work has been properly completed and approved by the Engineer, make the required corrections to prevent future washouts and replace the topsoil, fertilizer, seed and mulch. This replacement will be paid for as additional work using the applicable contract items.

If an area washes out for reasons attributable to the Contractor's activity or failure to take proper precautions, replacement will be at the Contractor's expense.

The Engineer will inspect the seeded turf to ensure the end product is well established, weed free, in a vigorous growing condition, and contains the species called for in the seeding mixture.

If the seeded turf is not well established at the end of the first growing season, the Contractor is responsible to re-seed until the turf is well established and approved by the Engineer.

Provide weed control, if weeds are determined by the Engineer to cover more than 10 percent of the total area of slope restoration, in accordance with subsection 816.03.J of the Standard Specifications for Construction. Weed control will be at the Contractor's expense with no additional charges to the project.

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**
Slope Restoration, Type __	Square Yard

1. Place **Slope Restoration, Type A** in all areas not described in the other types of slope restoration and measure by area in square yards in place. **Slope Restoration, Type A** includes all labor, equipment and materials required to install Topsoil Surface, Furnished or Salvaged; Fertilizer, Chemical Nutrient, Class A; Seeding Mixture; and Mulch and Mulch

Anchoring which will not be paid for separately but included in the contract unit price for **Slope Restoration, Type A**.

2. Place **Slope Restoration, Type B** parallel (6 feet minimum) to the edge of the roadway, in areas that have a 1 on 3 slope and in any ditch with a grade less than 1.5 percent, or as directed by the Engineer. **Slope Restoration, Type B** will be measured by area in square yards in place. **Slope Restoration, Type B** includes all labor, equipment and materials required to install Topsoil Surface, Furnished or Salvaged; Fertilizer, Chemical Nutrient, Class A; Seeding Mixture; and Mulch Blanket which will not be paid for separately but included in the contract unit price for **Slope Restoration, Type B**.

3. Place **Slope Restoration, Type C** in areas that have a 1 on 2 slope, any ditch with a grade of 1.5 percent to 3 percent or as directed by the Engineer. **Slope Restoration, Type C** will be measured by area in square yards in place. **Slope Restoration, Type C** includes all labor, equipment and materials required to install Topsoil, Furnished or Salvaged; Fertilizer, Chemical Nutrient, Class A; Seeding Mixture; and High Velocity Mulch Blanket which will not be paid for separately but included in the contract unit price for **Slope Restoration, Type C**.

4. Place **Slope Restoration, Type D** in areas that have a slope steeper than 1 on 2, any ditch with a grade steeper than 3 percent or as directed by the Engineer. **Slope Restoration, Type D** will be measured by area in square yards in place. **Slope Restoration, Type D** includes all labor, equipment and materials required to install Topsoil, Furnished or Salvaged; Fertilizer, Chemical Nutrient, Class A; Seeding Mixture; and TRM which will not be paid for separately but included in the contract unit price for **Slope Restoration, Type D.**