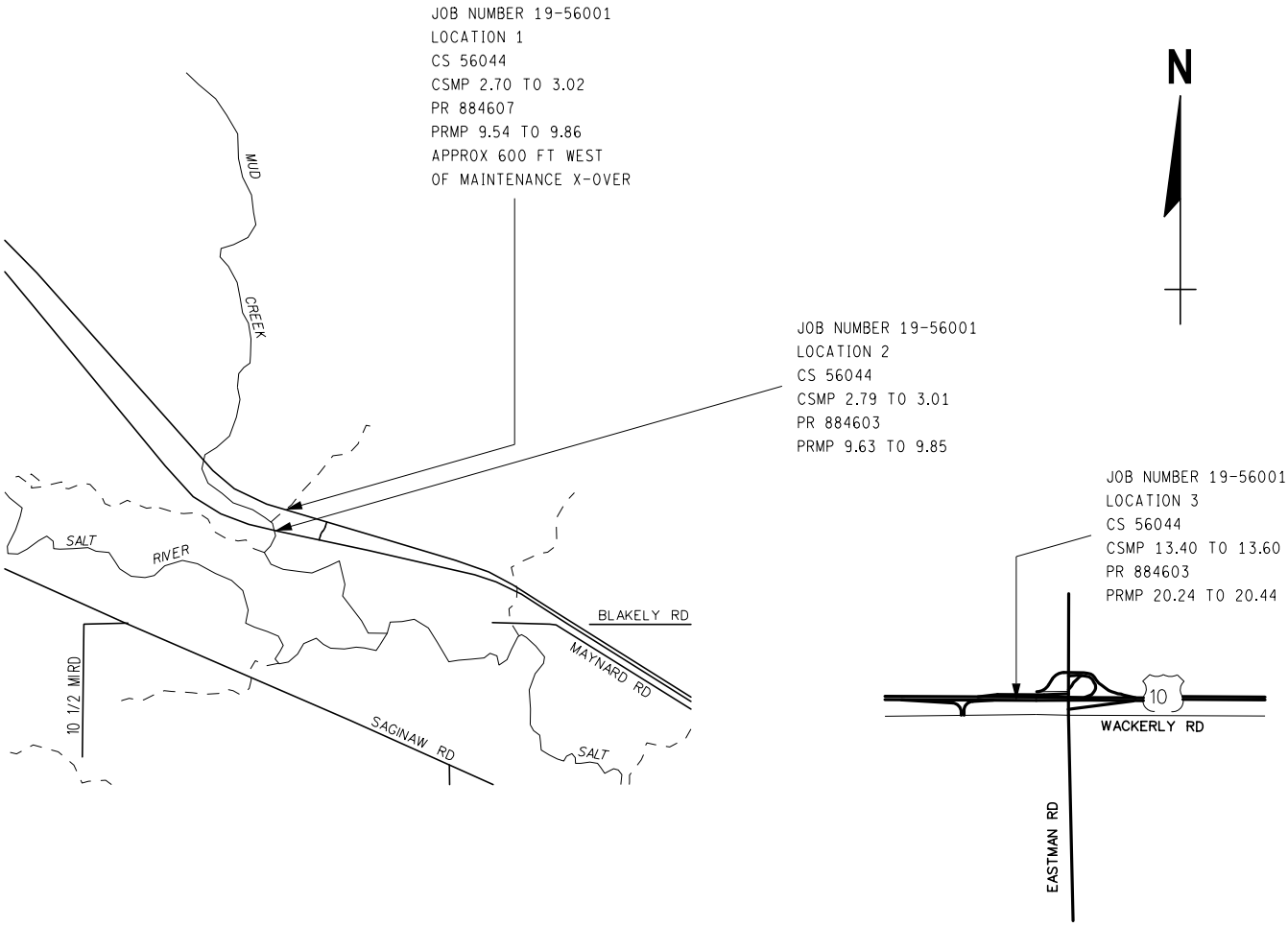
MICHIGAN DEPARTMENT OF TRANSPORTATION

ROUTE: US-10
JEROME AND LARKIN TOWNSHIPS
MIDLAND COUNTY

COUNTY KEY

SECTION	CONTROL SEC	JOB NO.	FED AID PROJ
	56044	19-56001	NO



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 # 17.

MILES:

CONTRACT FOR:
DRAINAGE IMPROVEMENTS TO WB US-10 OVER MUD CREEK TRIBUTARY AND EB US-10 OVER MUD CREEK, INCLUDING INSTALLATION OF CURB AND GUTTER, DOWNSPOUTS, GUARDRAIL RECONSTRUCT, TRENCH AND REPLACE SHOULDER, AND SLOPE RESTORATION. WASHOUT REPAIR ON EB US-10 NEAR EASTMAN RD.

RECOMMENDED FOR APPROVAL BY:

_____ , P.E. - PROJECT MANAGER _____ DATE

_____ , P.E. - CONSTRUCTION ENGINEER _____ DATE

MDOT Michigan Department of Transportation

PAUL C. AJEGBA, P.E. - DIRECTOR

DATE: 5/30/19	US-10 DRAINAGE IMPROVEMENTS	DRAWING	SHEET
DESIGN UNIT: MYERS	LOCATION SHEET		
TSC: MT. PLEASANT			1

LOG OF PROJECT

C.S. 56044
J.N. 19-56001

PROGRESS SCHEDULE

Work may begin immediately after receiving approval from MDOT. Work at all locations must be completed by August 29, 2019. Notice must be provided to Jason Potts at 989-737-0211 a minimum of three (3) calendar days prior to beginning any work.

JOB LOCATION

Location 1: Begins in Jerome Township, Midland county on the north side of WB US-10 at the unnamed tributary leading to Mud Creek east of the Mud Creek Bridge.

Location 2: Begins in Jerome Township, Midland county on the south side of EB US-10 at the Mud Creek bridge and continues easterly to the end of the guardrail

Location 3: Begins in The City of Midland, Midland county on the south side of EB US-10 entrance ramp from Wackerly at the failed spillway.

CS Information
CS 56044 MP 2.70 to 3.02 (WB US-10)
CS 56044 MP 2.79 to 3.01 (EB US-10)
CS 56044 MP 13.40 to 13.60 (EB US-10)

PR Information
PR 884607 MP 9.54 to 9.86 (WB US-10)
PR 884603 MP 9.63 to 9.85 (EB US-10)
PR 884603 MP 20.24 to 20.44 (EB US-10)

DESCRIPTION OF WORK

The work shall consist of reconstructing the guardrail per the attached Special Provision and placing concrete curb and gutter in at the designated areas. Extend the existing guardrail at location 1 west 20’ and east 193’ to go beyond the proposed downspout and spillway. Place W-backed guardrail at the spillway locations, as needed, per Standard Plan R-72 series. Any existing washout areas shall be filled with embankment and slope restoration. Riprap will be placed at the end of each downspout and spillway. Slope restoration will be placed in all of the disturbed areas as per the attached Special Provision. Place silt fence between each downspout 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). Crushed concrete may not be used within 100’ of any water course per 12SP902C. Any material used is included in the trenching pay item.

ESTIMATED QUANTITIES

LOG OF PROJECT

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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 Scott Badger at (989) 280-4057.

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	LS
<u>Location 1: North side of WB US-10 over Mud Creek Tributary:</u>		
Excavation, Earth	150	Cyd
Embankment, CIP	120	Cyd
Erosion Control, Silt Fence	450	Ft
Trenching	1.4	Sta
Culv, Cl A, 12”	25	Ft
Dr Marker Post	1	Ea
Downspout Header, Conc	1	Ea
Conc, Grade S2	.8	Cyd
Reinforcement, Steel, Culv and headwall	40	lbs
Curb and Gutter, Conc, Det D2	126	Ft
Shoulder Gutter, Conc, Det 3	1	Ea
Spillway, Conc	10	Ft
Guardrail, Type T	213	Ft
Guardrail, Reconst, Type T	213	Ft
Guardrail, Backed, Det G3	1	Ea
Guardrail Approach Terminal, Type 2T	1	Ea
Riprap, Plain	24	Syd
Slope Restoration, Type C	700	Syd
<u>Location 2: South side of EB US-10 over Mud Creek:</u>		
Excavation, Earth	30	Cyd
Embankment, CIP	20	Cyd
Erosion Control, Silt Fence	370	Ft
Trenching	1.9	Sta
Culv, Cl A, 12”	40	Ft
Dr Marker Post	1	Ea

Downspout Header, Conc	1	Ea
Conc, Grade S2	.8	Cyd
Reinforcement, Steel, Culv and headwall	40	lbs
Curb and Gutter, Conc, Det D2	183	Ft
Shoulder Gutter, Conc, Det 3	1	Ea
Spillway, Conc	10	Ft
Guardrail, Reconst, Type T	225	Ft
Guardrail, Backed, Det G3	1	Ea
Riprap, Plain	24	Syd
Riprap, Heavy	30	Syd
Slope Restoration, Type C	130	Syd

Location 3: South side of EB US-10 entrance ramp from Wackerly:

Excavation, Earth	10	Cyd
Embankment, CIP	30	Cyd
Erosion Control, Silt Fenc	80	Ft
Culv, Cl A, 12”	25	Ft
Dr Marker Post	1	Ea
Downspout Header, Conc	1	Ea
Conc, Grade S2	.8	Cyd
Reinforcement, Steel, Culv and headwall	40	lbs
Curb and Gutter, rem	25	Ft
Curb and Gutter, Conc, Det D2	25	Ft
Guardrail, Recons, Type T	38	Ft
Riprap, Plain	15	Syd
Slope Restoration, Type C	30	Syd

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Table 1 (For Information Only)

Location: Westbound US-10 and Mud Creek tributary				
Station	**Downspout Header (Ea)**	**Culvert Length (Ft)**	**Riprap (Syd)**	**Comments**
0+80				Reconst departing terminal here.
0+90				Begin saw cut, trenching, and place Curb and Gutter Type D2
1+00	1	25	15	Place downspout header and downspout with concrete headwall with baffle (Paid as Conc, Grade S2), riprap end.
1+00				Location of end of ex. guardrail.
02+20			8.89	Place concrete spillway DET 3 10’ long and riprap with geotextile liner.
2+30				End saw cut, trenching, and curb and gutter
2+93				End guardrail reconstruct, begin new guardrail, type T construction
5+06				Begin approach terminal 2T
5+50				End of guardrail approach terminal

Table 2 (For Information Only)

Location: Eastbound US-10 and Mud Creek				
Station	**Downspout Header (Ea)**	**Culvert Length (Ft)**	**Riprap (Syd)**	**Comments**
1+00				Existing Joint between bridge deck and approach slab
1+23				End of existing Curb and gutter, begin sawcut, trenching, and place Curb and Gutter Type D2
2+10	1	40	15	Place downspout header and downspout with concrete headwall with baffle (Paid as Conc, Grade S2), riprap end.
3+10			8.89	Place concrete spillway DET 3 10' long and riprap with geotextile liner.
3+20				End saw cut, trenching, and curb and gutter

Table 3 (For Information Only)

Location: South side of EB US-10 entrance ramp from Wackerly				
Station	**Downspout Header (Ea)**	**Culvert Length (Ft)**	**Riprap (Syd)**	**Comments**
10+00				Existing downspout
11+90				Begin Guardrail Reconst
11+93				Begin Curb and Gutter Removal and replacement with D2 Curb and Gutter
12+05	1	25	15	Place embankment to fill washout are and add downspout at location of failed spillway.
12+18				End curb and gutter removal and replacement
12+28				End Guardrail Reconst

MAINTAINING TRAFFIC

Traffic Restrictions

Maintaining traffic will be accomplished with single lane or shoulder closures and traffic shifts utilizing Maintaining Traffic Typicals M0020a, M0880a, M0990a with additional W1-6 signs. 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 required for 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.

All work shall be conducted during daytime hours only. All lanes shall be open to traffic on WB from the end of work on Thursday until normal starting time on Monday, and on EB from the end of work on Friday until normal starting time on Monday.

No work shall be performed, or lane closures allowed during the Independence Day, or Labor Day holiday periods. The Labor Day holiday period shall be defined as beginning on Thursday August 29, 2019 at noon until Tuesday September 3, 2019 at normal starting time. The Independence Day holiday period shall be defined as beginning on Thursday, June 27, 2019 at noon until Monday, July 8, 2019 at normal starting time.

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.

MDOT's roadway lighting system, Intelligent Transportation Systems (ITS) and other miscellaneous electrical systems are not a part of Miss Dig. Contractors shall submit a form 5300 a minimum of 3 business days before digging in or near MDOT freeway right-of-way.

AGGREGATE BASE
Aggregate bases shall use Aggregate 22A unless otherwise specified. Crushed concrete may not be used within 100' of any water course per 12SP902C.

GUARDRAIL AT DOWNSPOUTS
Downspout headers are intended to be planned to fit in between guardrail posts as per detail, no additional payment will be made for W backed rail at downspouts due to incorrect placement to accommodate this. Spillways will require W backed rail and are included in the estimate.

CURB AND GUTTER GRADES
The face of the curb and gutter will match the existing pavement edge after sawcutting and removal. Both of the locations covered by this project have minimal fall. It is the contractor's responsibility to ensure positive drainage to spillways and downspouts. This will require tipping the gutter pan back to generate fall during forming and finishing of the concrete.

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 2B & 2T (SKT, ET-Plus & X-Lite-Tangent-50)*R-62-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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AT&T 136 E. 4th St. Clare, Michigan 48617 Ph: 989-980-4266(W) Attn: Chris Latty	Telecom
Breitburn Energy 1165 Elkview Dr., P.O. Box 1256 Gaylord, MI 49735 Ph: 888-732-0020 (W) Attn: Robert Nowak	Gas
Charter Communications 7372 Davison Rd Davison, Michigan 48423 Ph: 810-658-5140(W) Attn: David Kelly	Cable
City of Midland 333 W. Ellsworth Midland, Michigan 48640 Ph: 989-837-3352(W) Attn: Josh Fredrickson	Water
Consumers Energy 2400 Weiss Street Saginaw, Michigan 48602 Ph: 989-791-5353(W) Attn: Greg Squanda	Electric
Consumers Energy 1945 West Parnall Road, P12-208A Jackson, Michigan 49201 Ph: 517-788-0817(W) Attn: Pete Mulhearn	Electric
Consumers Energy 2400 Weiss Street Saginaw, Michigan 48602 Ph: 989-791-5885(W) Attn: Kyle Skrabut	Gas
Consumers Energy 1945 West Parnall Road, P23-228 Jackson, Michigan 49201 Ph: 517-788-0998(W) Attn: Timothy Coppernoll	Gas

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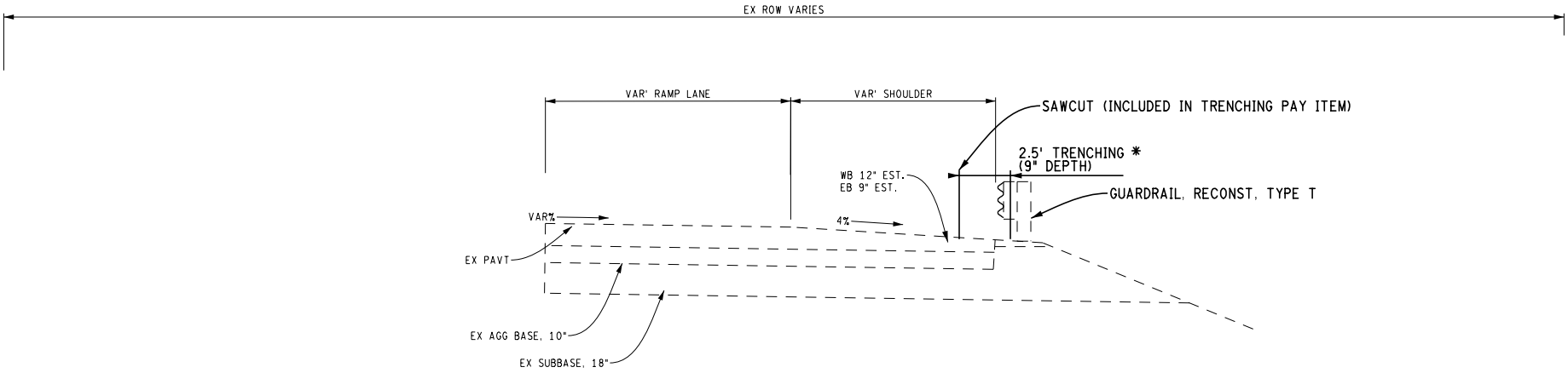
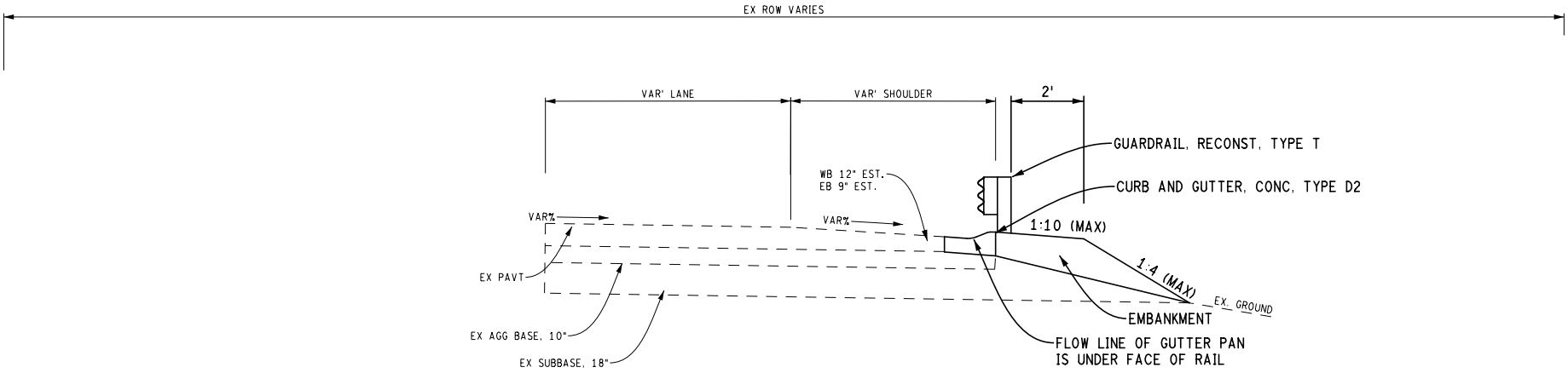
DOW Chemical Co. 921 Building Midland, Michigan 48667 Ph: 989-636-6779(W) Attn: Martin Hill	Other
METC 27175 Energy Way Novi, Michigan 48377 Ph: 248-946-3298(W) Attn: Erin Keeler	Electric
Midland County Drain Commissioner 220 West Ellsworth Street, Room 229-30 Midland, Michigan 48640 Ph: 989-832-6772(W) Attn: Doug Enos	County Drain
Midland County Water District No. 1 P.O. Box 320 Sanford, Michigan 48657 Ph: 989-687-2709(W) Attn: Ron Rose	Water
TDS Telecom (Wolverine Telephone) 104 N. Cedar St., P.O. Box 78 Sanford, Michigan 48657 Ph: 989-687-2111(W) Attn: Ron Cay	Telecom
US Signal Company 201 Ionia Avenue, SW Grand Rapids, Michigan 49503	Telecom
Windstream KDL 800 N. Durand Rd Corunna, MI 48817 Ph: 812-253-1553 (W) Attn: Chris Rogers	Telecom



EXISTING NORMAL SECTION

SECTION APPLIES TO:
STA 0+90 TO STA 2+30 (WB)
STA 1+23 TO STA 3+20 (EB)
STA 11+90 TO STA 12+28 (EB)

* TRENCHING MATERIAL WILL BE PICKED UP AND REMOVED AND DISPOSED OF FROM THE SITE BY THE CONTRACTOR.



PROPOSED NORMAL SECTION

SECTION APPLIES TO:
STA 0+90 TO STA 2+30 (WB)
STA 1+23 TO STA 3+20 (EB)
STA 11+90 TO STA 12+28 (EB)

MDOT Michigan Department of Transportation	0 VERT. (FT) 8	DATE: 5/29/19	CS: 56044	TYPICAL SECTIONS	DRAWING	SHEET
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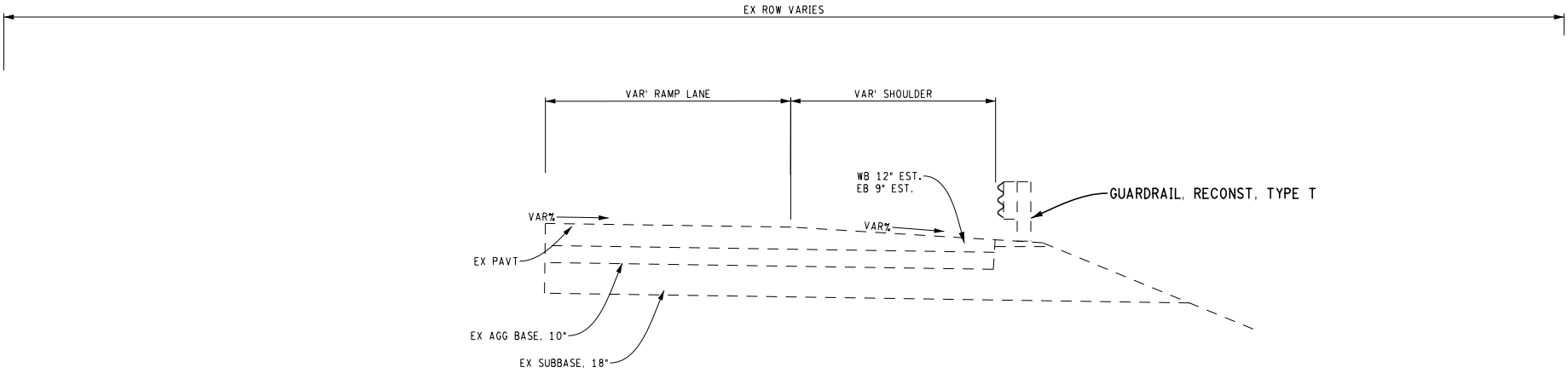

EXISTING NORMAL SECTION

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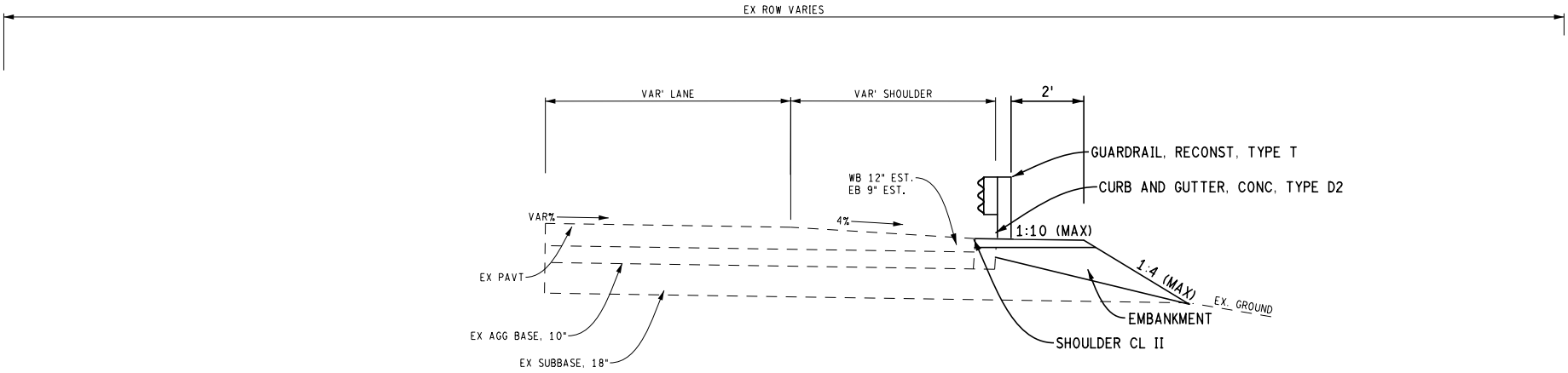
STA 0+80 TO STA 0+90 AND STA 2+30 TO STA 5+50 (WB)
STA 3+20 TO STA 3+25 (EB)



PROPOSED NORMAL SECTION

SECTION APPLIES TO:
STA 0+80 TO STA 0+90 AND STA 2+30 TO STA 5+50 (WB)
STA 3+20 TO STA 3+25 (EB)

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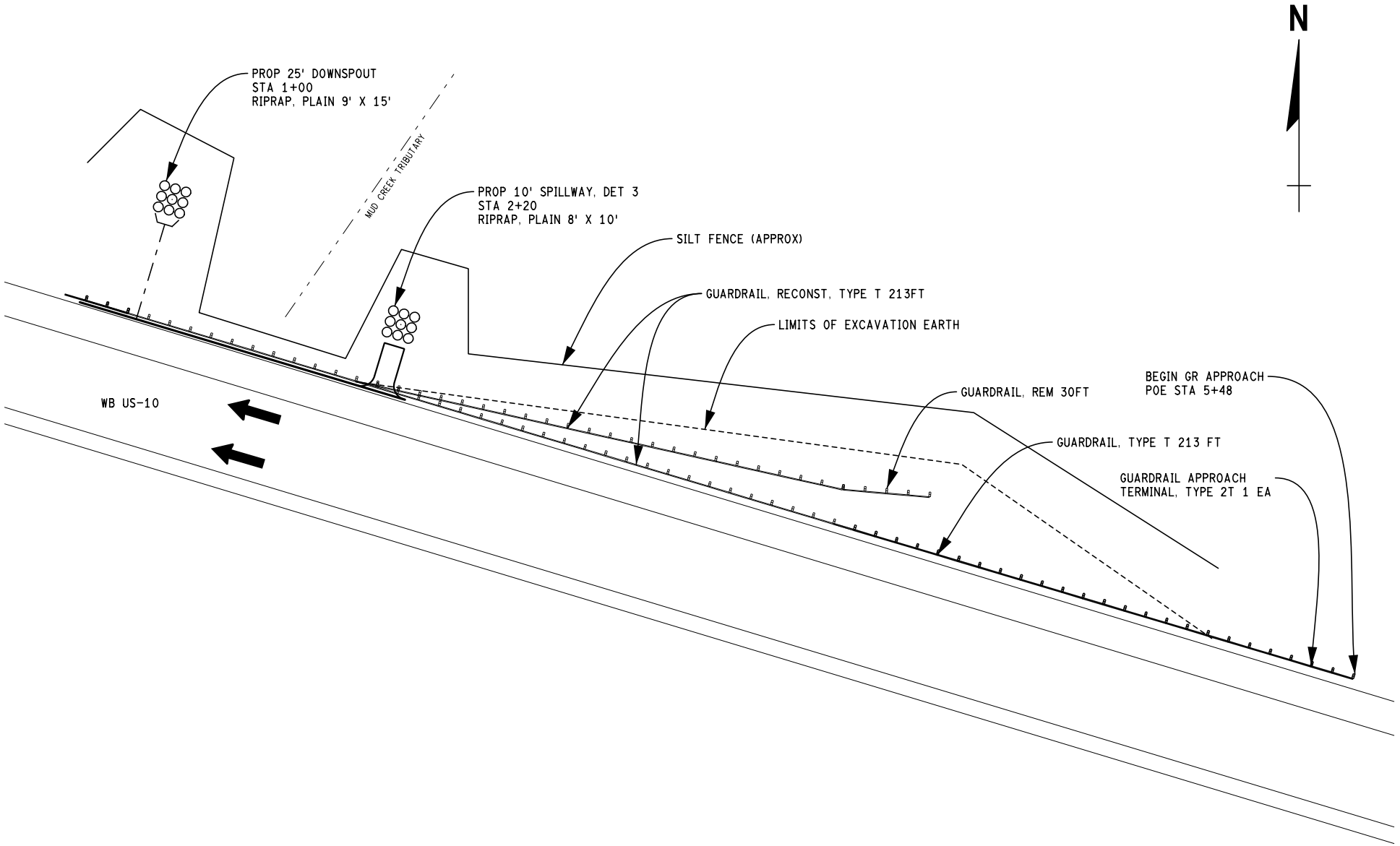

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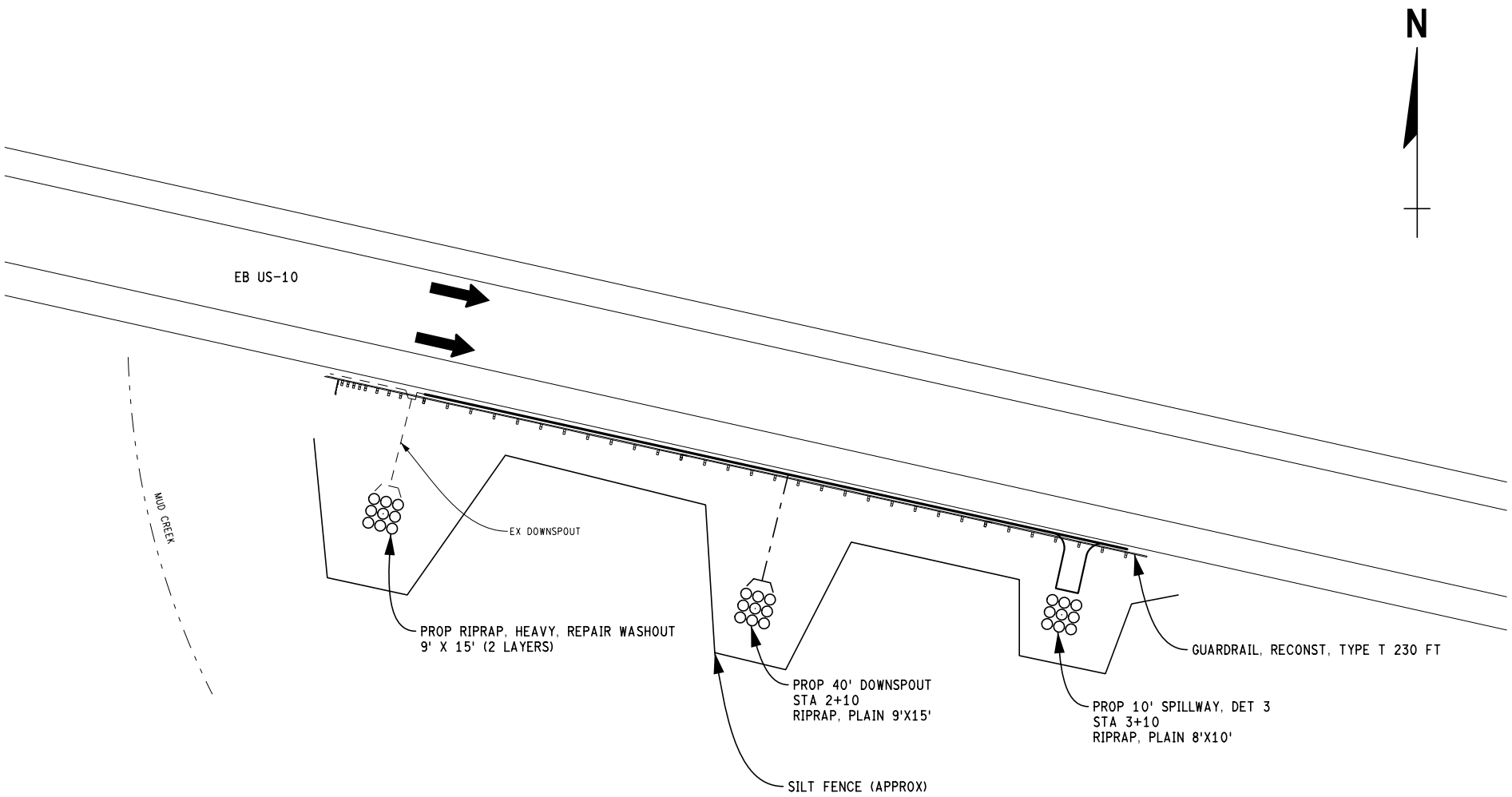

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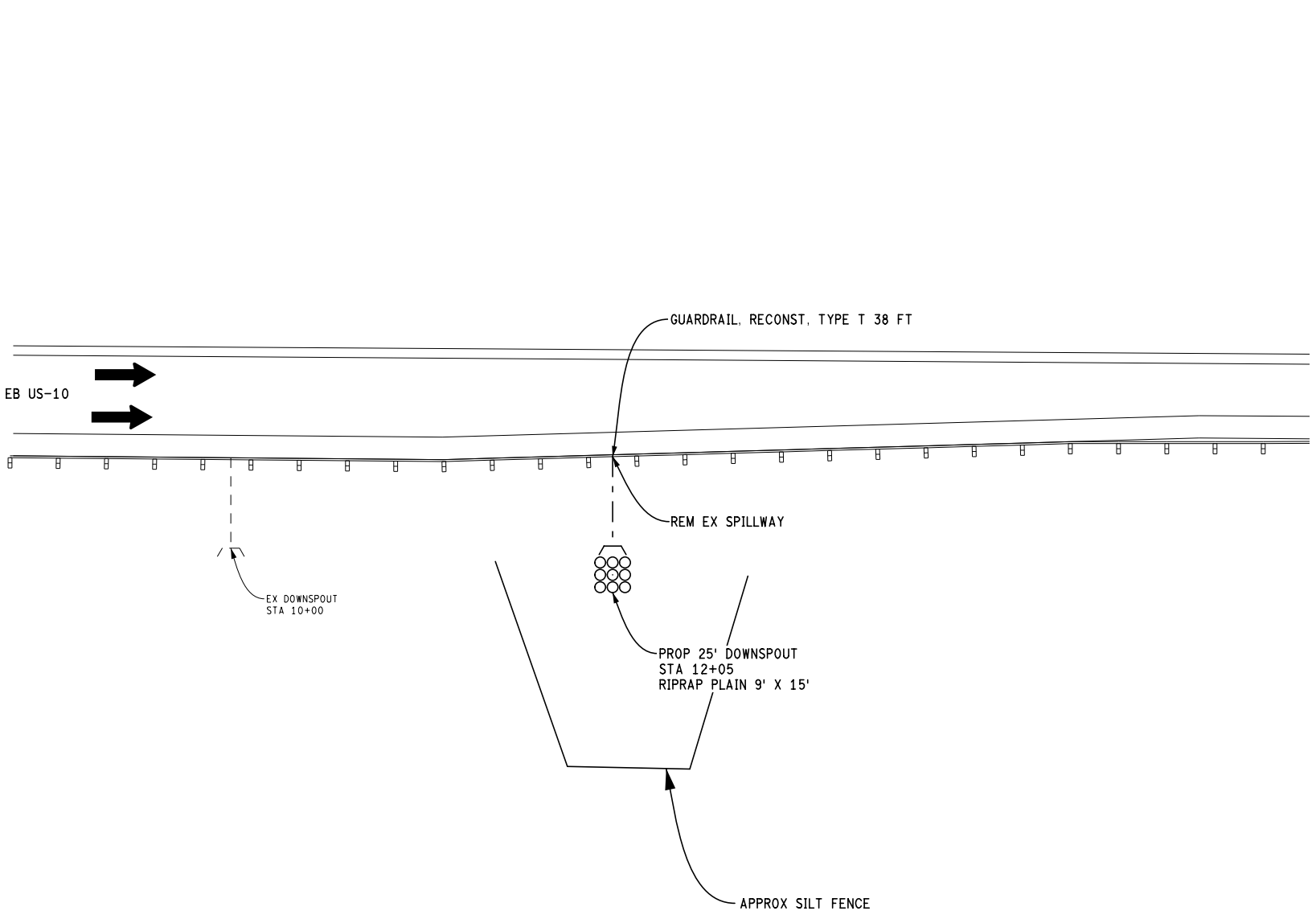

MDOT Michigan Department of Transportation	NO SCALE	DATE: 5/30/19	CS: 56044	EB US-10 ENTRANCE RAMP FROM WACKERLY	DRAWING	SHEET
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FILE:		TSC: MT. PLEASANT				16

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
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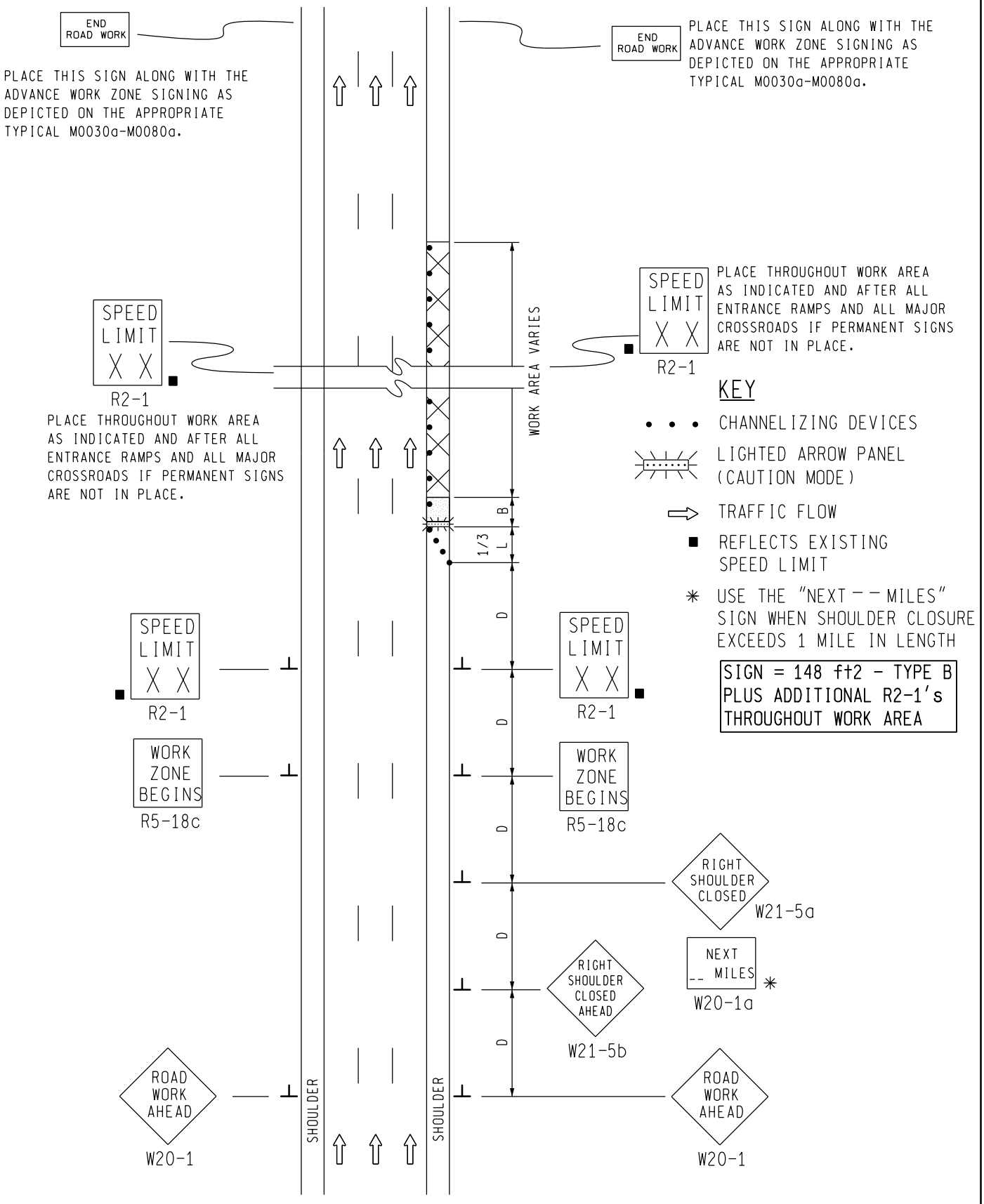


NOT TO SCALE

MDOT Michigan Department of Transportation

TRAFFIC AND SAFETY

MAINTAINING TRAFFIC TYPICAL

TYPICAL TEMPORARY TRAFFIC CONTROL FOR A SHOULDER CLOSURE ON A DIVIDED ROADWAY OR FREEWAY NO SPEED REDUCTION

DRAWN BY: CON:AE:djf	OCTOBER 2011	M0880a	SHEET 1 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		

FILE: PW RD/TS/Typicals/Signs/MT NON FWY/M0880a.dgn REV. 10/26/2011

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

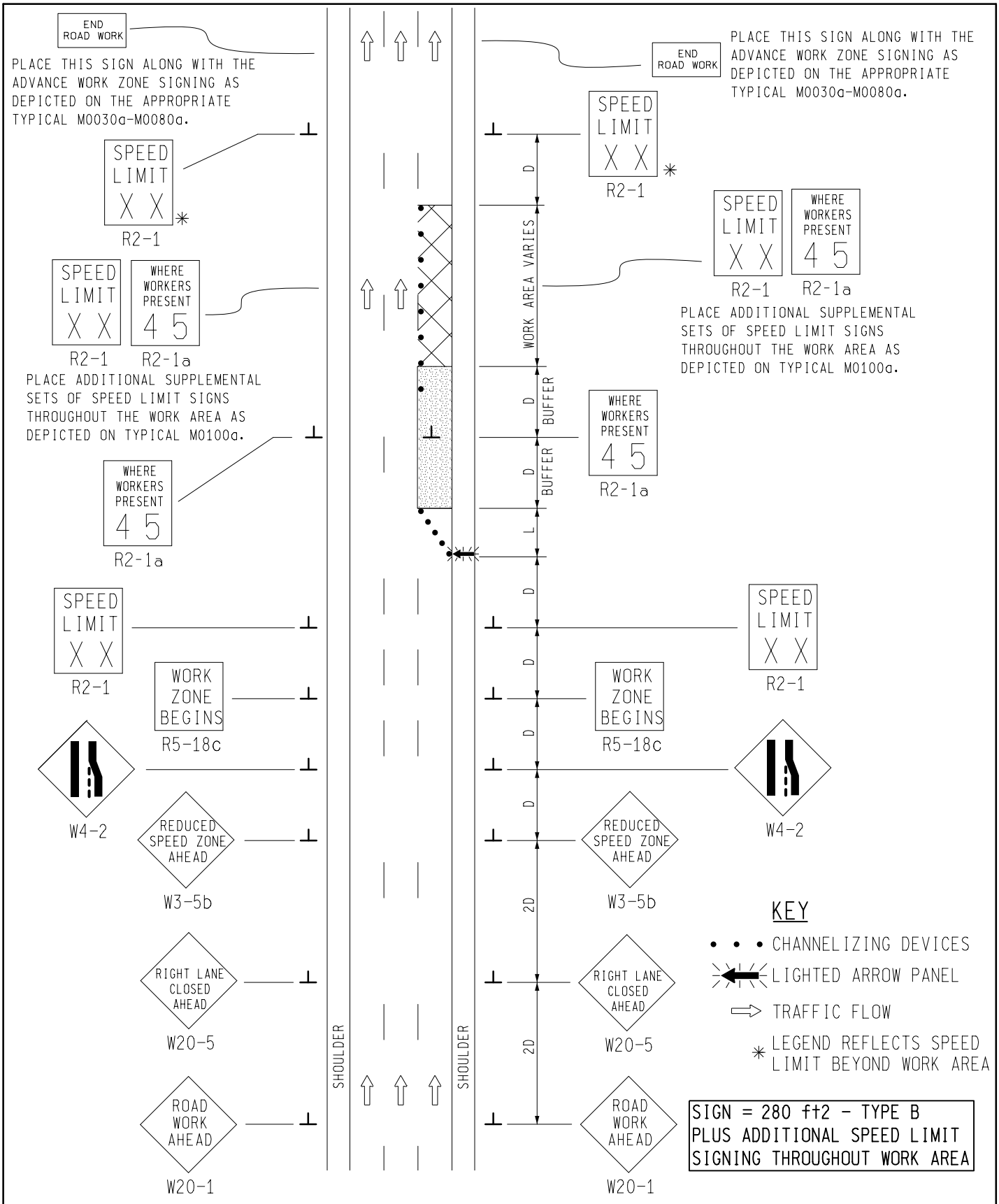
DIAMOND WARNING	- 48" x 48"
W20-1a PLAQUE	- 48 "x 36"
R2-1 REGULATORY	- 48" x 60"
R5-18c REGULATORY	- 48" x 48"

NOT TO SCALE

MDOT Michigan Department of Transportation
TRAFFIC AND SAFETY
MAINTAINING TRAFFIC TYPICAL

TYPICAL TEMPORARY TRAFFIC CONTROL FOR A SHOULDER CLOSURE ON A DIVIDED ROADWAY OR FREEWAY NO SPEED REDUCTION

DRAWN BY: CON:AE:djf	OCTOBER 2011	M0880a	SHEET 2 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		
FILE: PW RD/TS/Typicals/Signs/MT NON FWY/M0880a.dgn REV. 10/26/2011			



MDOT Michigan Department of Transportation

TRAFFIC AND SAFETY

MAINTAINING TRAFFIC TYPICAL

TYPICAL TEMPORARY TRAFFIC CONTROL FOR A ONE-LANE CLOSURE ON A FREEWAY USING REDUCED SPEED LIMIT WHERE WORKERS PRESENT

DRAWN BY: CON:AE:djf	OCTOBER 2011	M0990a	SHEET 1 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		
FILE: K:-DGN-TSR-STDS-ENGLISH-MNTTRF-M0990a.dgn	REV. 10/27/2011		

NOTES

1I. D = DISTANCE BETWEEN TRAFFIC CONTROL DEVICES
AND LENGTH OF LONGITUDINAL BUFFERS
L = MINIMUM LENGTH OF TAPER
SEE **M0020a** FOR "D" AND "L" 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.

4D. THE SPACING OF CHANNELIZING DEVICES SHOULD NOT EXCEED 45 FEET WHEN USED FOR TAPER CHANNELIZATION, AND SHOULD NOT EXCEED 90 FEET WHEN USED FOR TANGENT CHANNELIZATION.

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.

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.

21. ALL EXISTING PAVEMENT MARKINGS WHICH ARE IN CONFLICT WITH EITHER PROPOSED CHANGES IN TRAFFIC PATTERNS OR PROPOSED TEMPORARY TRAFFIC MARKINGS, SHALL BE REMOVED BEFORE ANY CHANGE IS MADE IN THE TRAFFIC PATTERN. EXCEPTION WILL BE MADE FOR DAYTIME-ONLY TRAFFIC PATTERNS THAT ARE ADEQUATELY DELINEATED BY OTHER TRAFFIC CONTROL DEVICES.

26. THE LIGHTED ARROW PANEL SHALL BE LOCATED AT THE BEGINNING OF THE TAPER AS SHOWN. WHEN PHYSICAL LIMITATIONS RESTRICT ITS PLACEMENT AS INDICATED, THEN IT SHALL BE PLACED AS CLOSE TO THE BEGINNING OF THE TAPER AS POSSIBLE.

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 ONE-LANE CLOSURE ON A FREEWAY USING REDUCED SPEED LIMIT WHERE WORKERS PRESENT

DRAWN BY: CON:AE:djf	OCTOBER 2011	M0990a	SHEET 2 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		
FILE: K:-DGN-TSR-STDS-ENGLISH-MNTTRF-M0990a.dgn		REV. 10/27/2011	

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

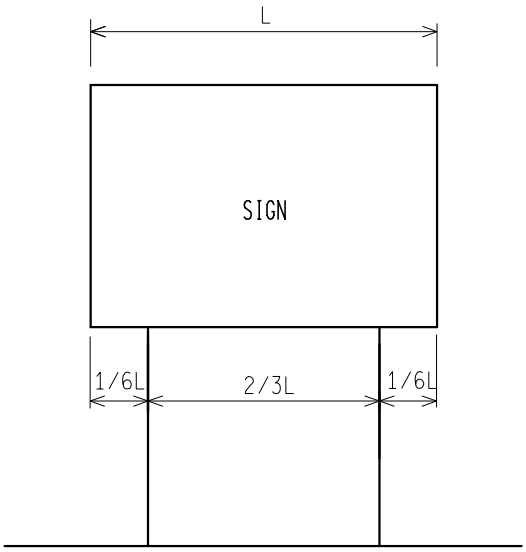
APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

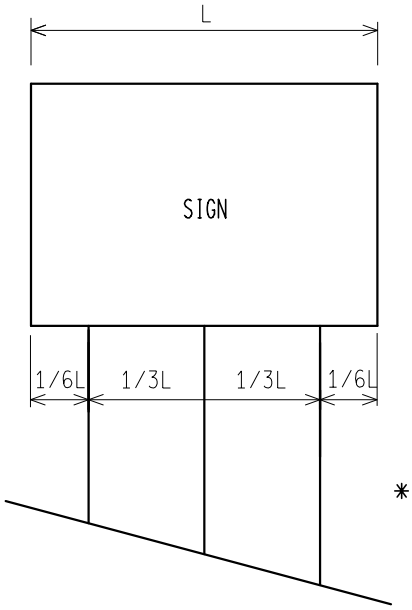
GROUND DRIVEN SIGN SUPPORTS FOR TEMP SIGNS

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

2 POST SIGN SUPPORT SPACING

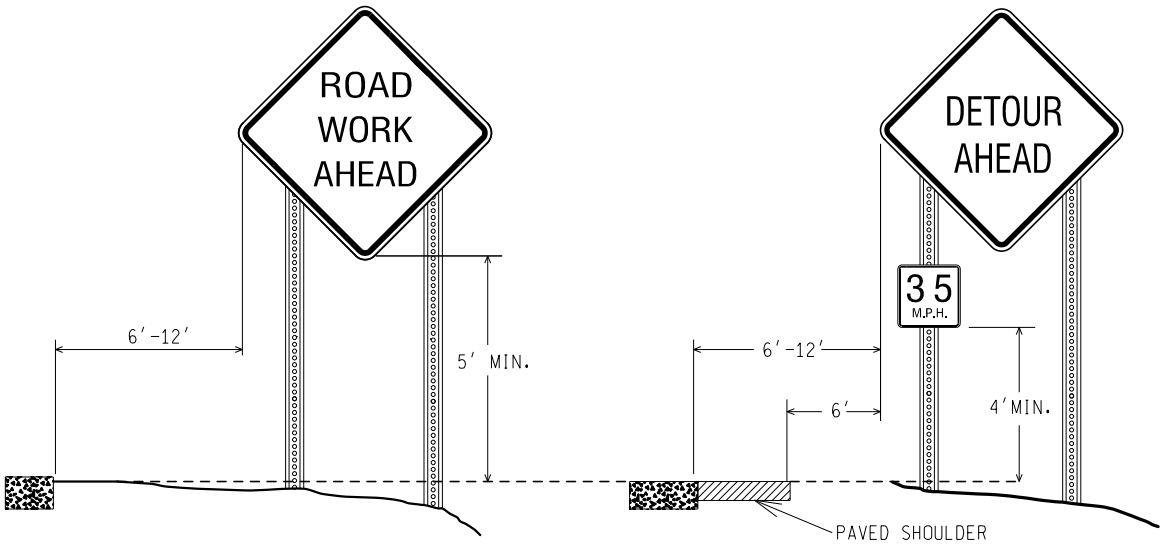


3 POST SIGN SUPPORT SPACING



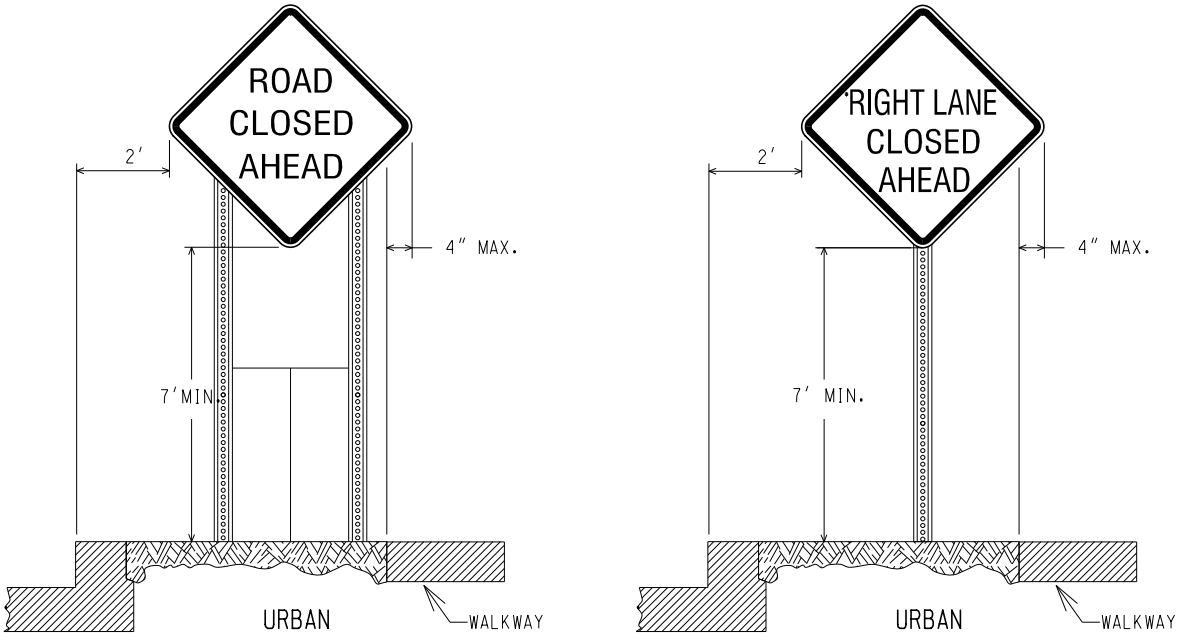
* FOR ALL 11' AND 12' LONG SIGNS ON 3 WOOD SUPPORTS, SPREAD POSTS SO AS TO HAVE A 8' MIN. TO 9' MAX. DISTANCE BETWEEN OUTSIDE POSTS.

NOT TO SCALE



RURAL

RURAL WITH ADVISORY
SPEED PLATE



(CURBED AREAS OR WHERE
WALKWAYS ARE PRESENT)

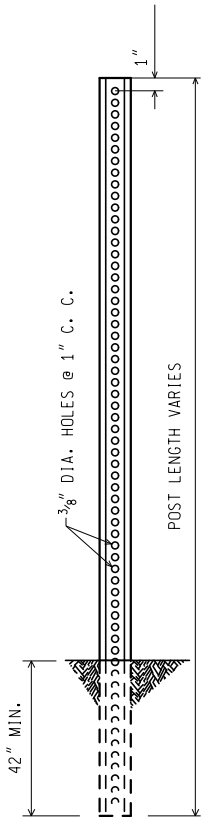
(CURBED AREAS OR WHERE
WALKWAYS ARE PRESENT)

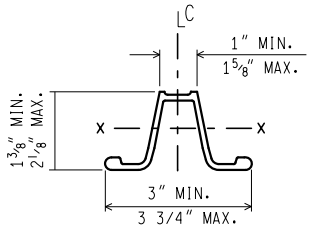
BOTTOM HEIGHT AND OFFSET

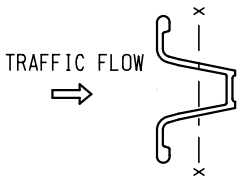
NOT TO SCALE

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

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







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

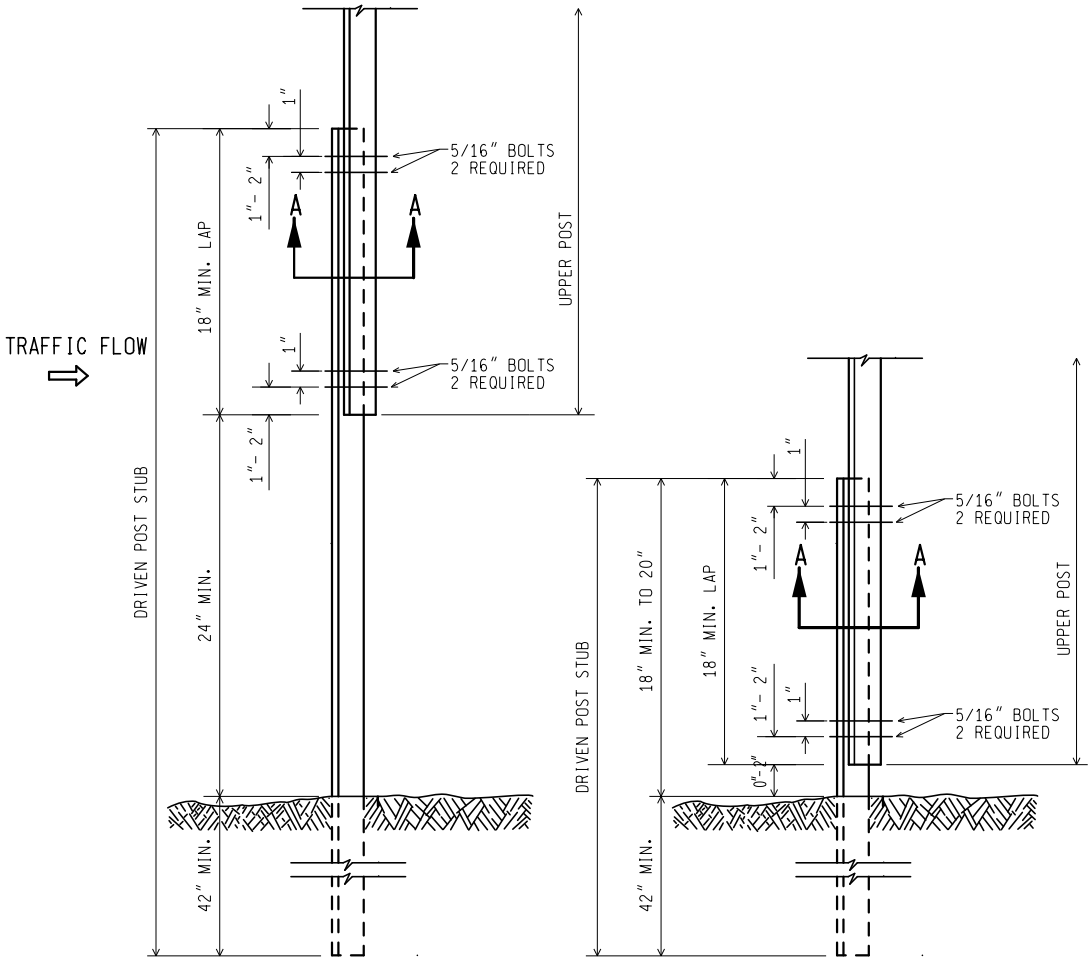
3 lb. U - CHANNEL STEEL POST
(NO SPLICE)

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

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



UPPER SPLICE

LOWER SPLICE

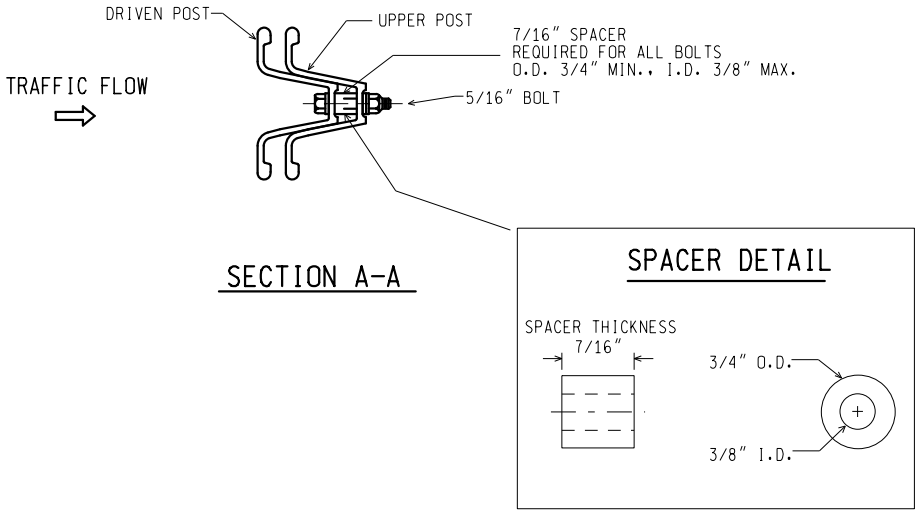
3 lb. U - CHANNEL STEEL POST
(WITH SPLICE)

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.

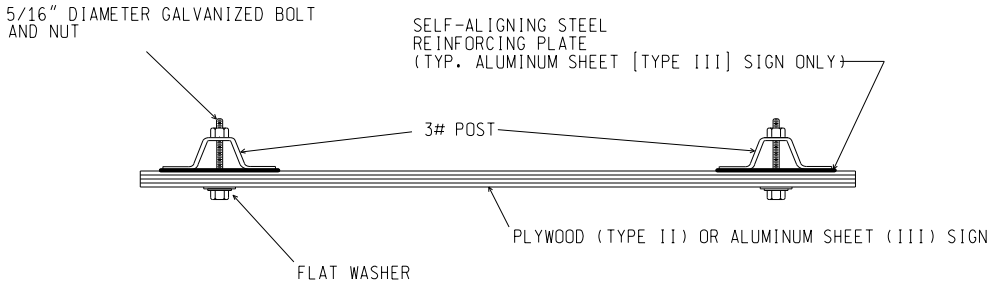
3. THE INTERIOR BOLT (FARTHEST FROM LAP), SPACER, WASHER, AND NUT SHALL BE INSTALLED IN THE NEXT PREPUNCHED HOLE.

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.

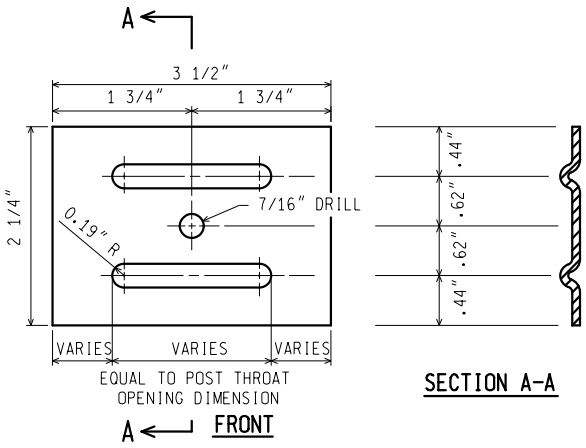
5. THE SPLICE LAP SHALL BE FASTENED BY FOUR-5/16" DIA. GALVANIZED A449 BOLTS (SAE J429 GRADE 5) OR GALVANIZED A325 BOLTS.

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

NOT TO SCALE



SIGN TO 3 lb. POST CONNECTION



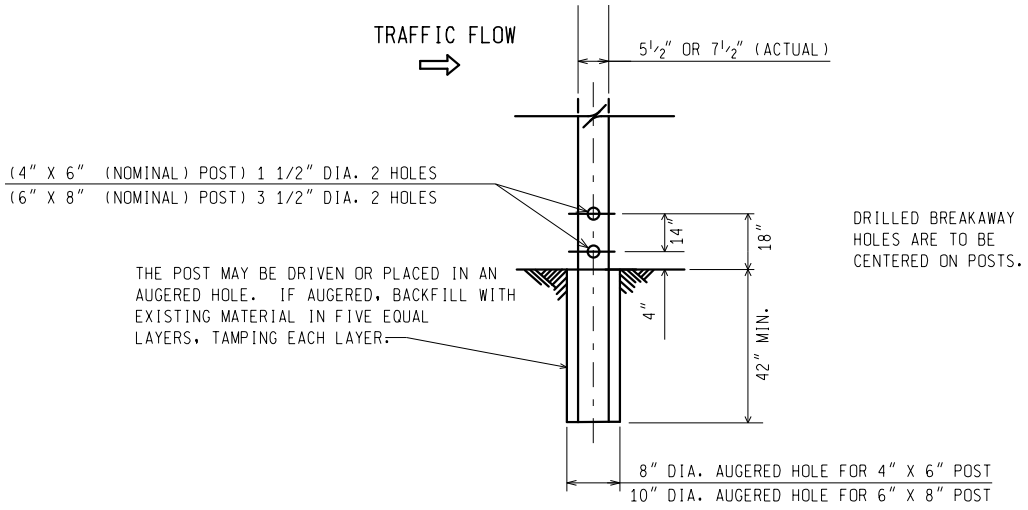
NOTES: (FOR STEEL SIGN REINF' PLATE)

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

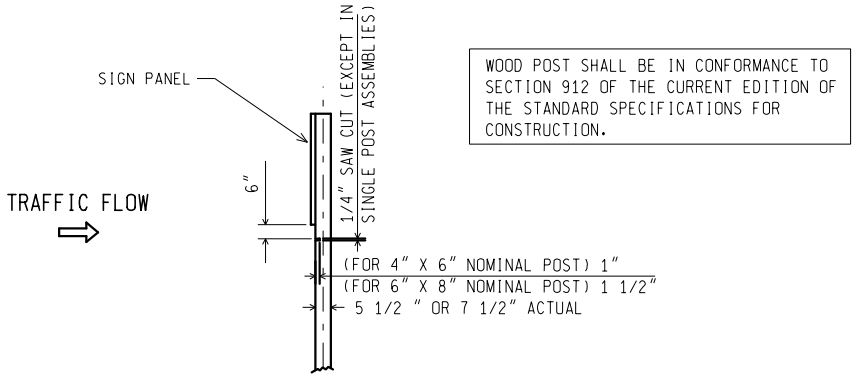
STEEL SIGN REINFORCING PLATE
REQUIRED FOR TYPE III SIGNS ONLY

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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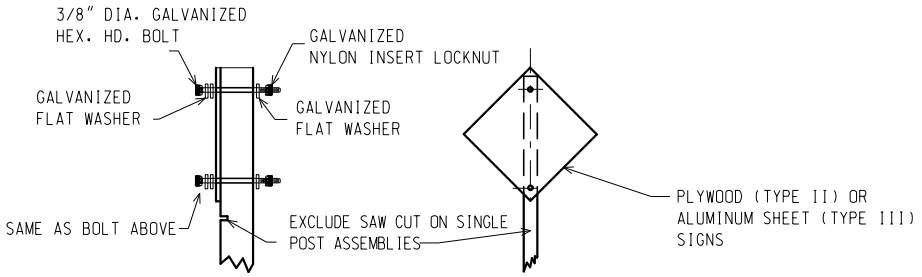
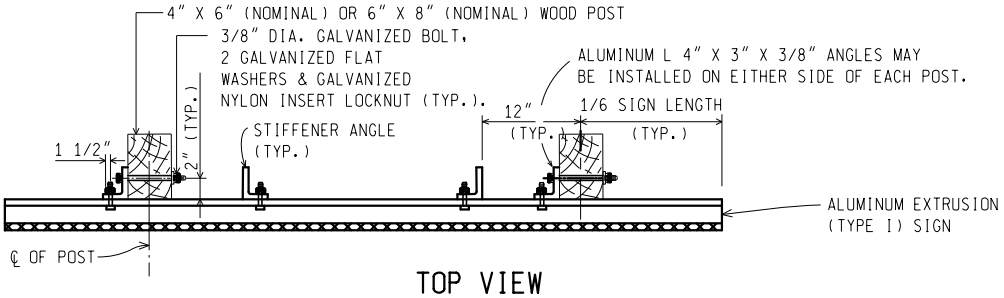
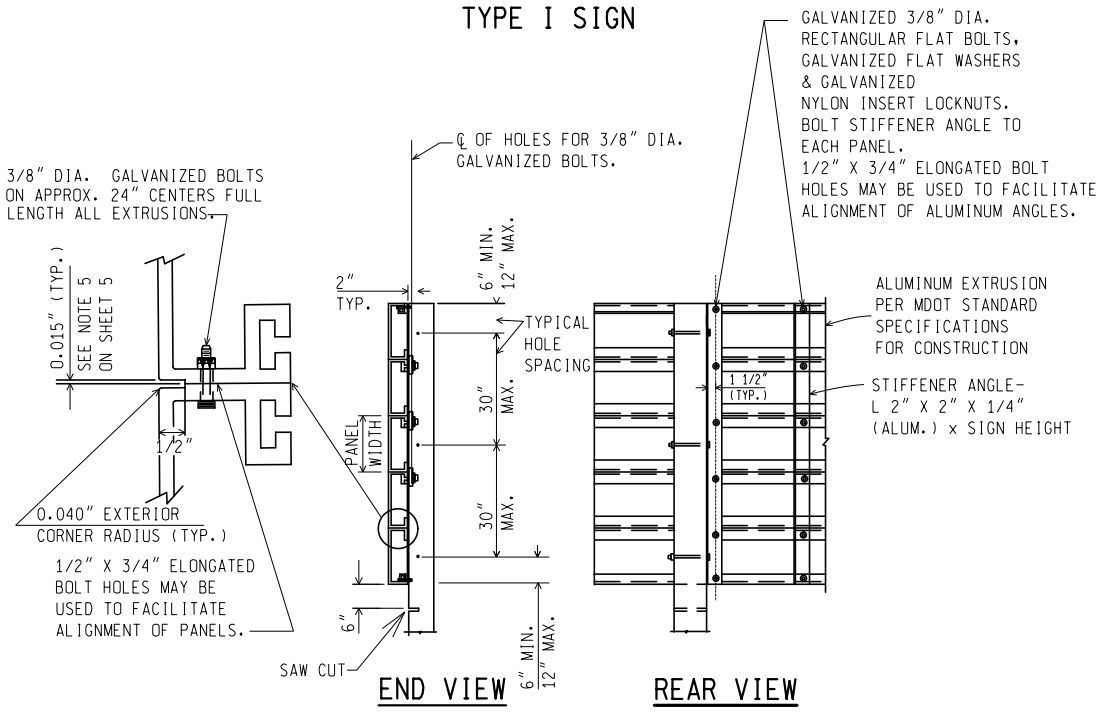


TYPE II AND TYPE III SIGNS



TOP VIEW
TYPE I SIGN



END VIEW
REAR VIEW

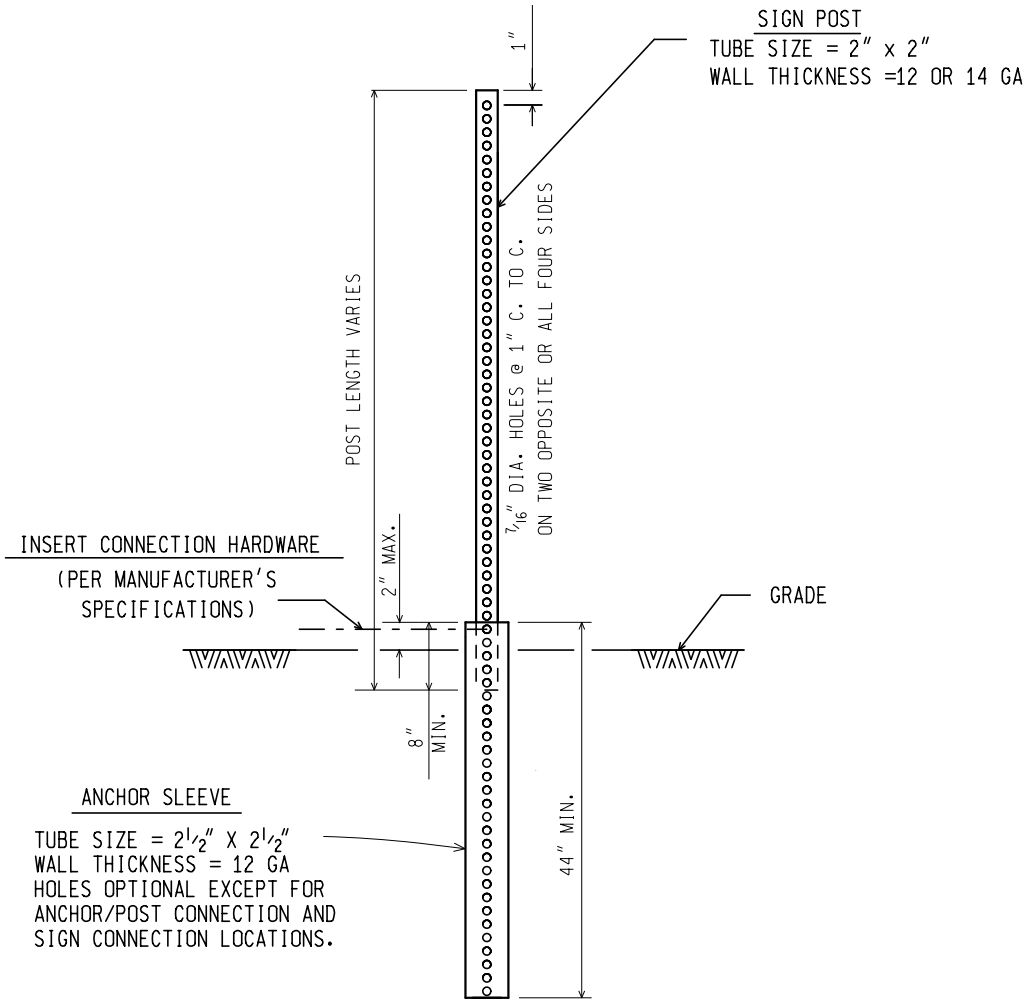
TYPE I SIGN - ERECTION DETAILS

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

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



SQUARE TUBULAR STEEL POST

NOT TO SCALE

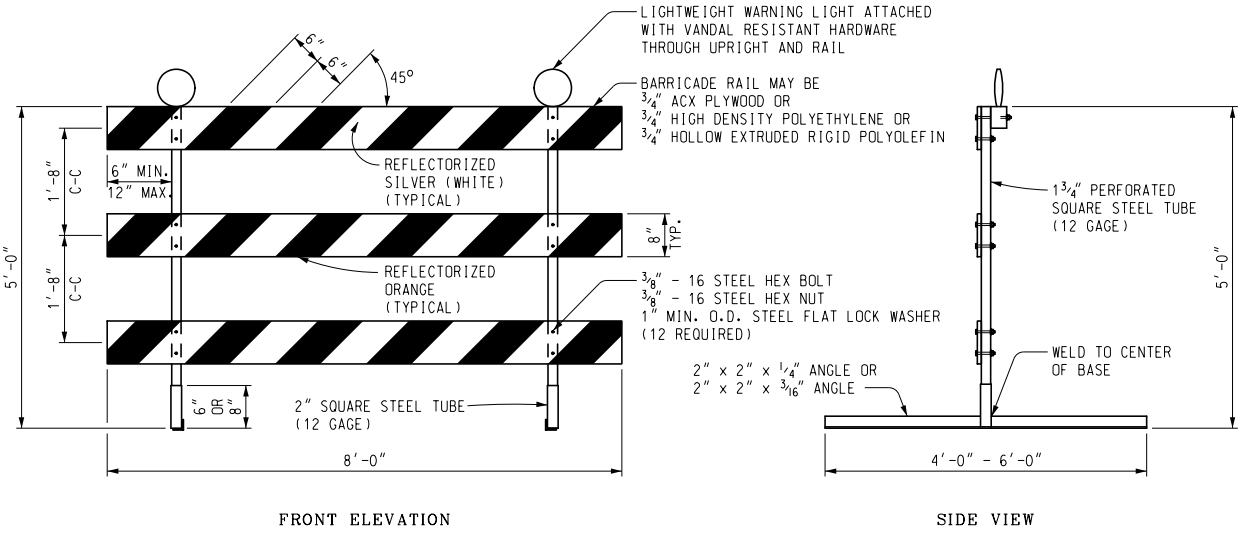
MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	F.H.W.A. APPROVAL	11/2/2017 PLAN DATE	WZD-100-A	SHEET 10 OF 11

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

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.

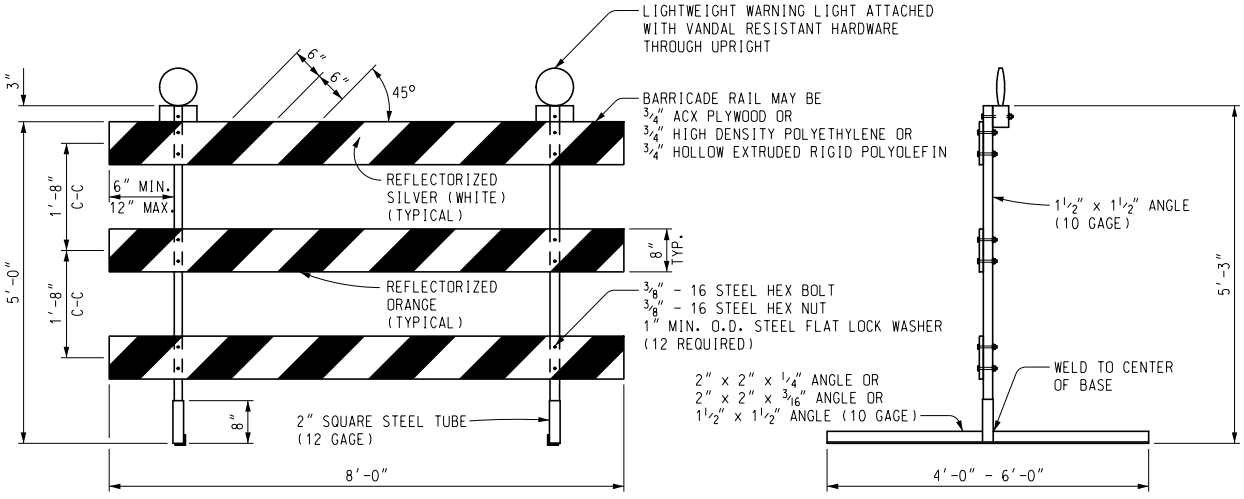
NOT TO SCALE



FRONT ELEVATION

SIDE VIEW

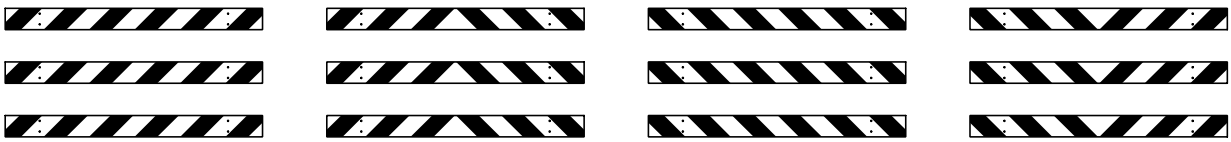
PERFORATED SQUARE STEEL TUBE OPTION



FRONT ELEVATION

SIDE VIEW

ANGLE IRON OPTION



LEFT DIRECTIONAL

BI-DIRECTIONAL

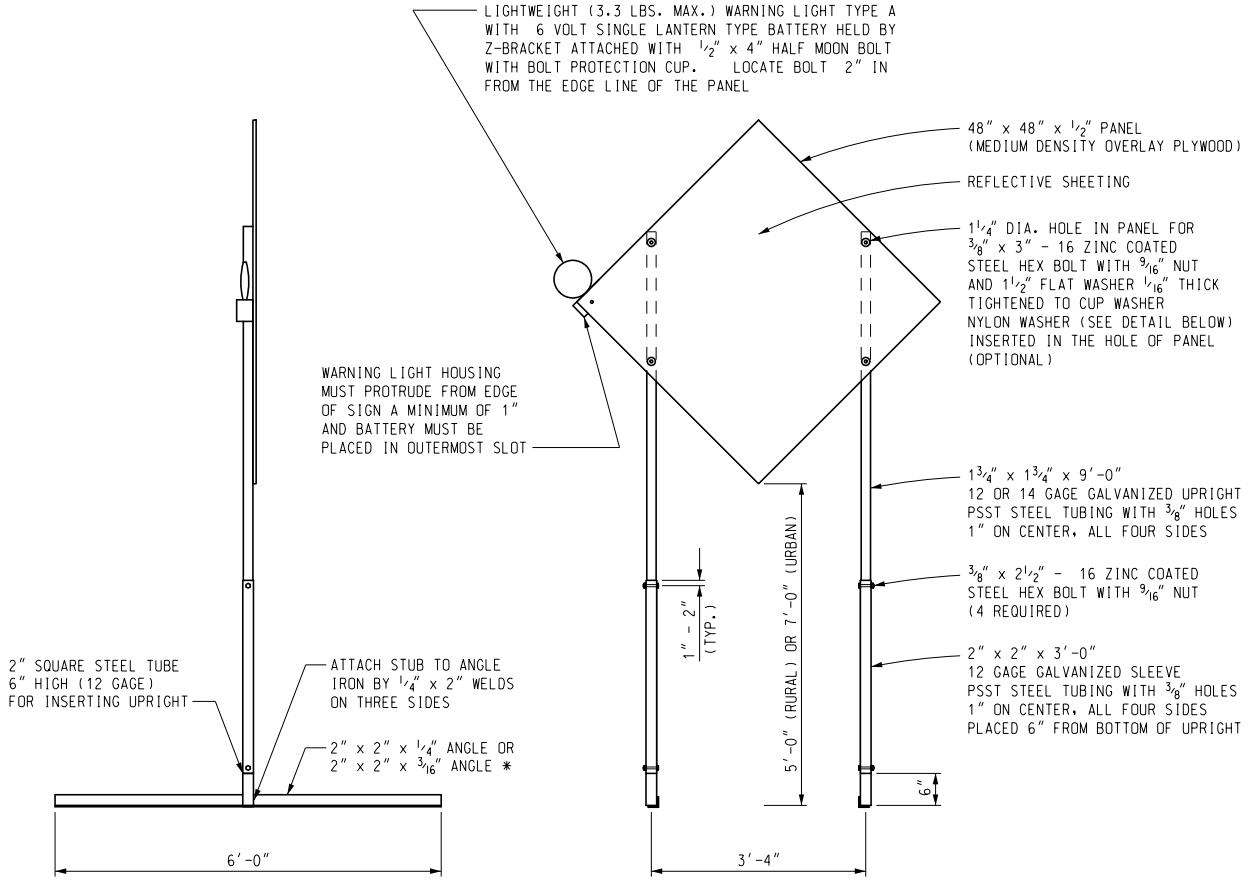
RIGHT DIRECTIONAL

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

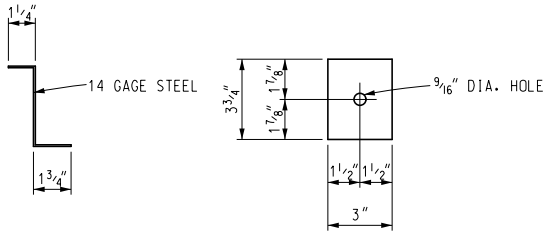
FRONT ELEVATION

TEMPORARY SIGN SUPPORT

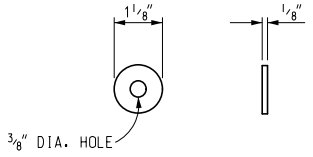
(WARNING LIGHT PLACED ON SIDE CLOSEST TO TRAFFIC)

* 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

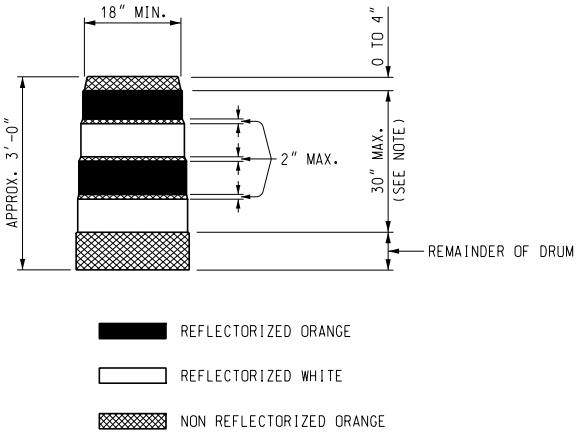
NOTE: THE ORIGINAL SIGNED COPY IS KEPT ON FILE AT THE MICHIGAN DEPARTMENT OF TRANSPORTATION.

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.

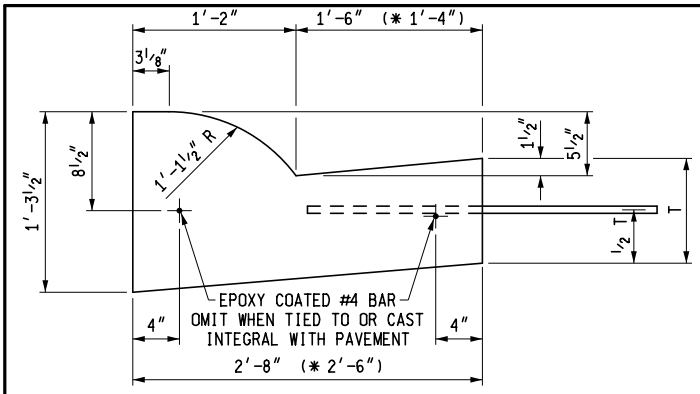
SEE ROAD STANDARD PLANS R-113-SERIES FOR TEMPORARY CROSSOVERS FOR DIVIDED ROADWAY, AND R-126-SERIES FOR TYPICAL LOCATION AND SPACING OF PLASTIC DRUMS FOR PLACEMENT OF TEMORARY CONCRETE BARRIER.

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

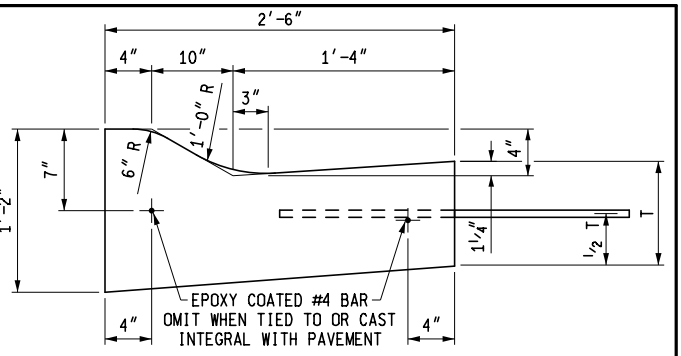
MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN	(SPECIAL DETAIL) F.H.W.A. APPROVAL	1/18/11 PLAN DATE	WZD-125-E	SHEET 3 OF 3



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

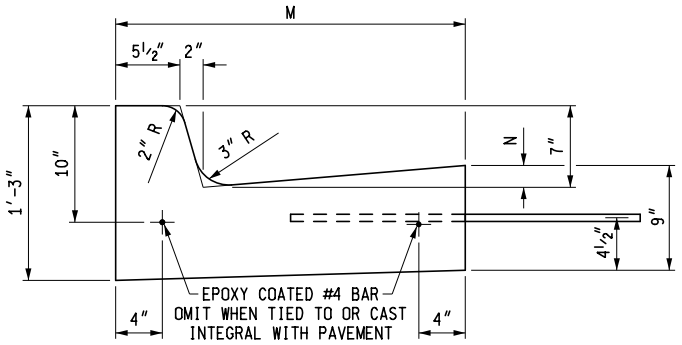
DETAIL	DIMENSION T	LANE TIES	CONCRETE CYD / LFT	CONCRETE CYD / LFT
B1	9″	AS SHOWN	0.0900	(* 0.0855)
B2	9″	OMITTED	0.0900	(* 0.0855)
B3	10″	AS SHOWN	0.0941	(* 0.0894)

B



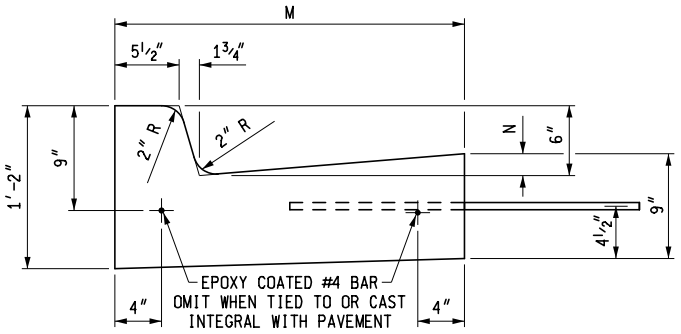
DETAIL	DIMENSION T	LANE TIES	CONCRETE CYD / LFT
D1	9″	AS SHOWN	0.0788
D2	9″	OMITTED	0.0788
D3	10″	AS SHOWN	0.0826

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

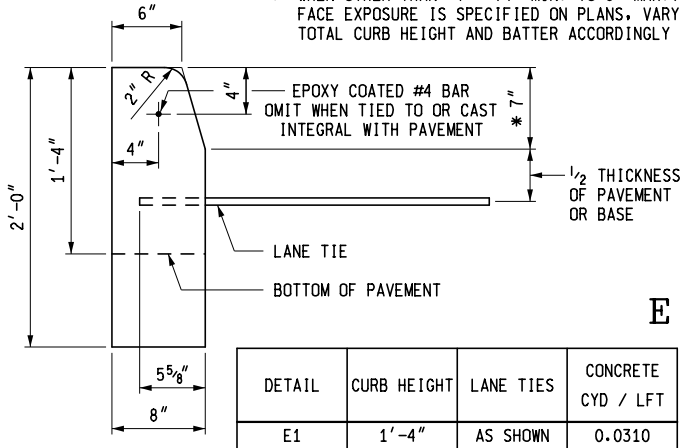
C



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

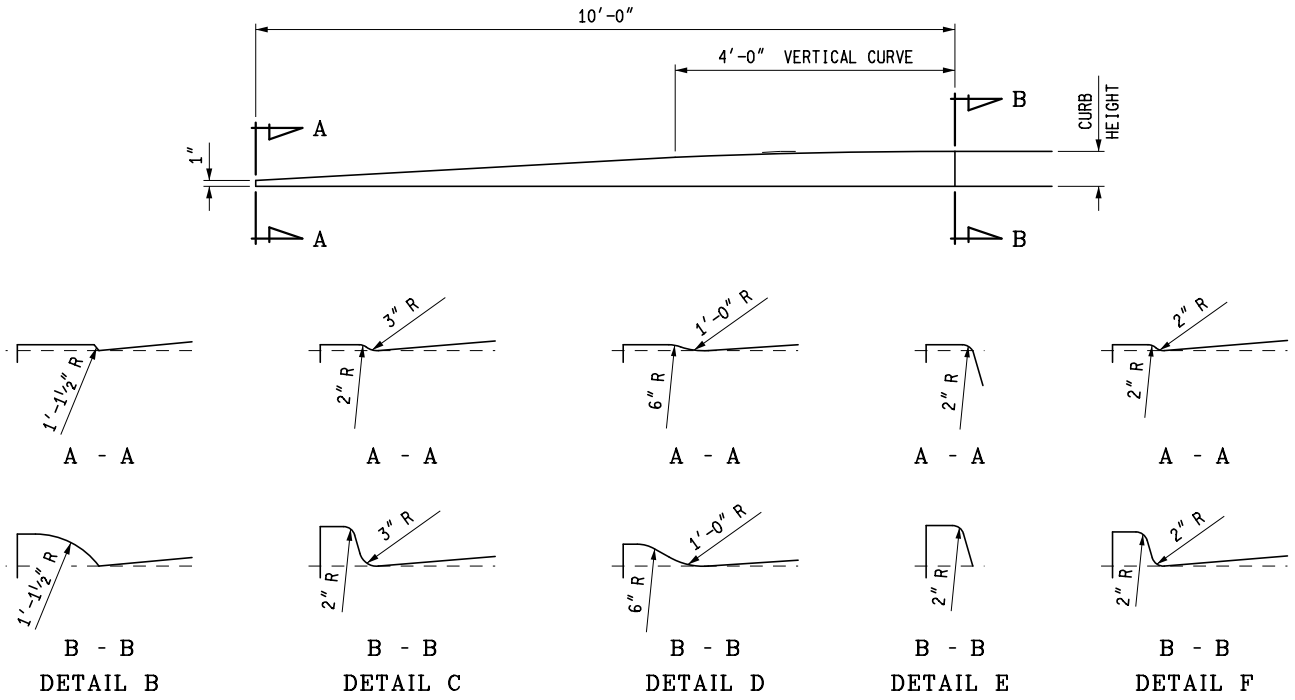
APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

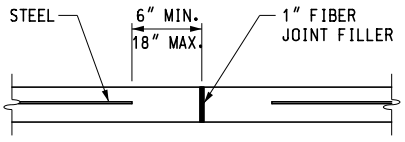
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

CONCRETE CURB AND CONCRETE CURB & GUTTER

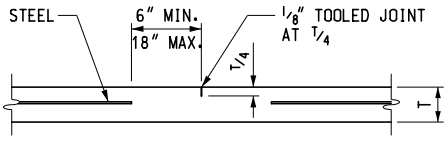
9-30-2014 F.H.W.A. APPROVAL	2-6-2014 PLAN DATE	R-30-G	SHEET 1 OF 2



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.

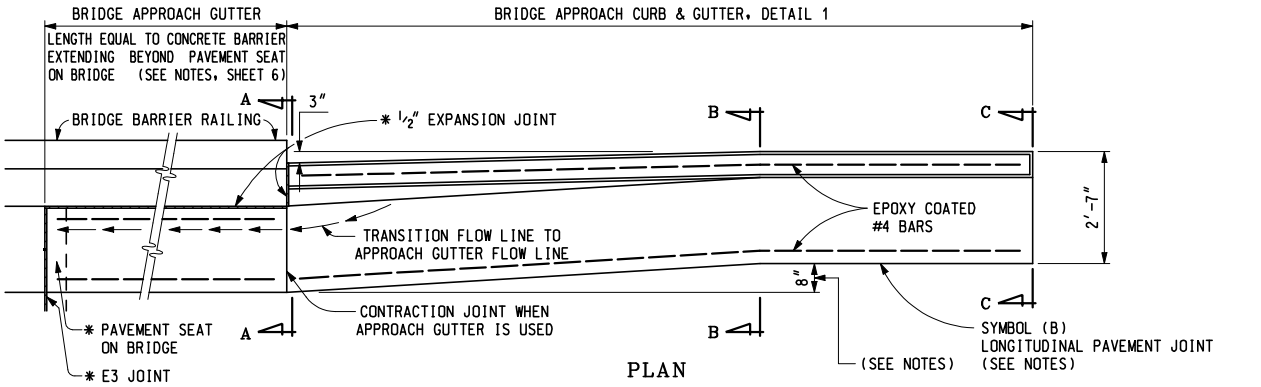
C. PLACE CONTRACTION JOINTS OPPOSITE ALL TRANSVERSE CONTRACTION JOINTS IN PAVEMENT.

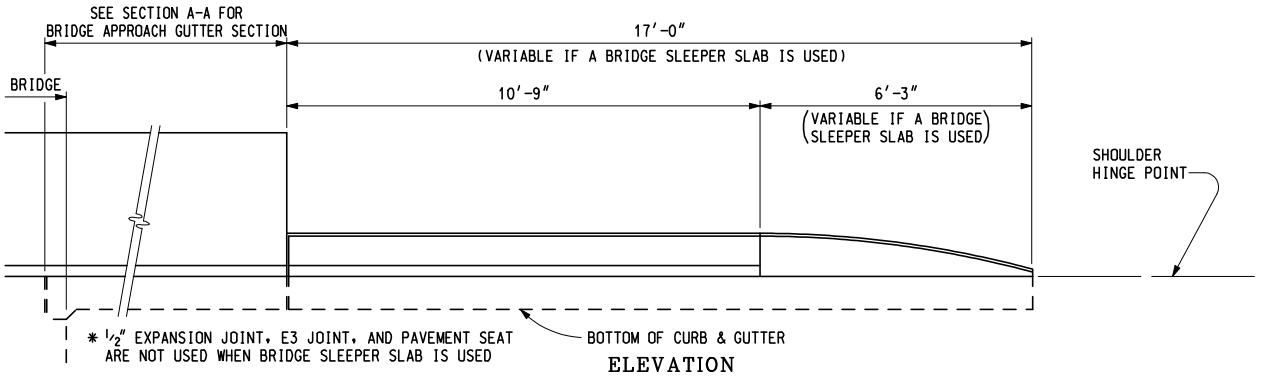
D. A SYMBOL (B) JOINT SHALL BE PLACED BETWEEN CURB OR CURB AND GUTTER AND ADJACENT CONCRETE PAVEMENT AS SPECIFIED ON STANDARD PLAN R-41-SERIES.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

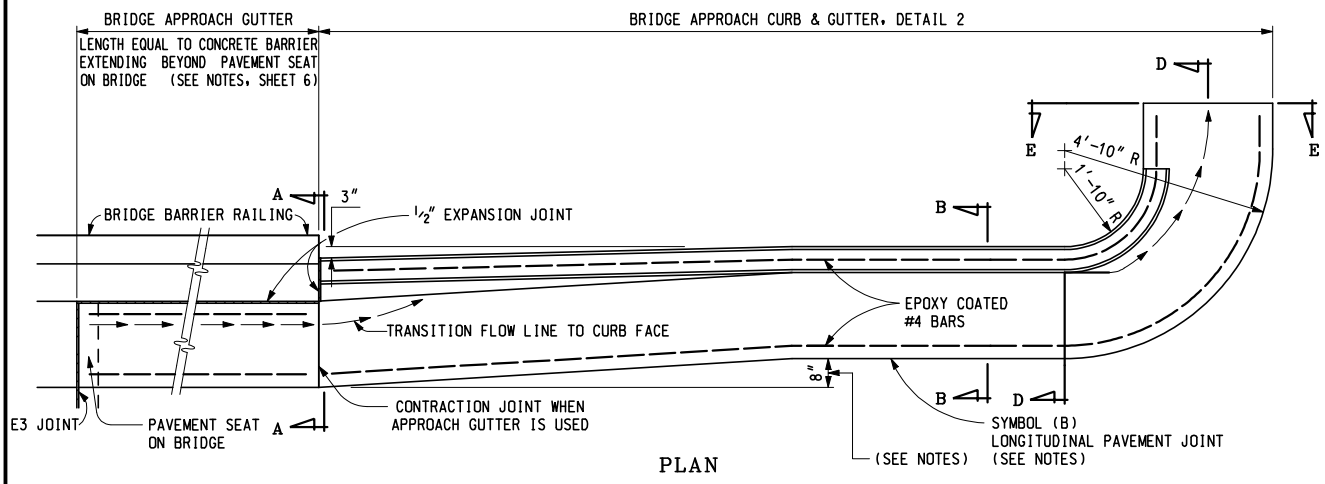
CONCRETE CURB AND CONCRETE CURB & GUTTER

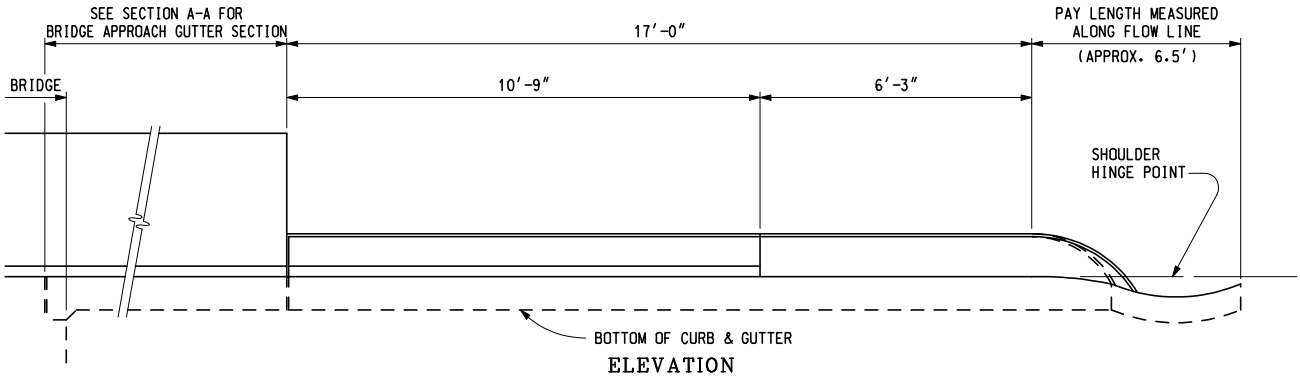
9-30-2014 F.H.W.A. APPROVAL	2-6-2014 PLAN DATE	R-30-G	SHEET 2 OF 2





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.

CHECKED BY: W.K.P.

ENGINEER OF CONSTRUCTION & TECHNOLOGY

ENGINEER OF MAINTENANCE

ENGINEER OF TRAFFIC AND SAFETY

ENGINEER OF DESIGN SUPPORT AREA

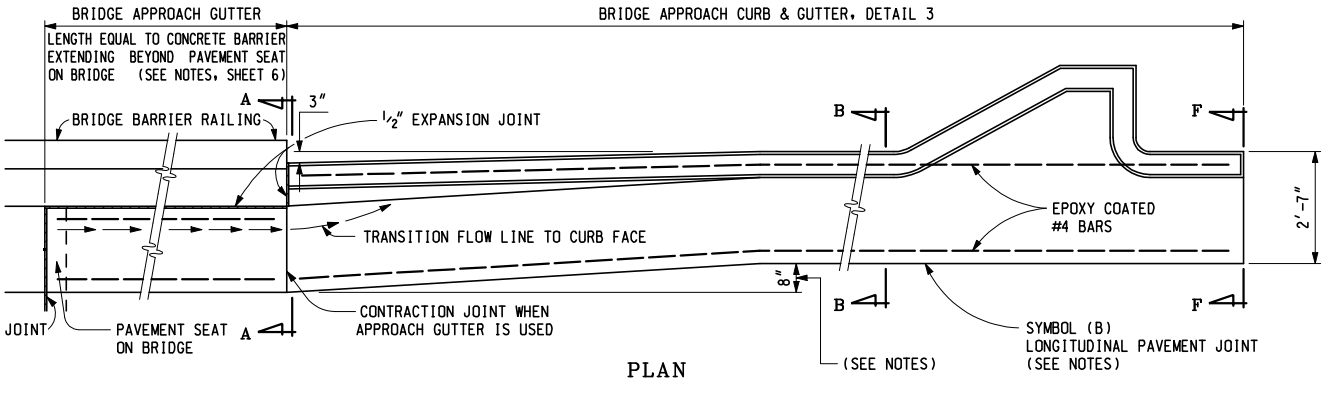
DEPARTMENT DIRECTOR
Gloria J. Jeff

ENGINEER OF DEVELOPMENT

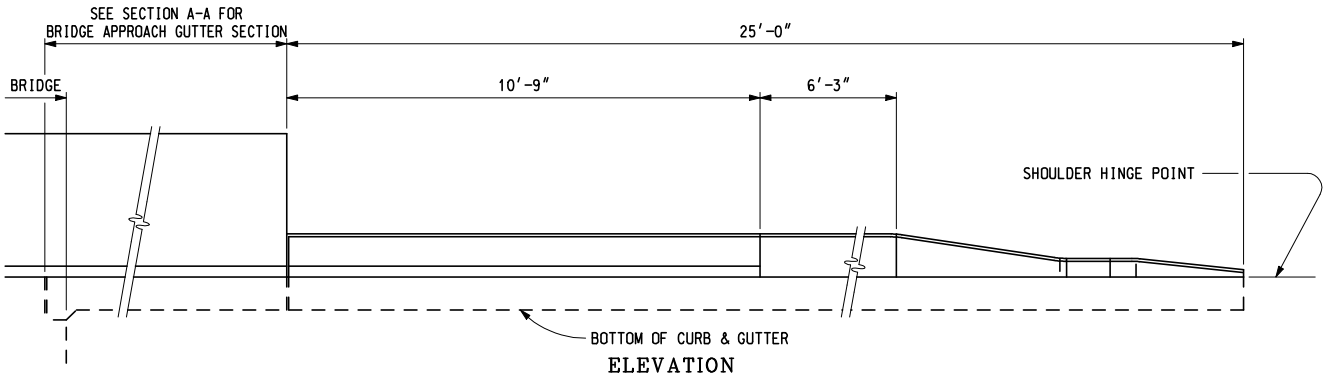
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

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		

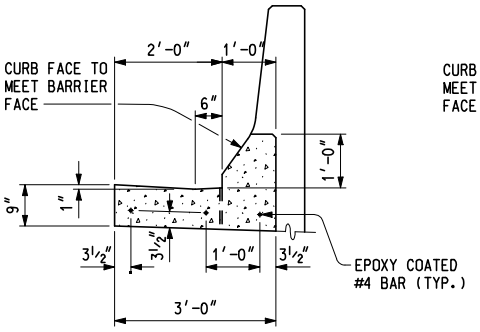


PLAN

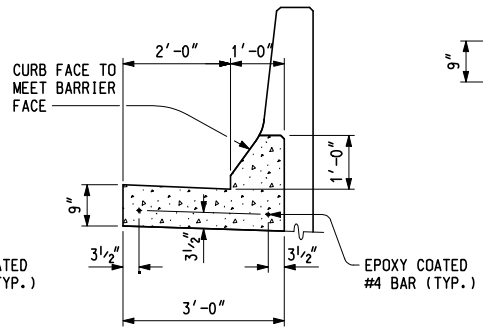


ELEVATION

BRIDGE APPROACH CURB & GUTTER, DETAIL 3

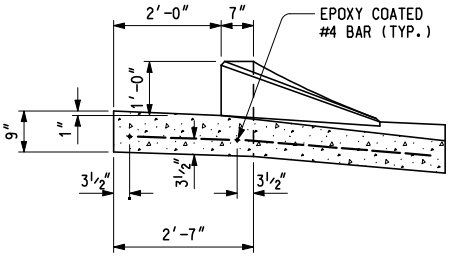


CROSS SECTION WHEN APPROACH GUTTER IS USED

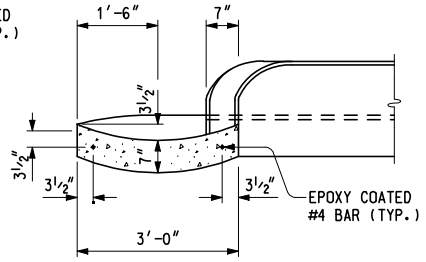


CROSS SECTION WHEN APPROACH GUTTER IS NOT USED

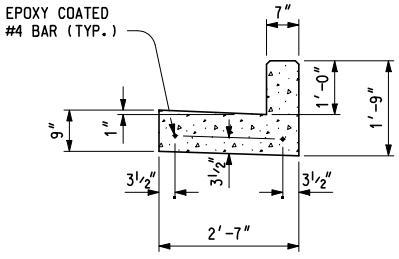
SECTION A - A
(SEE NOTES, SHEET 6)



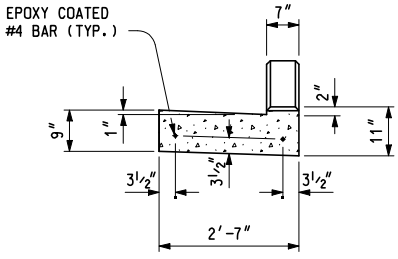
SECTION D - D



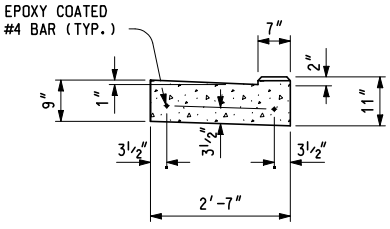
SECTION E - E



SECTION B - B



SECTION C - C



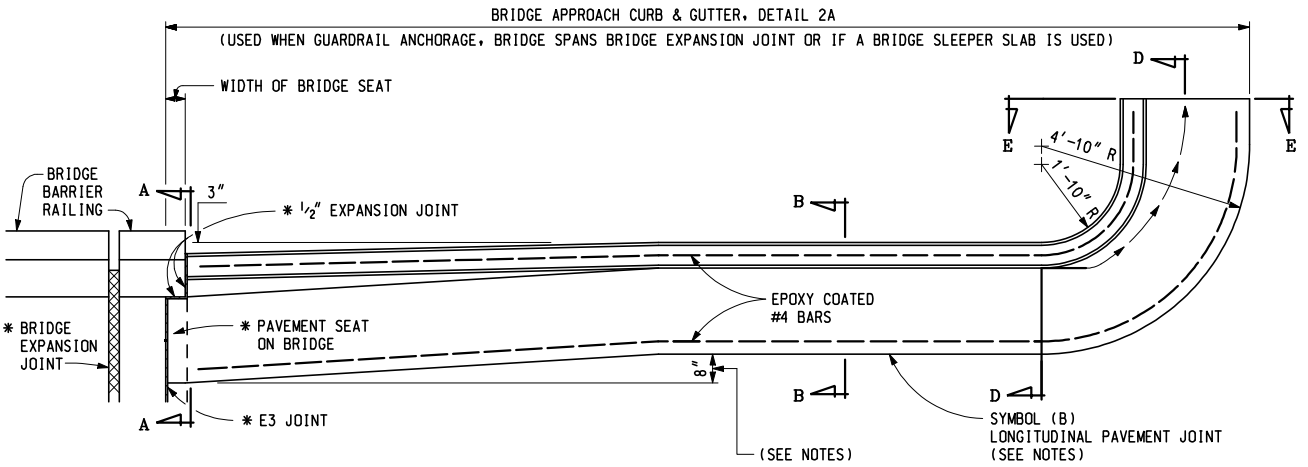
SECTION F - F

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

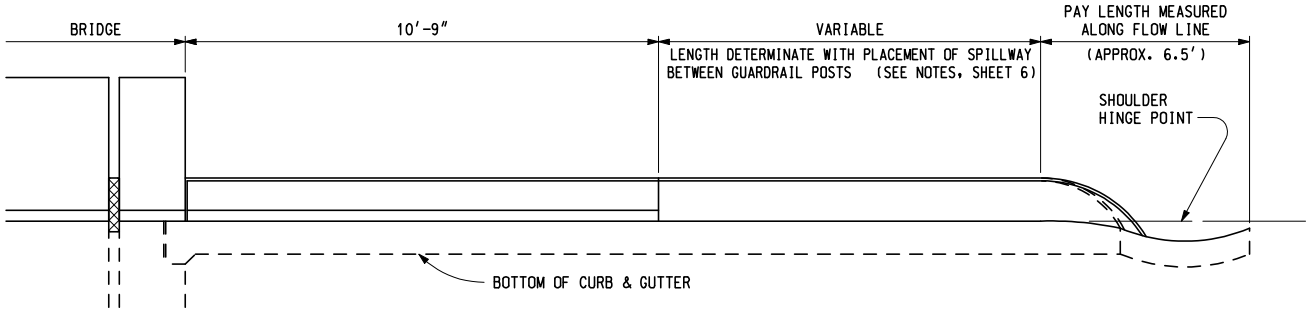
APPROACH CURB & GUTTER DOWNSPOUTS

(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

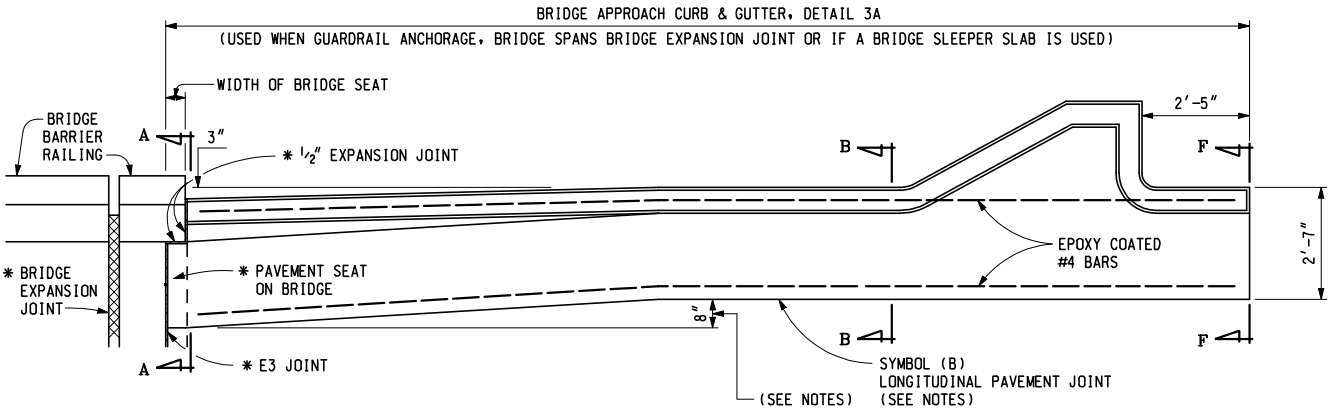


PLAN

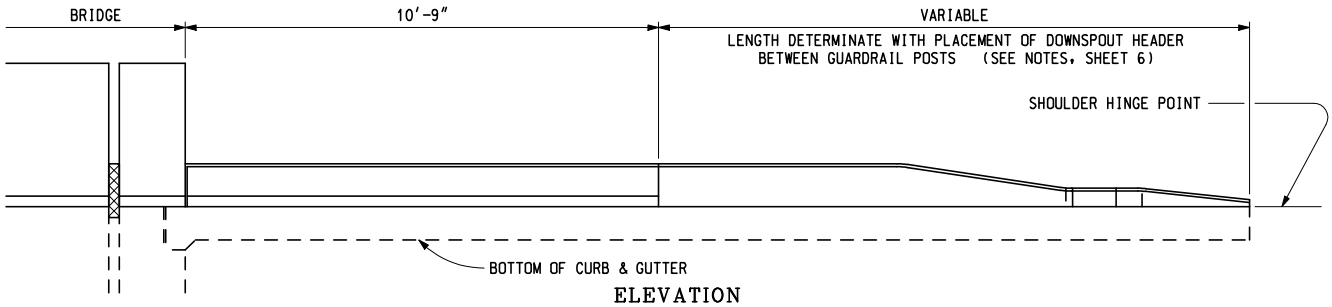


ELEVATION

BRIDGE APPROACH CURB & GUTTER, DETAIL 2A



PLAN



ELEVATION

BRIDGE APPROACH CURB & GUTTER, DETAIL 3A

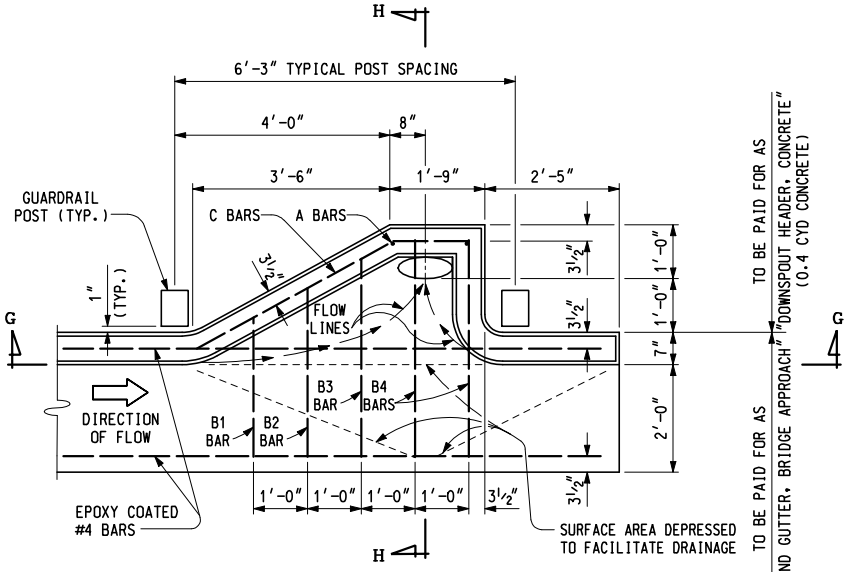
* BRIDGE EXPANSION JOINT, 1/2" EXPANSION JOINT, E3 JOINT, AND PAVEMENT SEAT ARE NOT USED WHEN BRIDGE SLEEPER SLAB IS USED

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

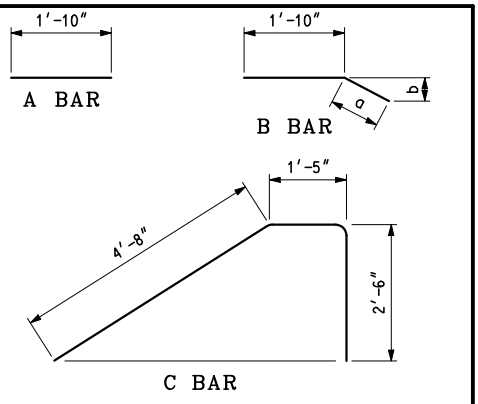
APPROACH CURB & GUTTER DOWNSPOUTS

(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



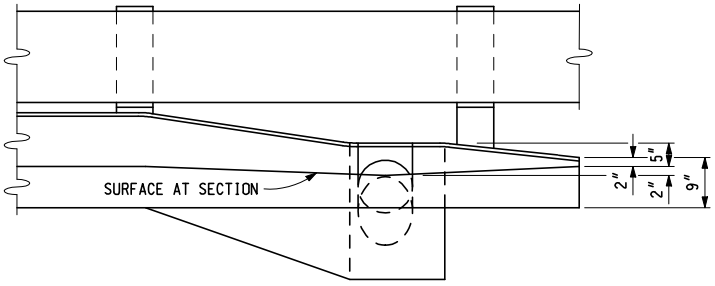
PLAN OF CONCRETE DOWNSPOUT HEADER



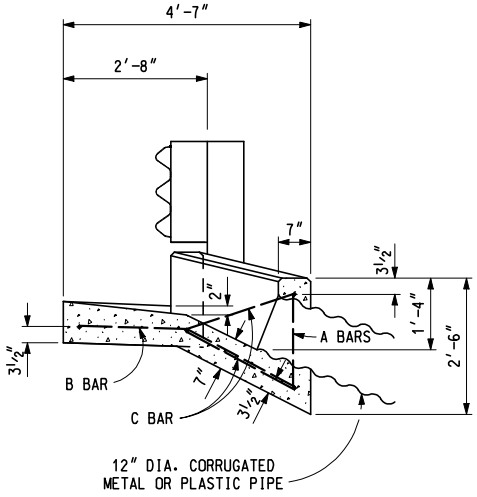
NOTE: ALL BARS ARE EPOXY COATED

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					

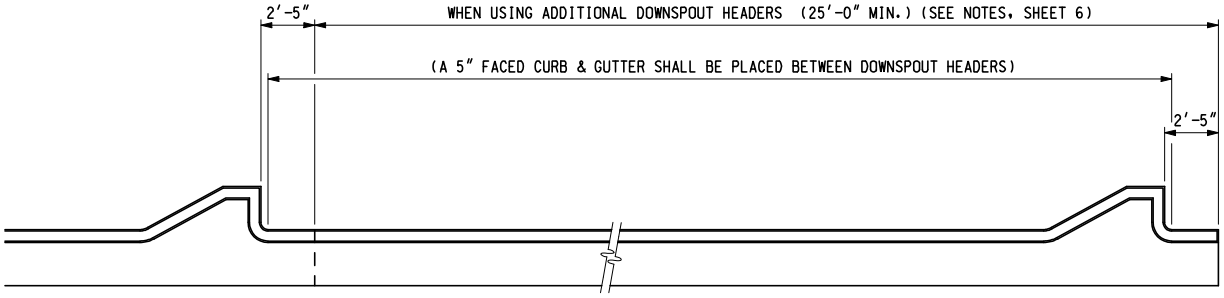


SECTION G - G



SECTION H - H

DETAIL SHOWS RELATIONSHIP OF GUARDRAIL WITH DOWNSPOUT HEADER



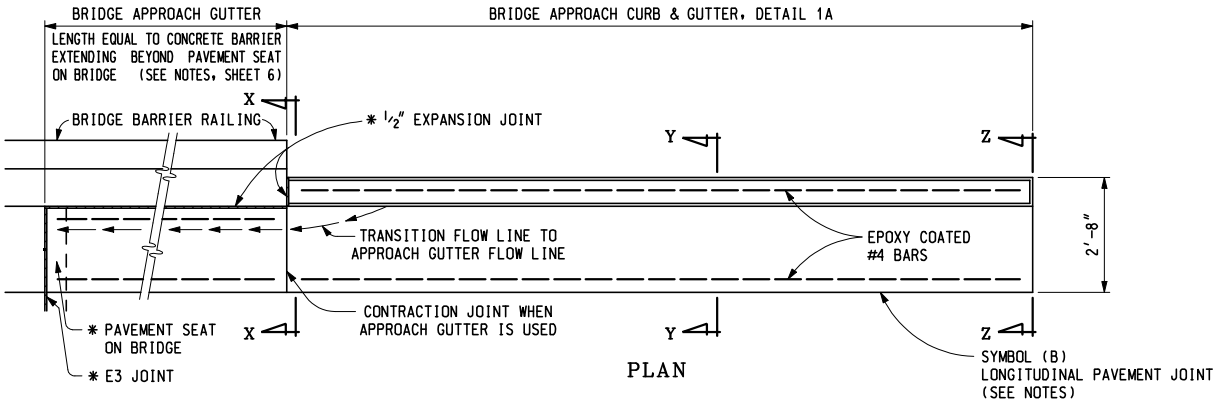
PLAN OF ADDITIONAL CONCRETE DOWNSPOUT HEADERS

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

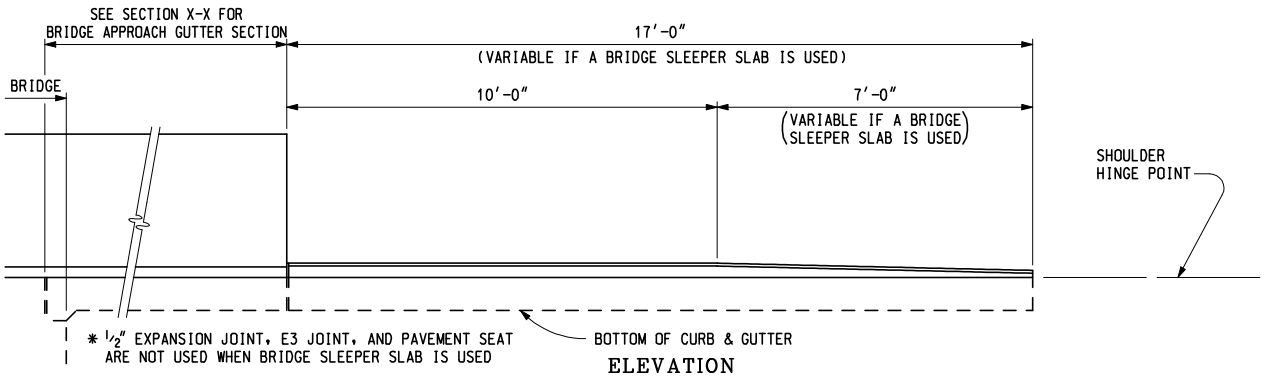
APPROACH CURB & GUTTER DOWNSPOUTS

(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



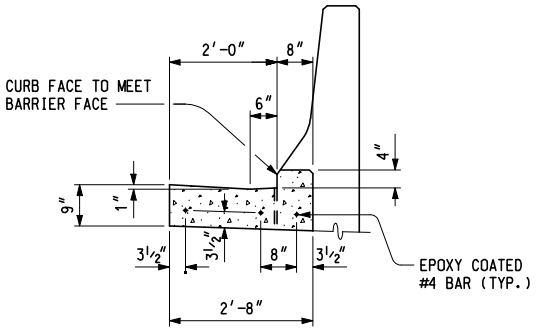
PLAN



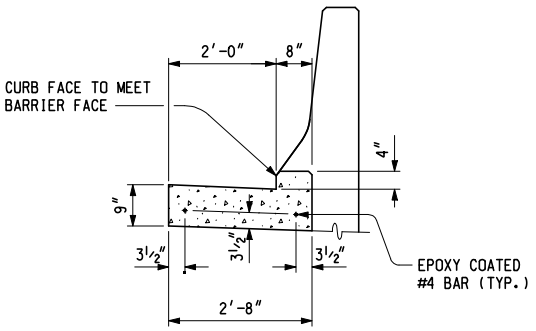
ELEVATION

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.



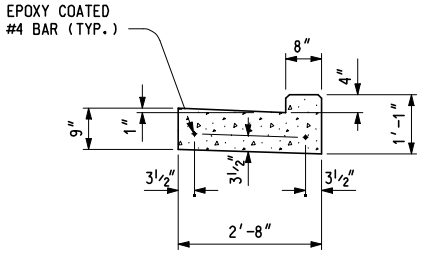
CROSS SECTION WHEN DEPARTING GUTTER IS USED



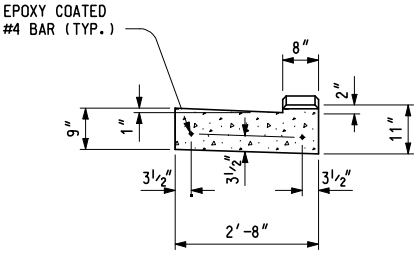
CROSS SECTION WHEN DEPARTING GUTTER IS NOT USED

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.

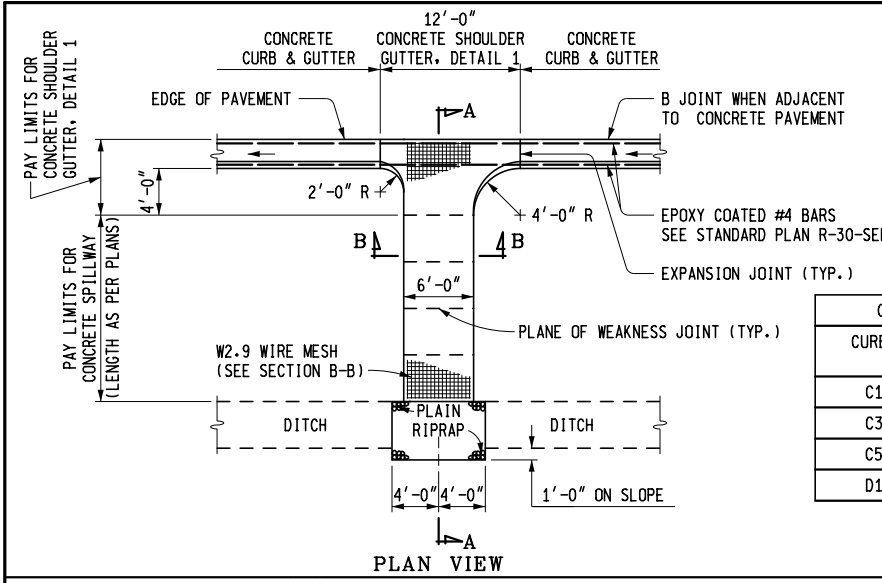
MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

APPROACH CURB & GUTTER DOWNSPOUTS

(FOR BRIDGE BARRIER ON RURAL HIGHWAYS)

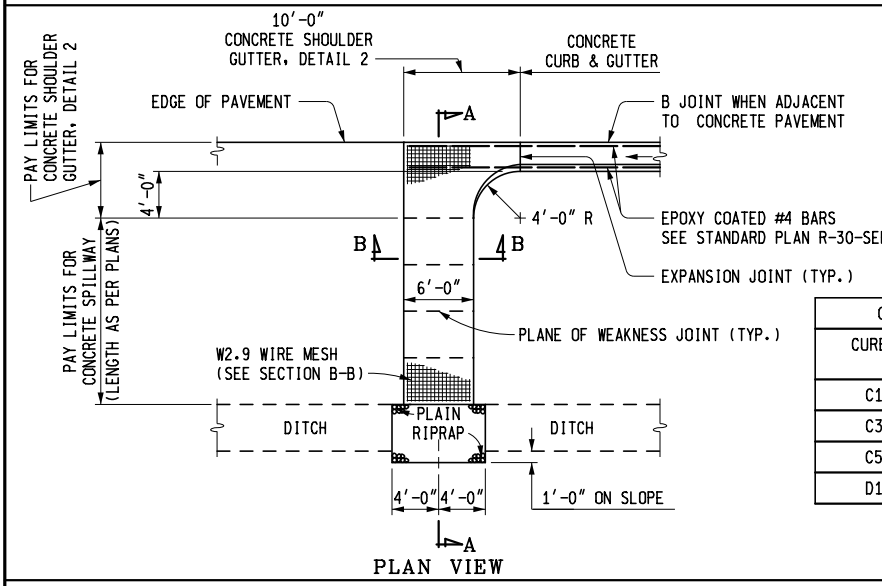
10-27-2004 F.H.W.A. APPROVAL	4-28-2004 PLAN DATE	R-32-E	SHEET 6 OF 6



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

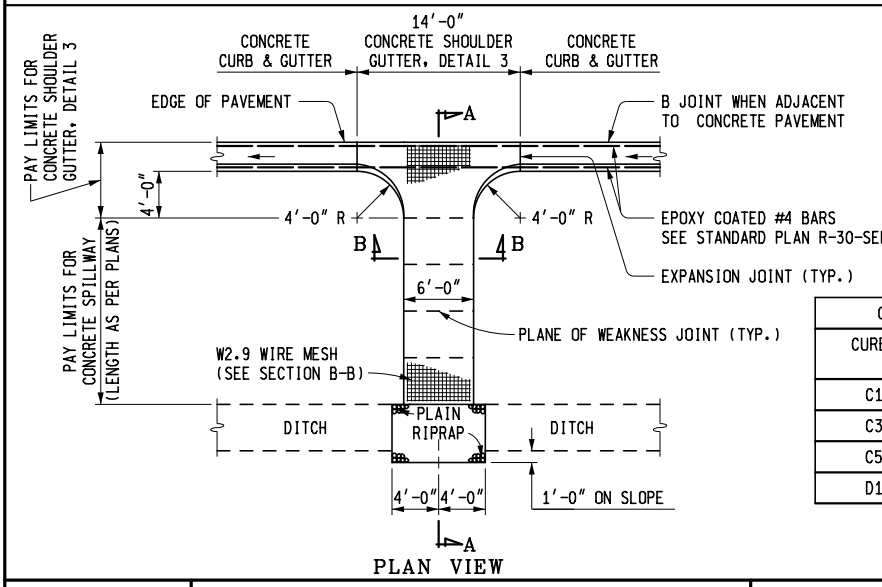
USED AS INTERMEDIATE OPENING IN CURB & GUTTER



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

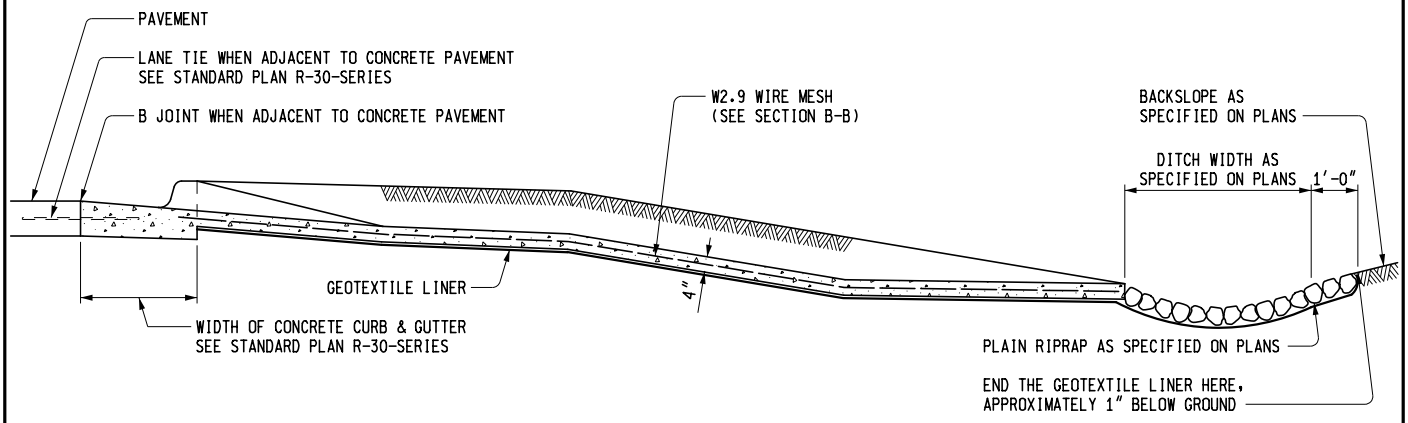
APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

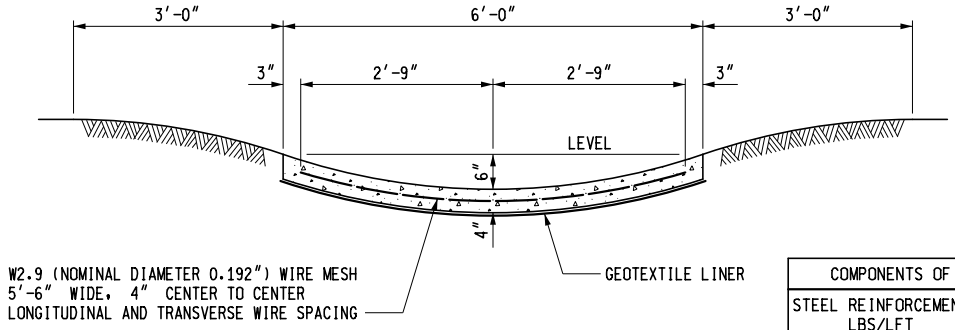
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

CONCRETE SHOULDER GUTTER AND SPILLWAY

F.H.W.A. APPROVAL	7-30-2018 PLAN DATE	R-35-E	SHEET 1 OF 2



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.

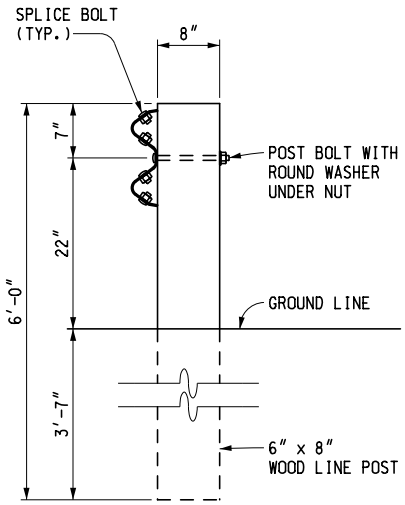
WHILE CONCRETE SPILLWAY IS SHOWN ON THE FORESLOPE, IT MAY BE USED ON THE BACKSLOPE, AS SPECIFIED ON THE PLANS. CONCRETE SHOULDER GUTTER WOULD BE CORRESPONDINGLY OMITTED.

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.

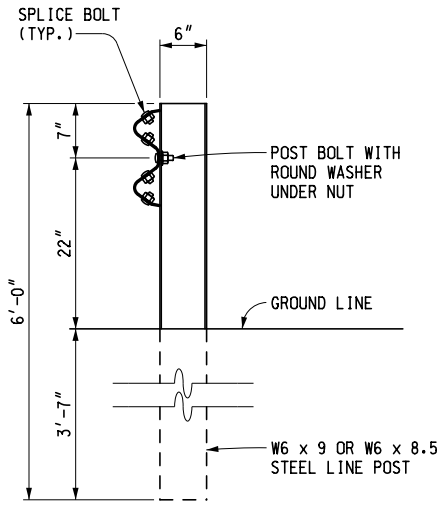
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

CONCRETE SHOULDER GUTTER AND SPILLWAY

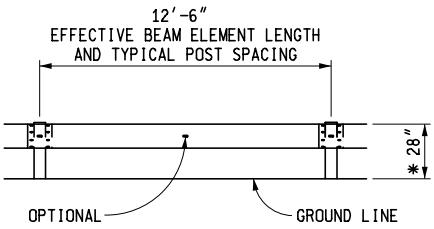
F.H.W.A. APPROVAL	7-30-2018 PLAN DATE	R-35-E	SHEET 2 OF 2



WOOD POST



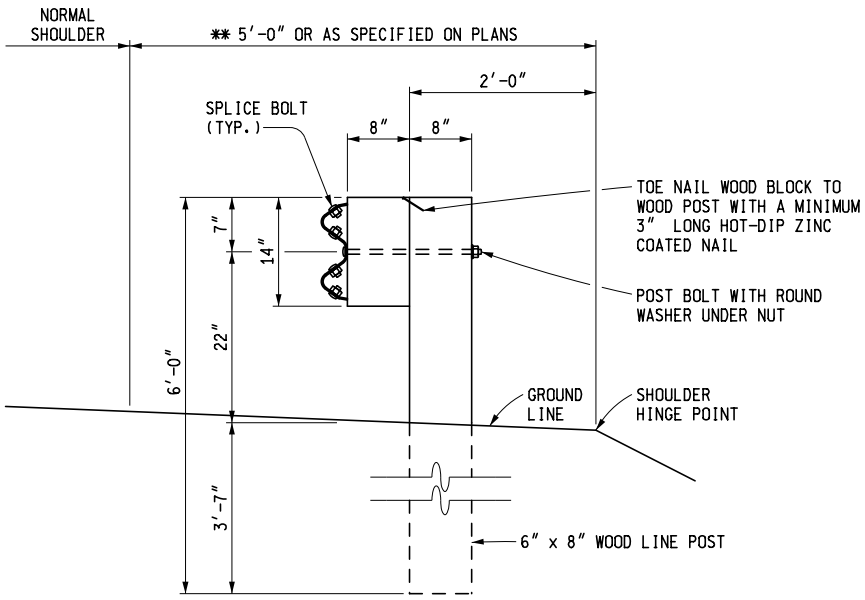
STEEL POST



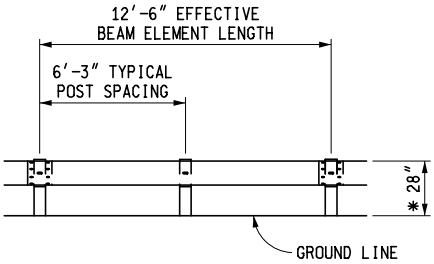
ELEVATION SHOWING POST SPACING

* 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
Paul C. Ajegba

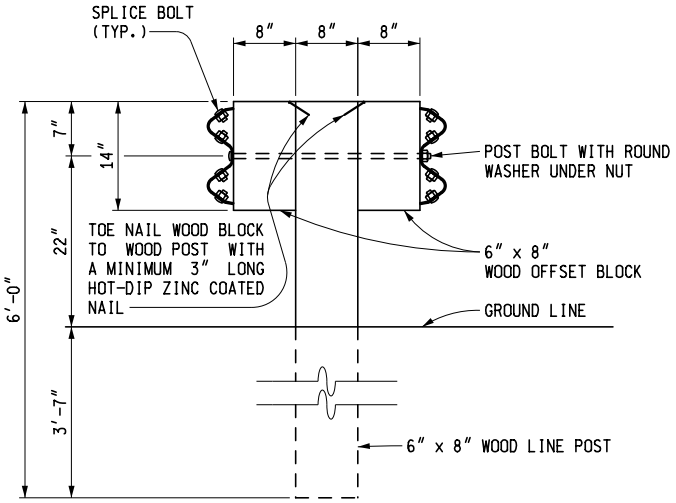
APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

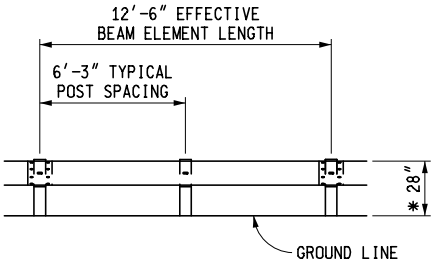
APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

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	2-27-2019 PLAN DATE	R-60-J	SHEET 1 OF 17

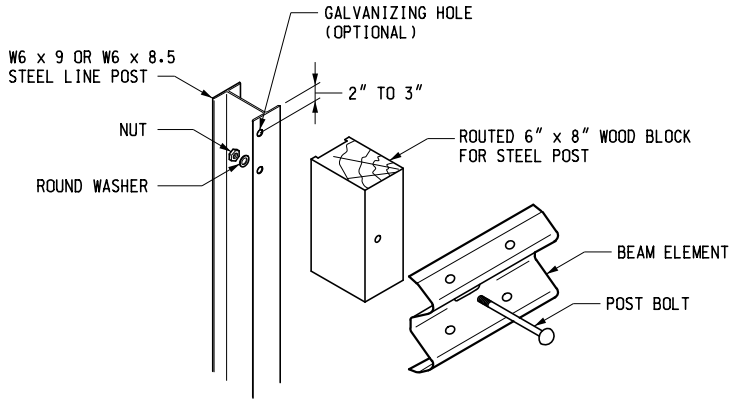


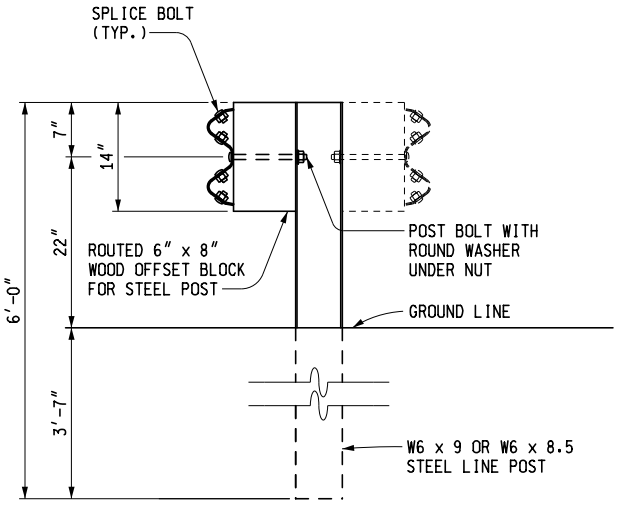


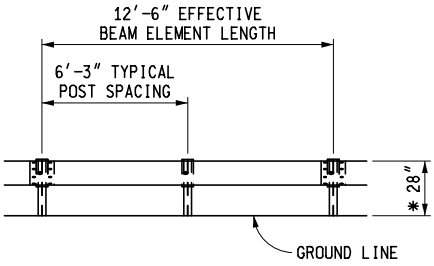
ELEVATION SHOWING POST SPACING

* 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

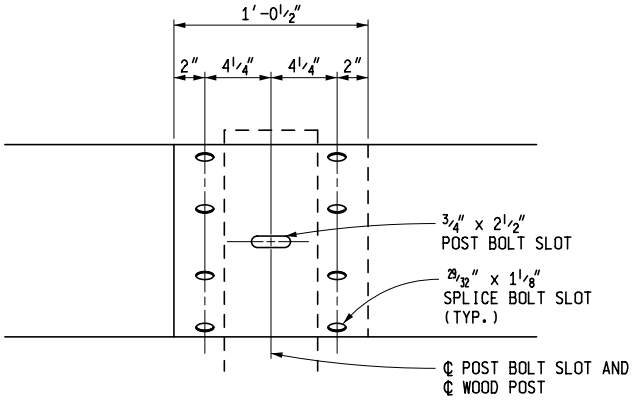
GUARDRAIL, TYPE B (OR BD)
(STEEL POST)

MICHIGAN DEPARTMENT OF TRANSPORTATION

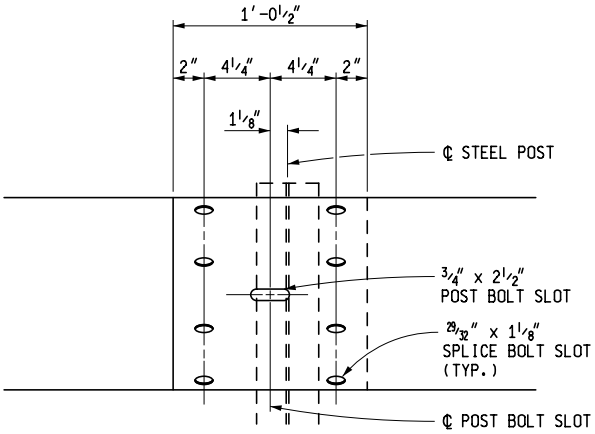
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

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

F.H.W.A. APPROVAL	2-27-2019 PLAN DATE	R-60-J	SHEET 2 OF 17

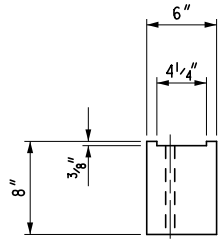


WOOD POST

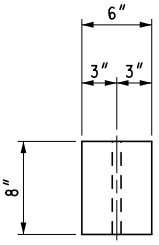


STEEL POST

BEAM ELEMENT SPLICE DETAILS



TOP



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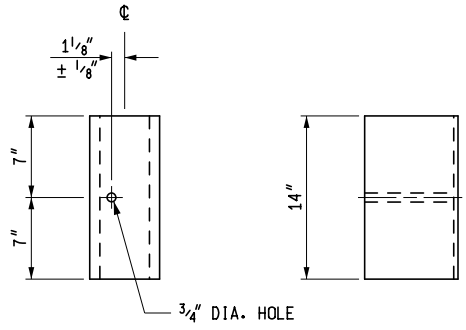
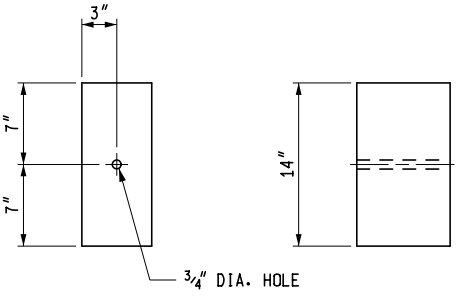


FRONT SIDE

FOR USE ON STEEL POSTS



FRONT SIDE

FOR USE ON WOOD POSTS

(SEE NOTES ON SHEET 16 OF 16)

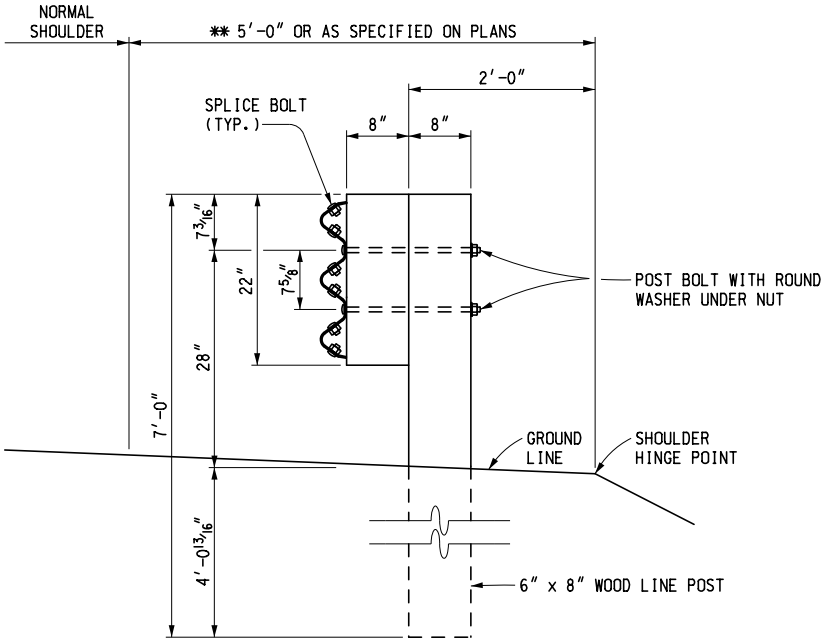
WOOD OFFSET BLOCKS FOR GUARDRAIL, TYPE B AND TYPE BD

MICHIGAN DEPARTMENT OF TRANSPORTATION

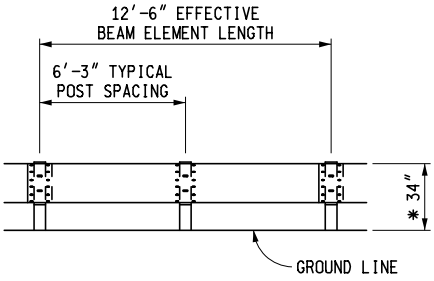
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

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

F.H.W.A. APPROVAL	2-27-2019 PLAN DATE	R-60-J	SHEET 3 OF 17



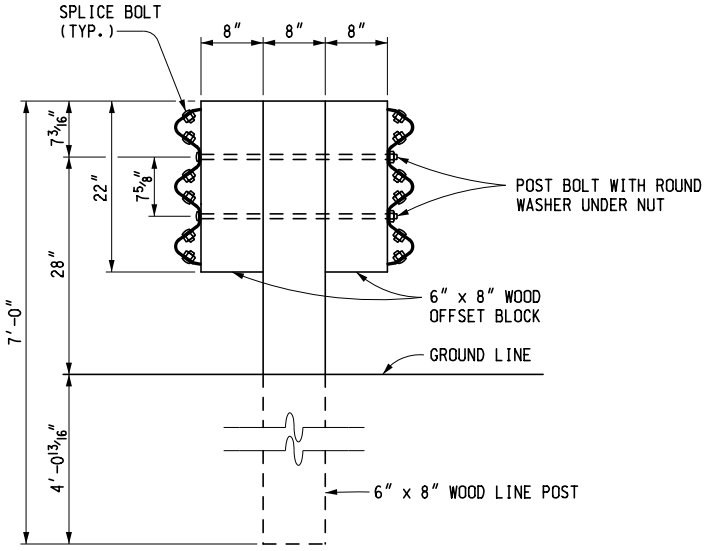
** FOR PAVED SHOULDER WIDTHS OF AT LEAST 12′, USE 3′-0″.

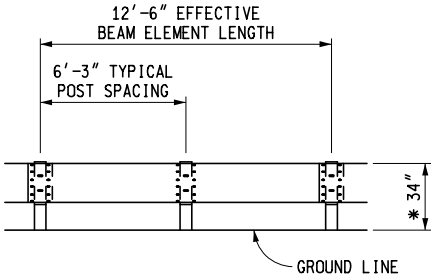


ELEVATION SHOWING POST SPACING

* 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

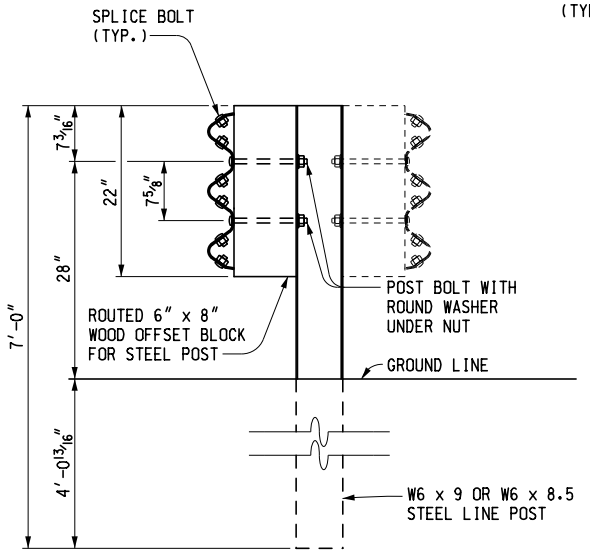
GUARDRAIL, TYPE TD
(WOOD POST)

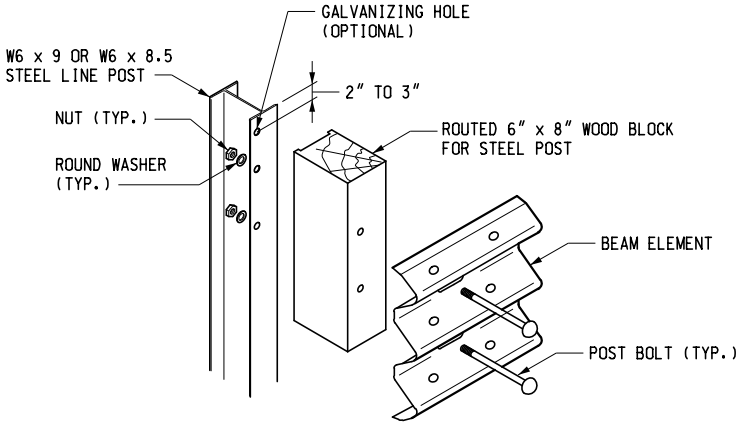
MICHIGAN DEPARTMENT OF TRANSPORTATION

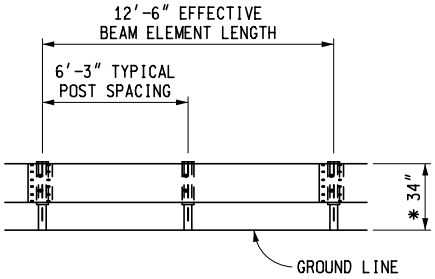
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

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

F.H.W.A. APPROVAL	2-27-2019 PLAN DATE	R-60-J	SHEET 4 OF 17



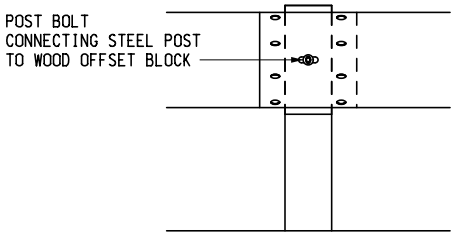




ELEVATION SHOWING POST SPACING

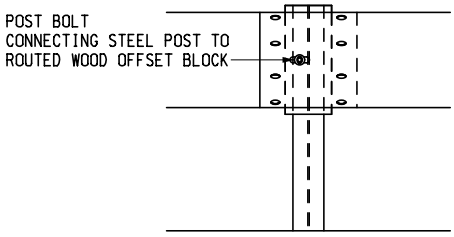
* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

GUARDRAIL, TYPE T OR TD
(STEEL POST)



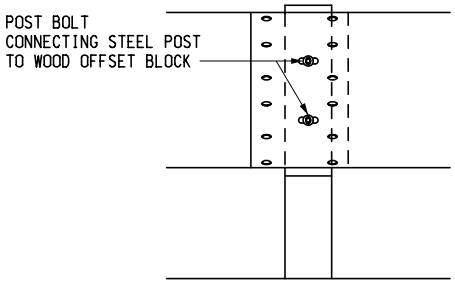
GUARDRAIL, TYPE B

WOOD POST



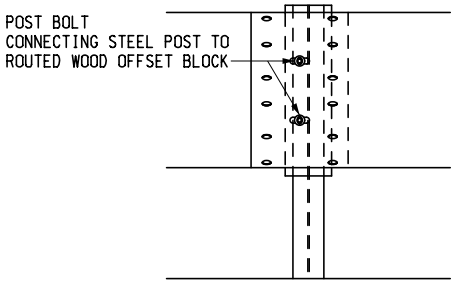
GUARDRAIL, TYPE B

STEEL POST



GUARDRAIL, TYPE T

WOOD POST



GUARDRAIL, TYPE T

STEEL POST

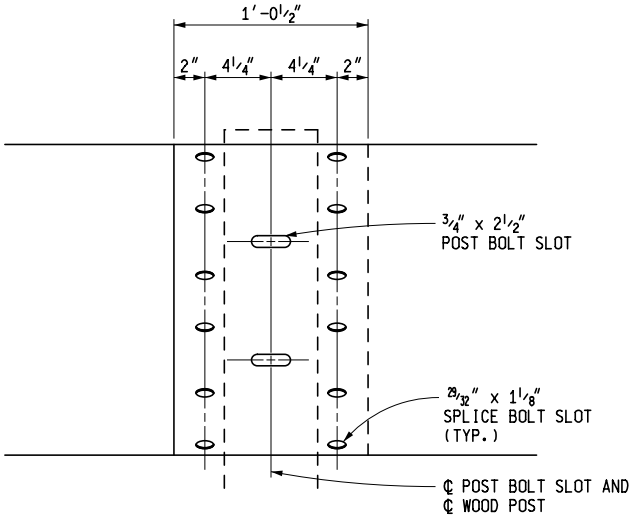
BLOCK AND POST CONNECTION DETAILS

MICHIGAN DEPARTMENT OF TRANSPORTATION

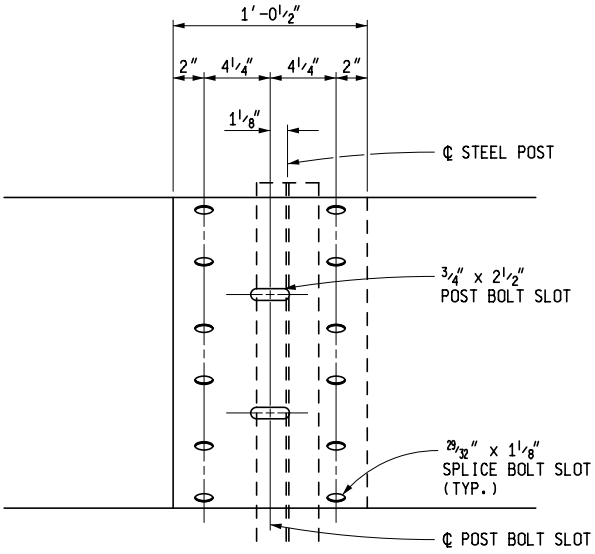
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

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

F.H.W.A. APPROVAL	2-27-2019 PLAN DATE	R-60-J	SHEET 5 OF 17

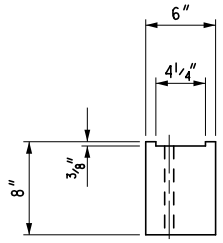


WOOD POST



STEEL POST

THRIE BEAM ELEMENT SPLICE DETAILS



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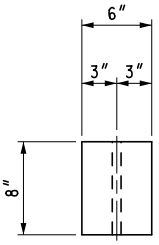

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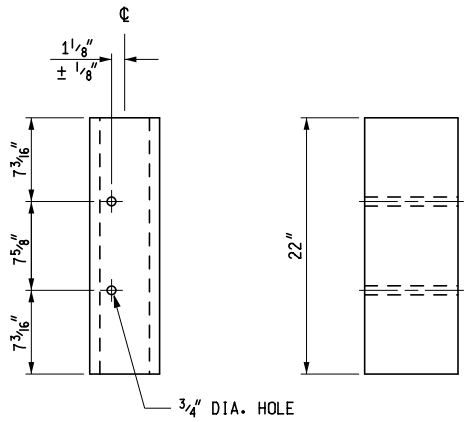
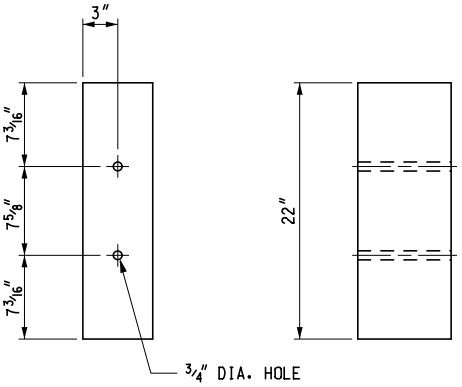


FRONT SIDE

FOR USE ON STEEL POSTS



FRONT SIDE

FOR USE ON WOOD POSTS

(SEE NOTES ON SHEET 16 OF 16)

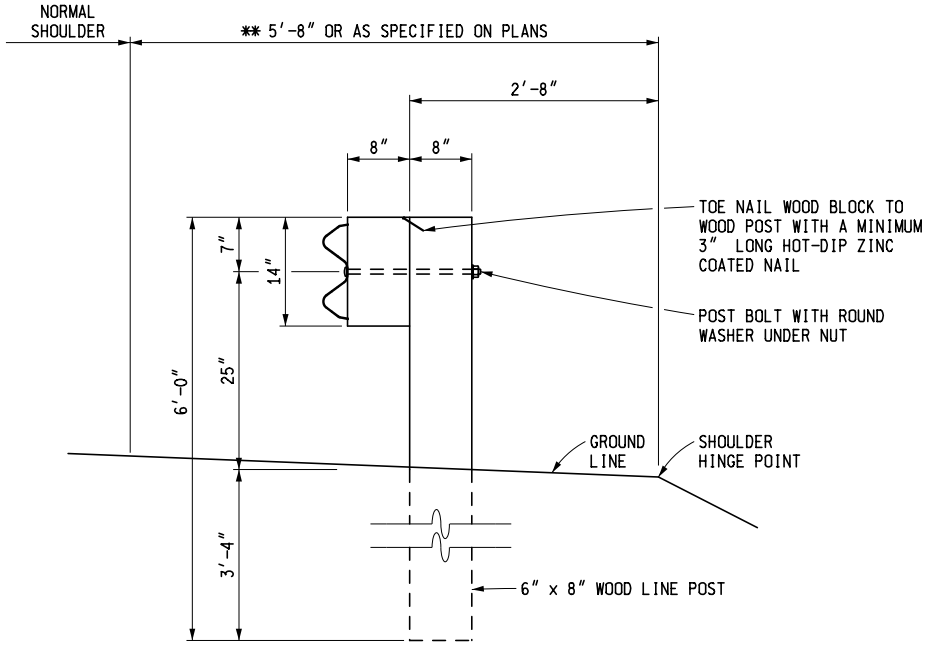
WOOD OFFSET BLOCKS FOR GUARDRAIL, TYPE T AND TYPE TD

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

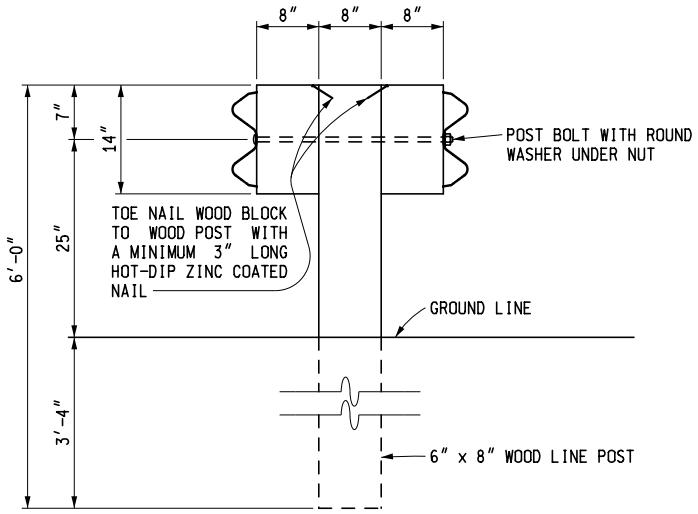
GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	2-27-2019 PLAN DATE	R-60-J	SHEET 6 OF 17



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

GUARDRAIL, TYPE MGS-8
(WOOD POST)



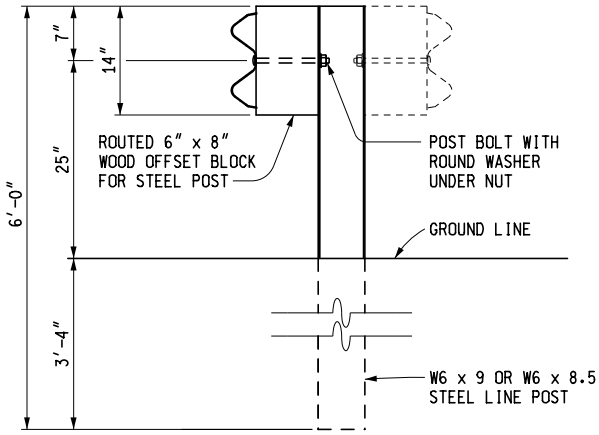
** FOR PAVED SHOULDER WIDTHS OF AT LEAST 12′, USE 3′-0″.

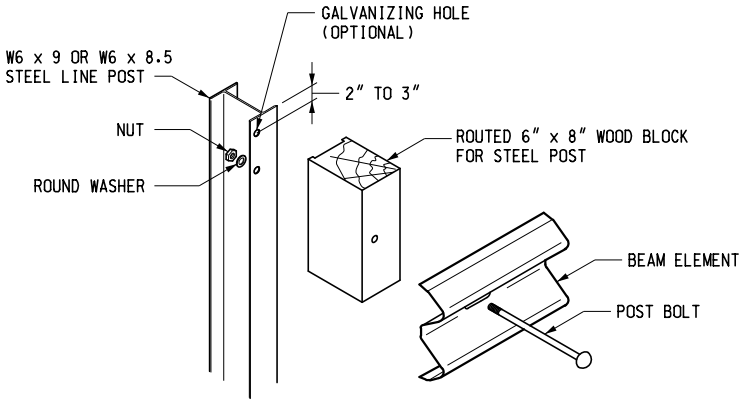
GUARDRAIL, TYPE MGS-8D
(WOOD POST)

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	2-27-2019 PLAN DATE	R-60-J	SHEET 7 OF 17



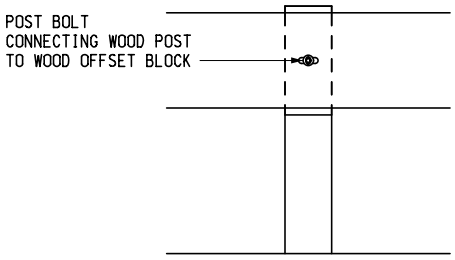


GUARDRAIL, TYPE MGS-8 (OR MGS-8D)
(STEEL POST)

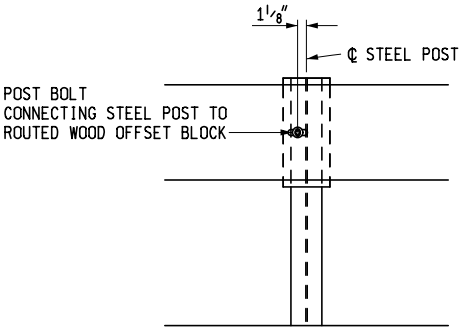
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

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

F.H.W.A. APPROVAL	2-27-2019 PLAN DATE	R-60-J	SHEET 8 OF 17

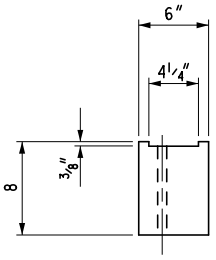


WOOD POST



STEEL POST

BLOCK AND POST CONNECTION DETAILS



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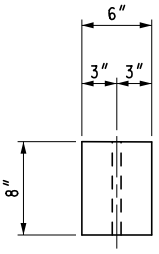

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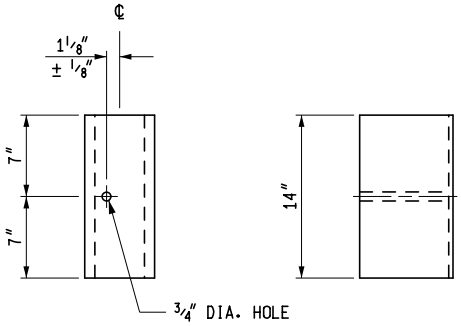
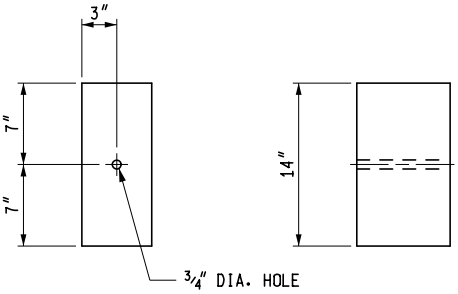


FRONT SIDE

FOR USE ON STEEL POSTS



FRONT SIDE

FOR USE ON WOOD POSTS

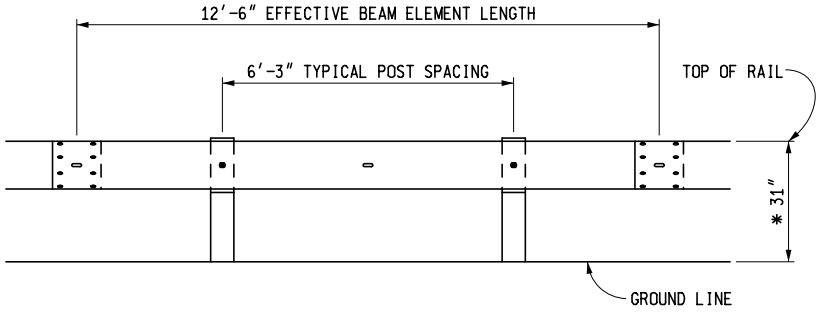
(SEE NOTES ON SHEET 16 OF 16)

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

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

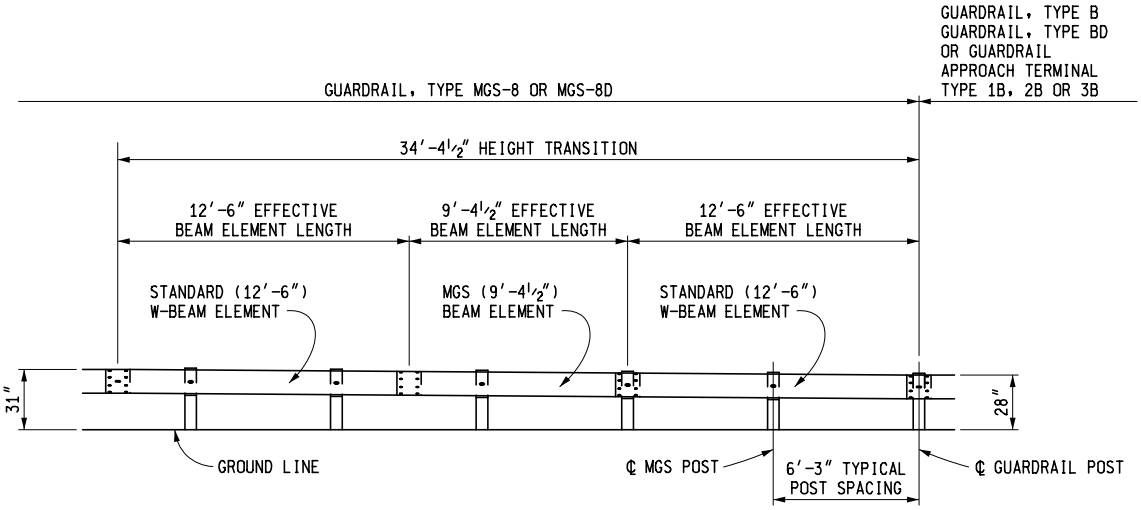
GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	2-27-2019 PLAN DATE	R-60-J	SHEET 9 OF 17

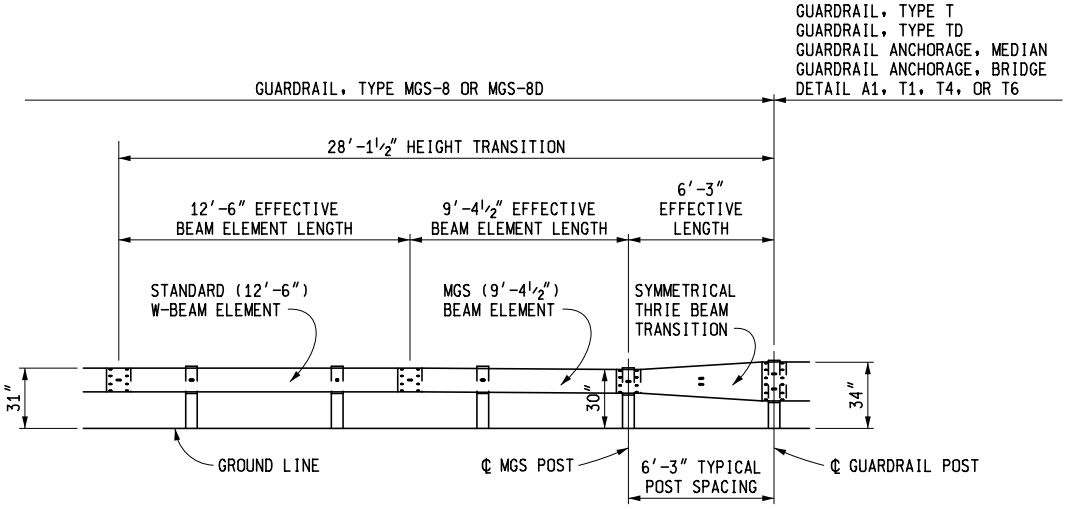


ELEVATION SHOWING POST SPACING FOR
GUARDRAIL, TYPE MGS-8 OR MGS-8D

* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB



ELEVATION SHOWING TRANSITION DETAIL FOR CONNECTING
GUARDRAIL, TYPE MGS-8 OR MGS-8D TO
GUARDRAIL, TYPE B, GUARDRAIL, TYPE BD, OR
GUARDRAIL APPROACH TERMINAL TYPE 1B, 2B, OR 3B

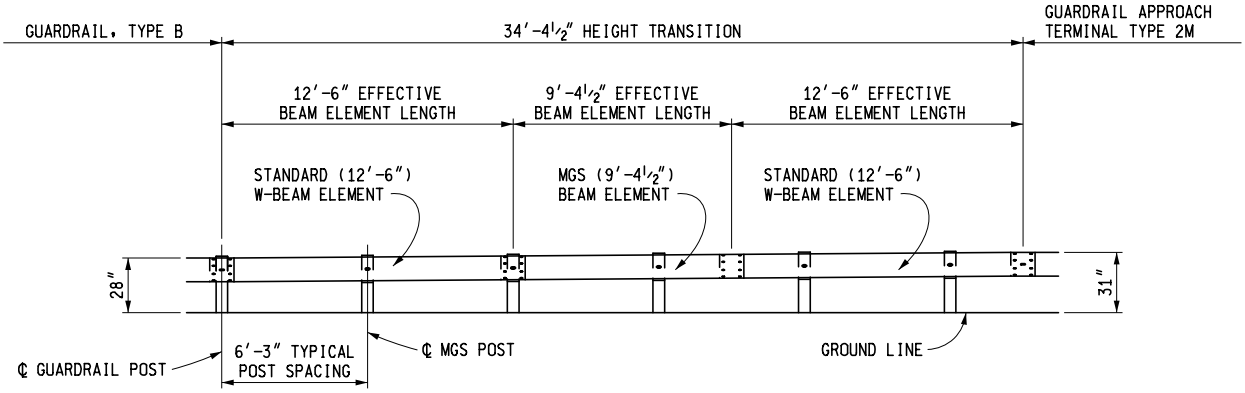


ELEVATION SHOWING TRANSITION DETAIL FOR CONNECTING
GUARDRAIL, TYPE MGS-8 OR MGS-8D TO
GUARDRAIL, TYPE T, GUARDRAIL, TYPE TD,
GUARDRAIL ANCHORAGE, MEDIAN,
GUARDRAIL ANCHORAGE, BRIDGE DETAIL A1, T1, T4 OR T6

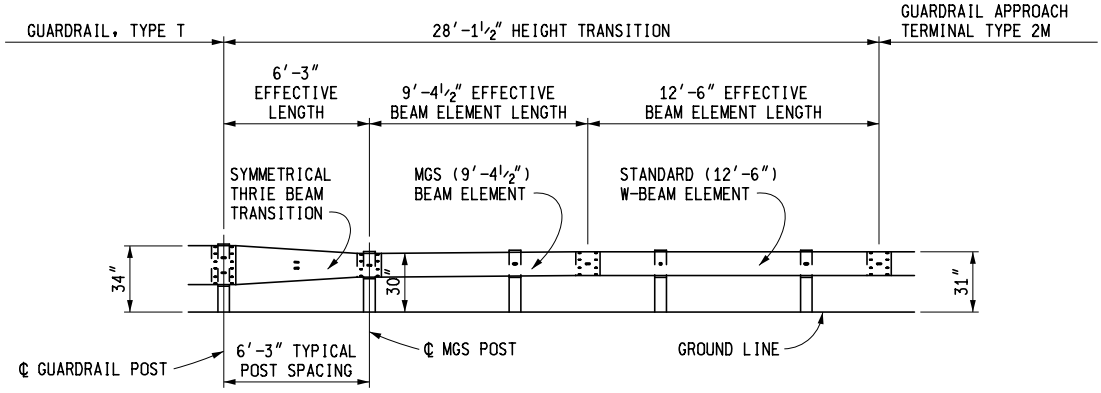
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

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

F.H.W.A. APPROVAL	2-27-2019 PLAN DATE	R-60-J	SHEET 10 OF 17



ELEVATION SHOWING TRANSITION DETAIL FOR CONNECTING
GUARDRAIL, TYPE B TO
GUARDRAIL APPROACH TERMINAL TYPE 2M

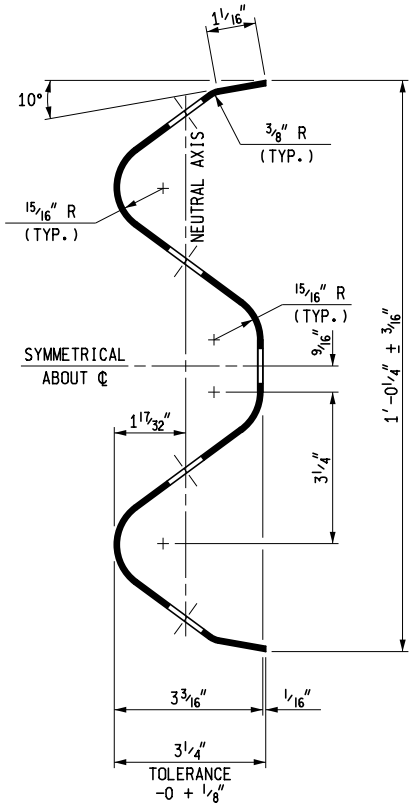


ELEVATION SHOWING TRANSITION DETAIL FOR CONNECTING
GUARDRAIL, TYPE T TO
GUARDRAIL APPROACH TERMINAL TYPE 2M

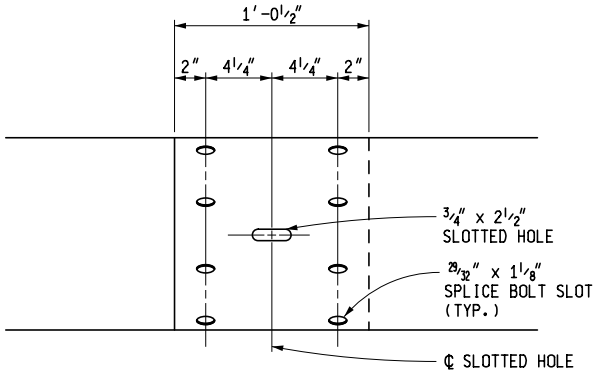
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

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

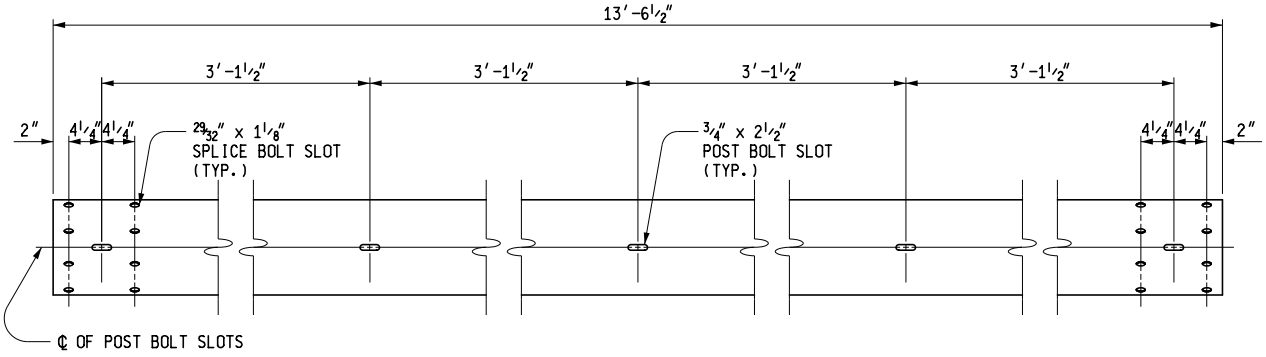
F.H.W.A. APPROVAL	2-27-2019 PLAN DATE	R-60-J	SHEET 11 OF 17



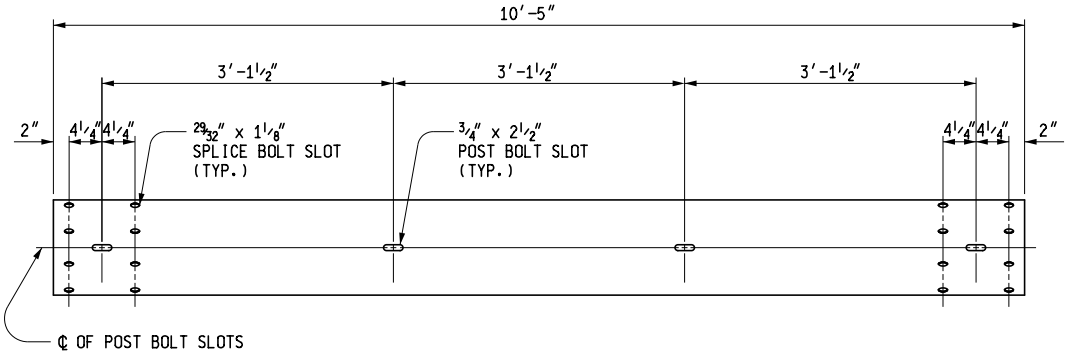
SECTION THROUGH BEAM ELEMENT



BEAM ELEMENT SPLICE DETAILS



FRONT ELEVATION OF BEAM ELEMENT



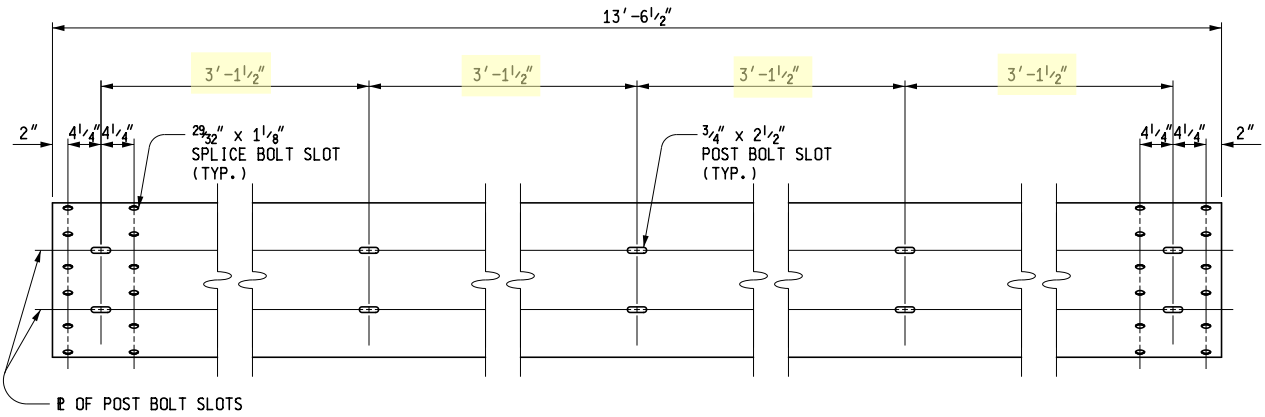
FRONT ELEVATION OF MGS (9'-4 1/2") BEAM ELEMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION

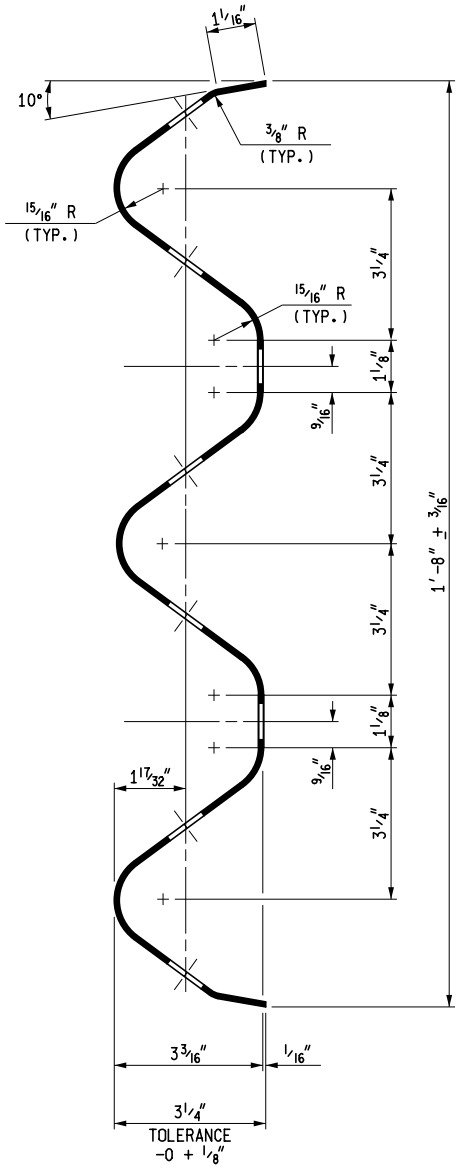
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

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

F.H.W.A. APPROVAL	2-27-2019 PLAN DATE	R-60-J	SHEET 12 OF 17



FRONT ELEVATION OF THRIE BEAM ELEMENT



SECTION THROUGH THRIE BEAM ELEMENT

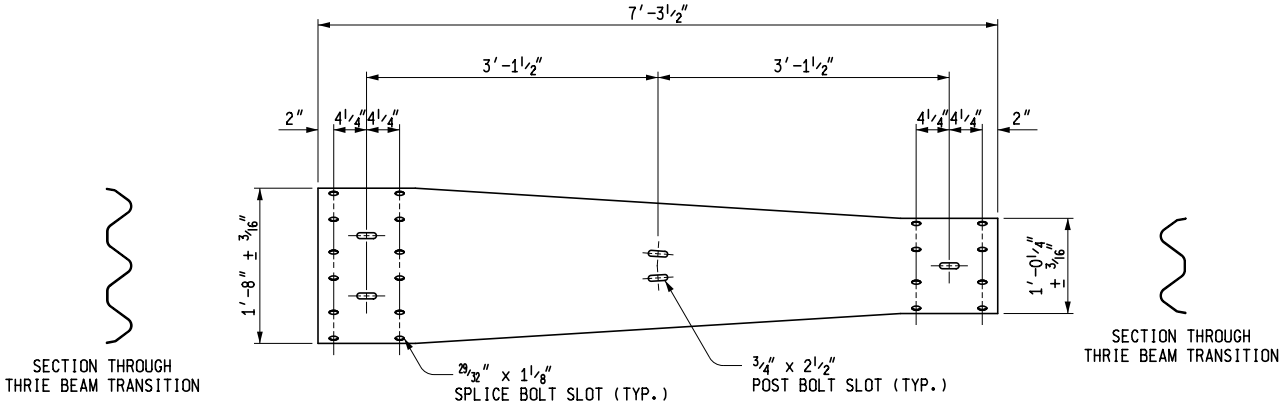
(FOR GUARDRAIL, TYPE T AND TD)

MICHIGAN DEPARTMENT OF TRANSPORTATION

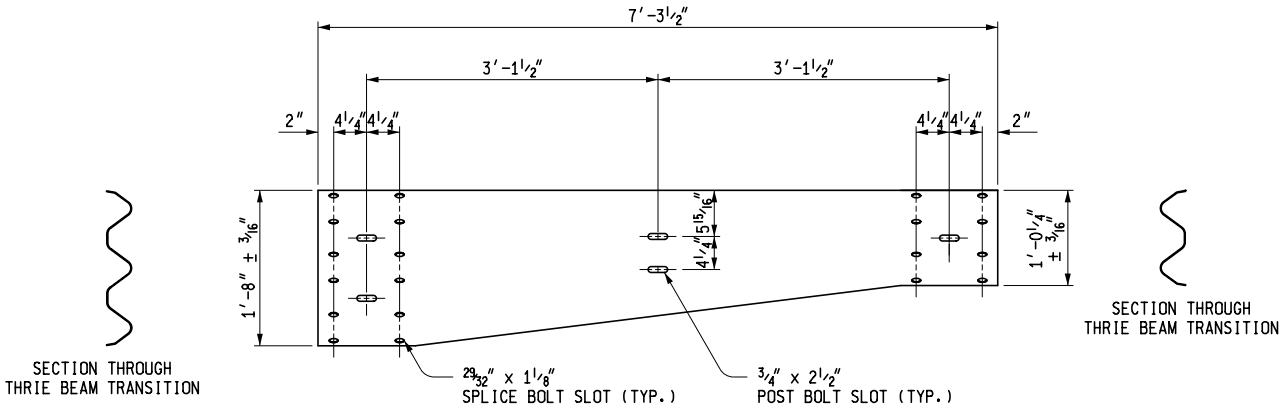
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

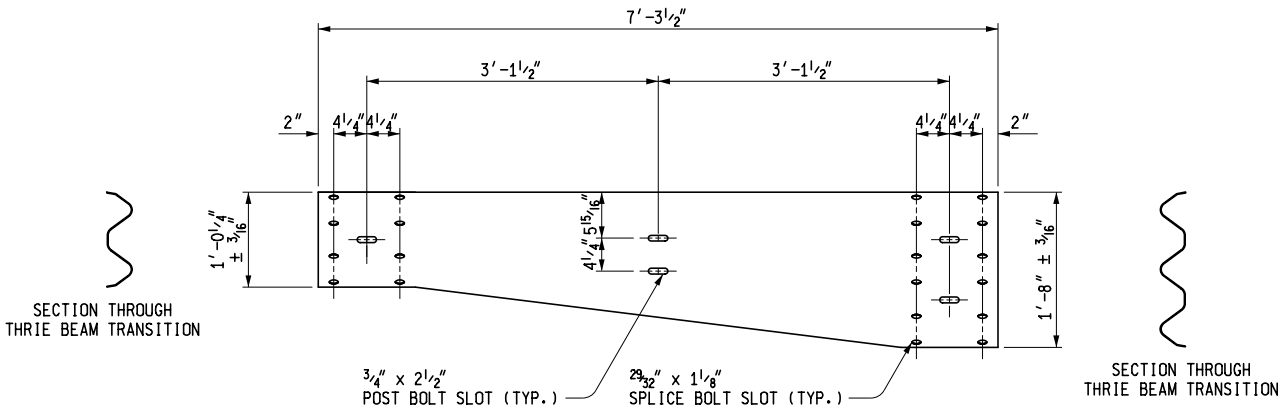
GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	2-27-2019 PLAN DATE	R-60-J	SHEET 13 OF 17



SYMMETRICAL THRIE BEAM TRANSITIONS





ASYMMETRICAL THRIE BEAM TRANSITIONS

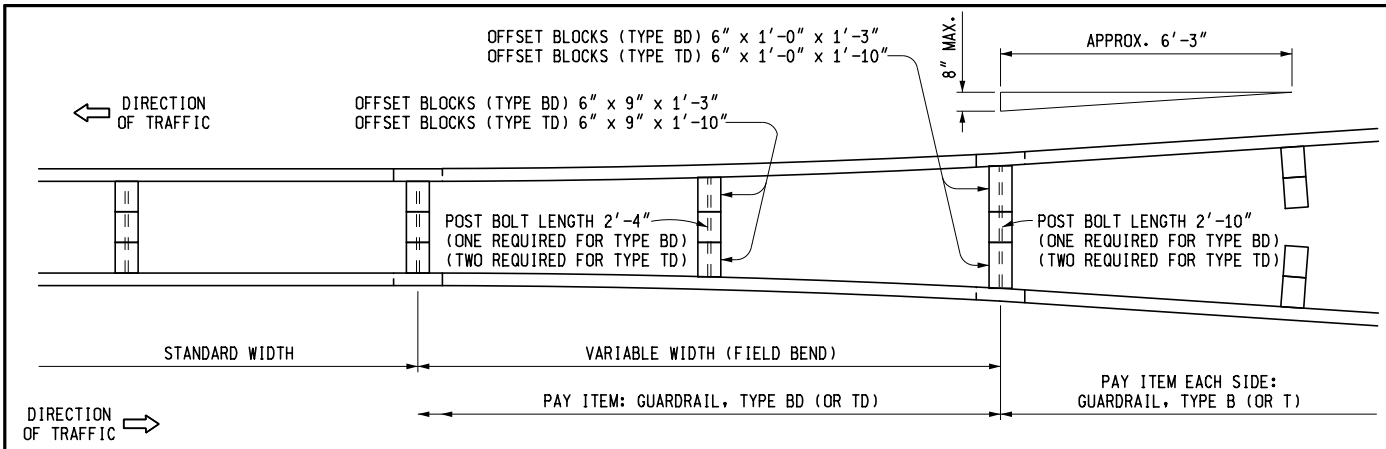
NOTE: ASYMMETRICAL TRANSITION TYPE WILL VARY BY LOCATION DEPENDING ON GUARDRAIL LAYOUT

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	2-27-2019 PLAN DATE	R-60-J	SHEET 14 OF 17



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

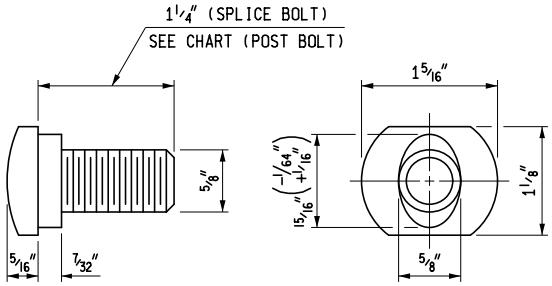
GUARDRAIL TYPE	POST	OFFSET BLOCK	POST BOLTS NO. REQ'D	POST BOLTS LENGTH	SPLICE BOLTS (1¼" LONG) (NO. REQ'D)		WASHERS (ROUND) (NO. REQ'D)
A	WOOD	N/A	1	9½"	8	NOT NEEDED AT INTERMEDIATE POSTS	1
	STEEL	N/A	1	2"			1
B	WOOD	WOOD	1	18"	8		1
	STEEL	WOOD	1	9½"			1
BD	WOOD	WOOD	1	*26½"	16		——
	STEEL	WOOD	2	9½"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

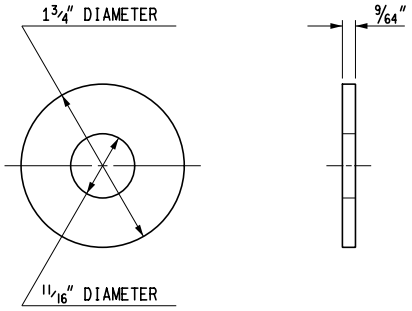
* EXCEPT AS SPECIFIED ON DETAIL SHOWING TRANSITION FROM GUARDRAIL, TYPE B (OR TYPE T) TO GUARDRAIL, TYPE BD (OR TYPE TD). POST BOLTS SHALL NOT EXTEND MORE THAN ½" BEYOND NUT.

MINIMUM POST BOLT THREAD LENGTH

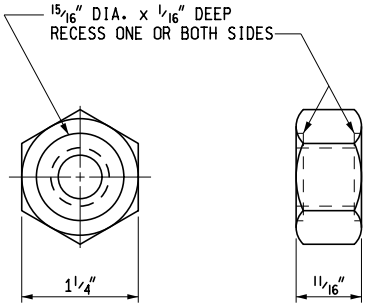
BOLT LENGTH	MINIMUM THREAD LENGTH
9½"	1¾"
18"	2½"
26½"	3"



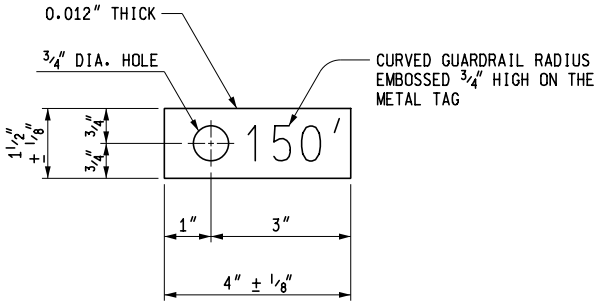
SPLICE BOLT AND POST BOLT



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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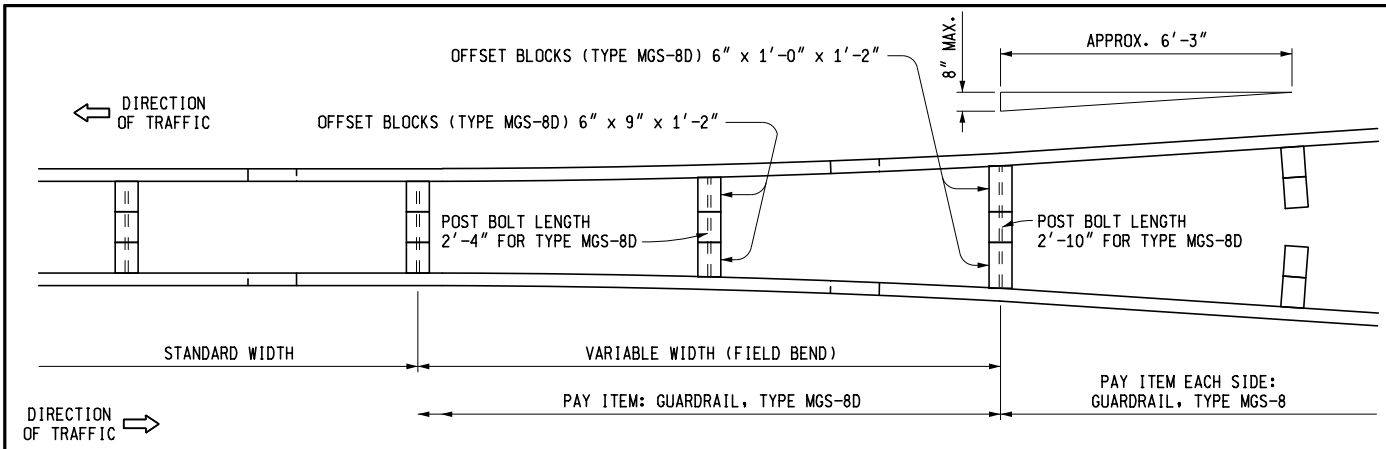


DETAIL SHOWING TRANSITION FROM GUARDRAIL, TYPE MGS-8 TO GUARDRAIL, TYPE MGS-8D

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.

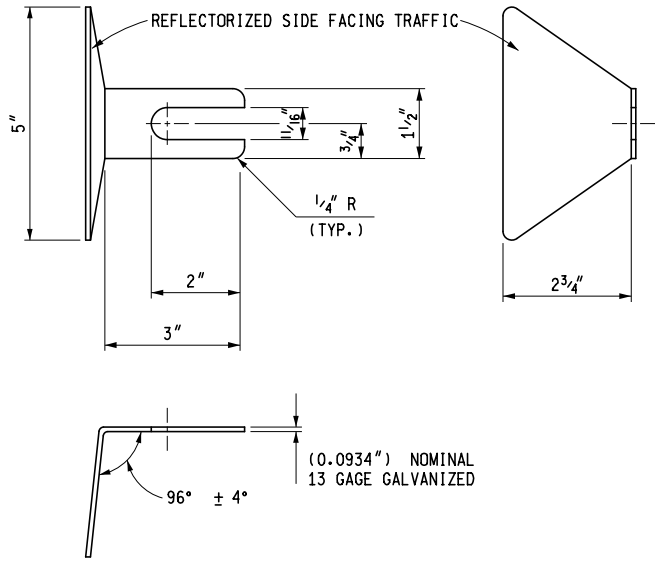
MINIMUM POST BOLT THREAD LENGTH

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

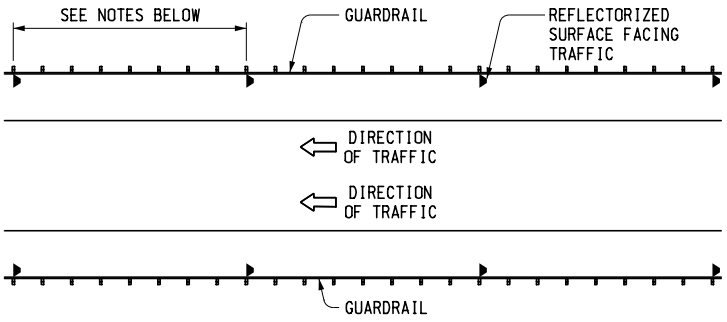
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

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

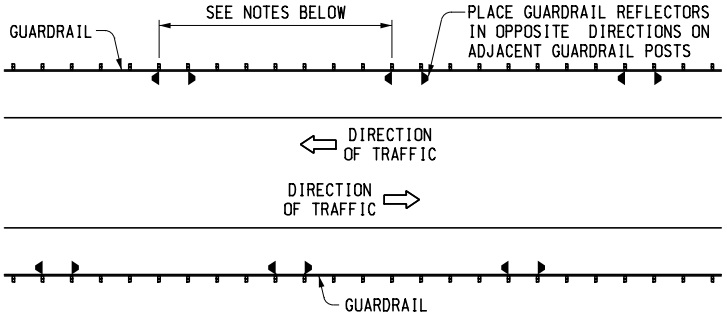
F.H.W.A. APPROVAL	2-27-2019 PLAN DATE	R-60-J	SHEET 16 OF 17



GUARDRAIL REFLECTOR



ONE-WAY TRAFFIC

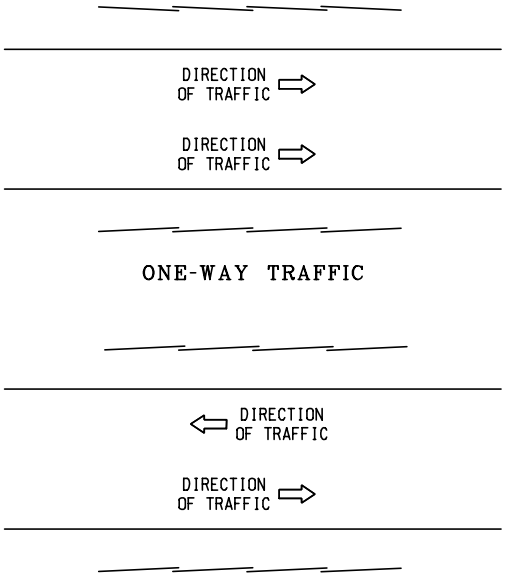


TWO-WAY TRAFFIC

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

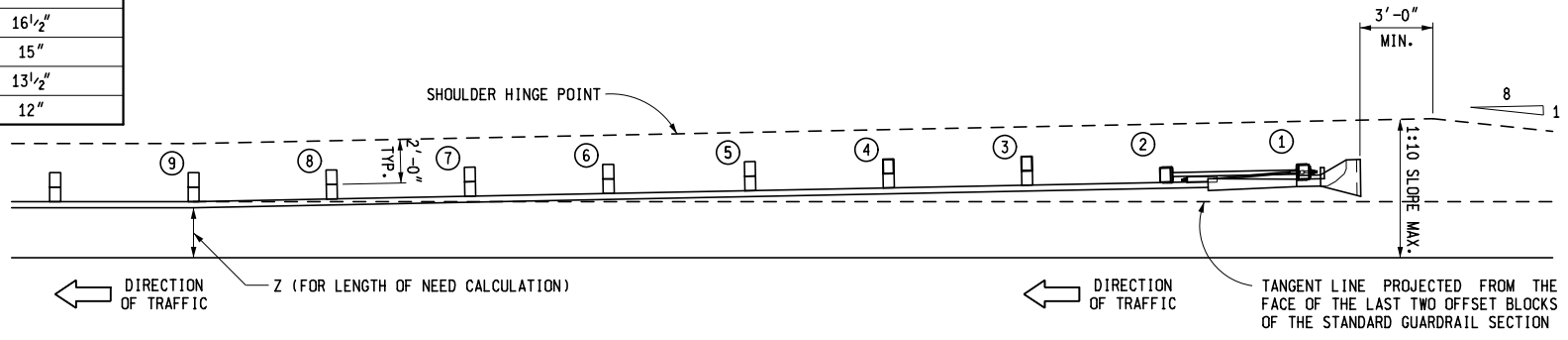
GUARDRAIL, TYPES A, B, BD, T, TD, MGS-8, & MGS-8D

F.H.W.A. APPROVAL	2-27-2019 PLAN DATE	R-60-J	SHEET 17 OF 17

POST	** POST OFFSET DISTANCE (FROM TANGENT LINE TO CENTER OF POST)
1	16″
2	14½″
3	21″
4	19½″
5	18″
6	16½″
7	15″
8	13½″
9	12″

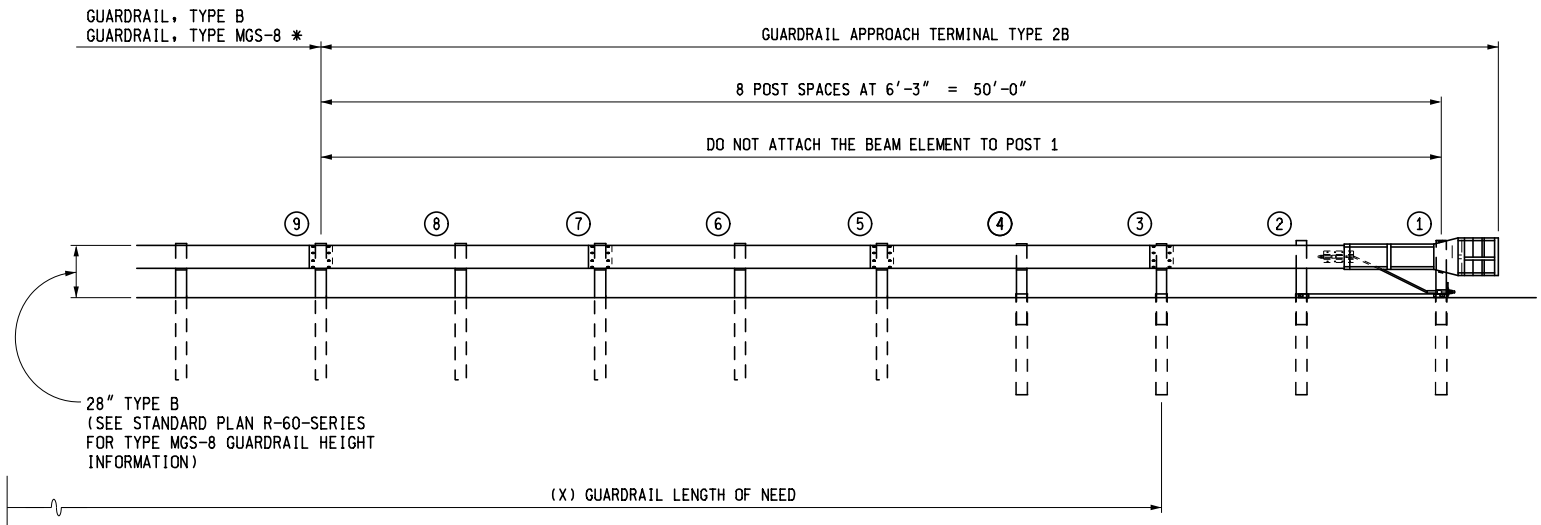
** USING 1:50 FLARE

OPTION 1
(DETAILED ON SHEETS 1 THROUGH 4)



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 2B



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 2B "SKT"

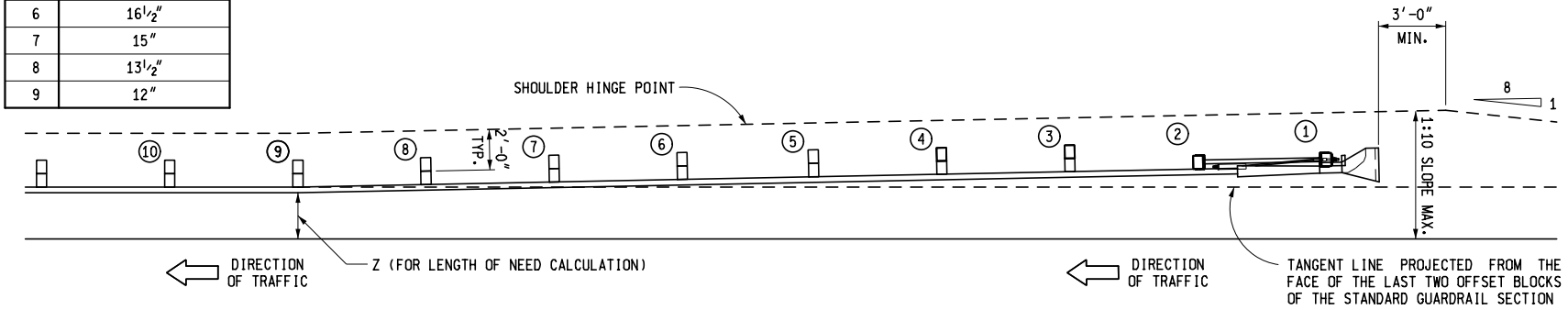
GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T
(SKT & ET-PLUS)

R-62-H-LAP

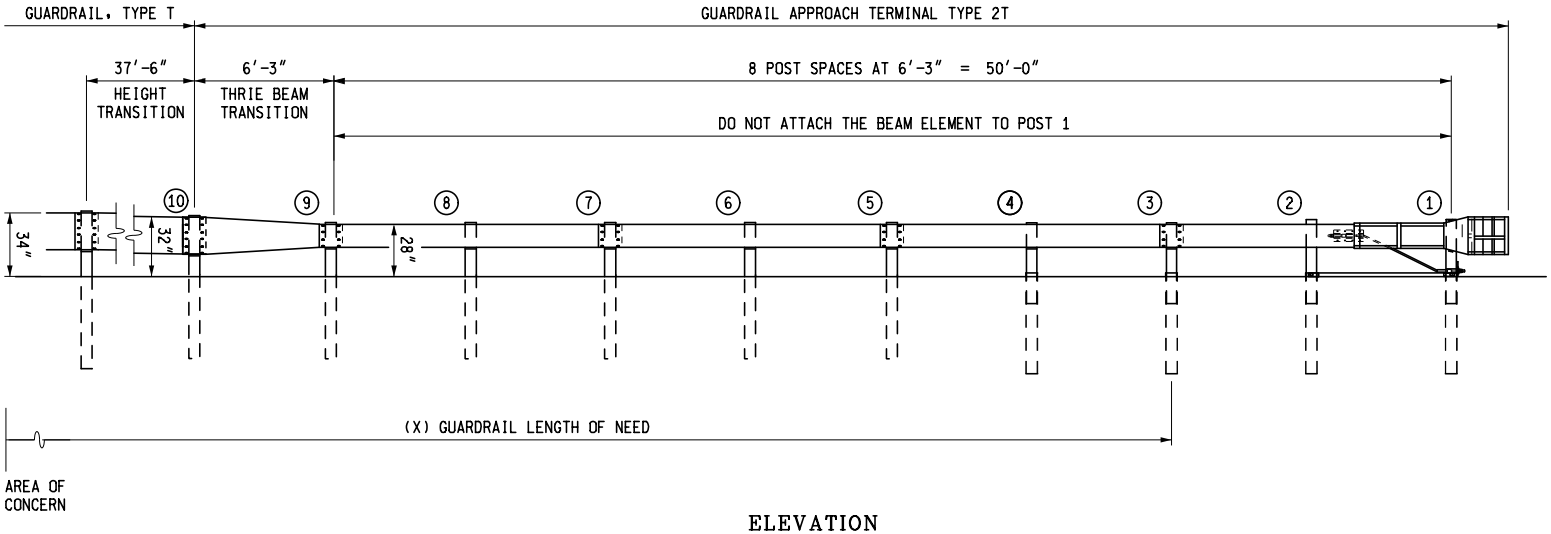
SHEET 1 OF 9

POST	** POST OFFSET DISTANCE (FROM TANGENT LINE TO CENTER OF POST)
1	16″
2	14½″
3	21″
4	19½″
5	18″
6	16½″
7	15″
8	13½″
9	12″

** USING 1:50 FLARE



PLAN VIEW

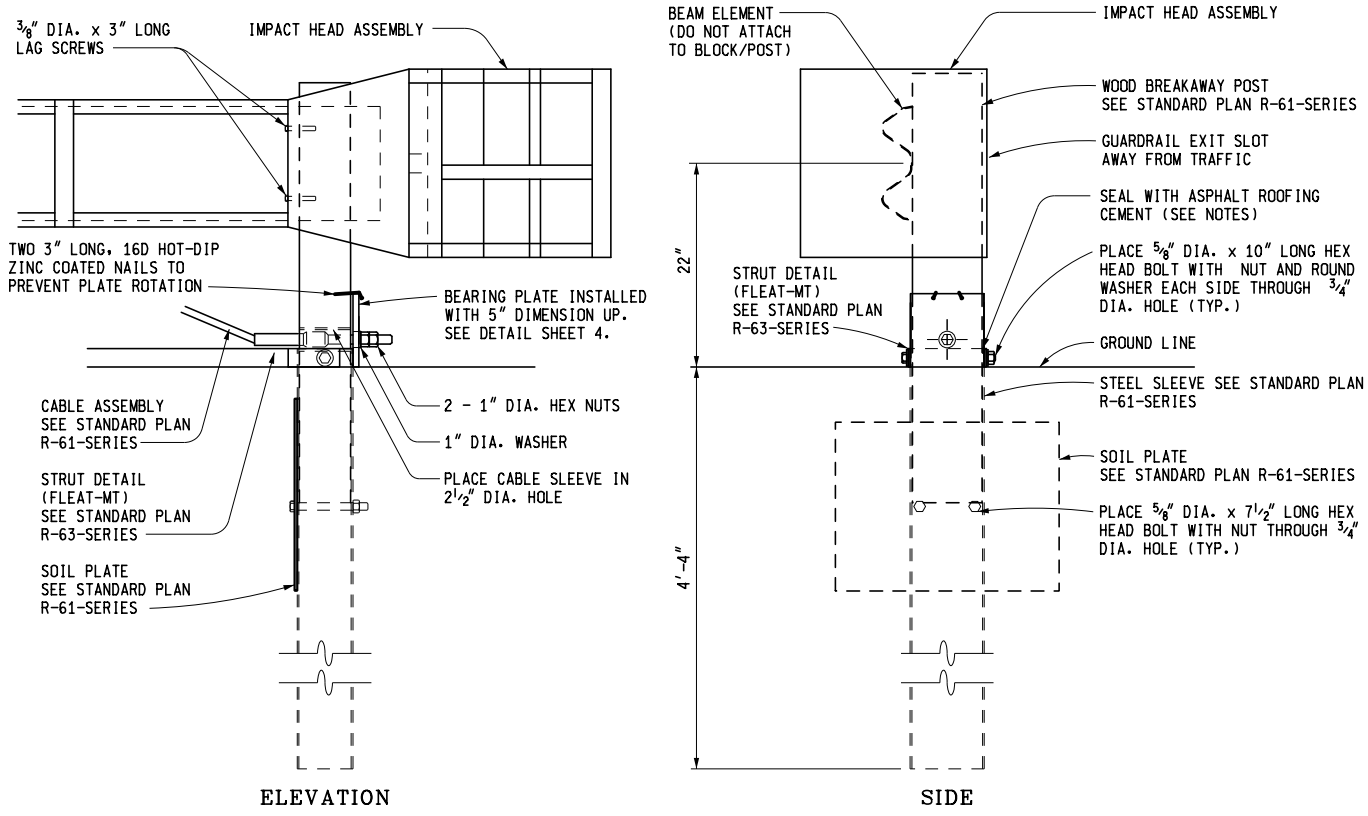


ELEVATION

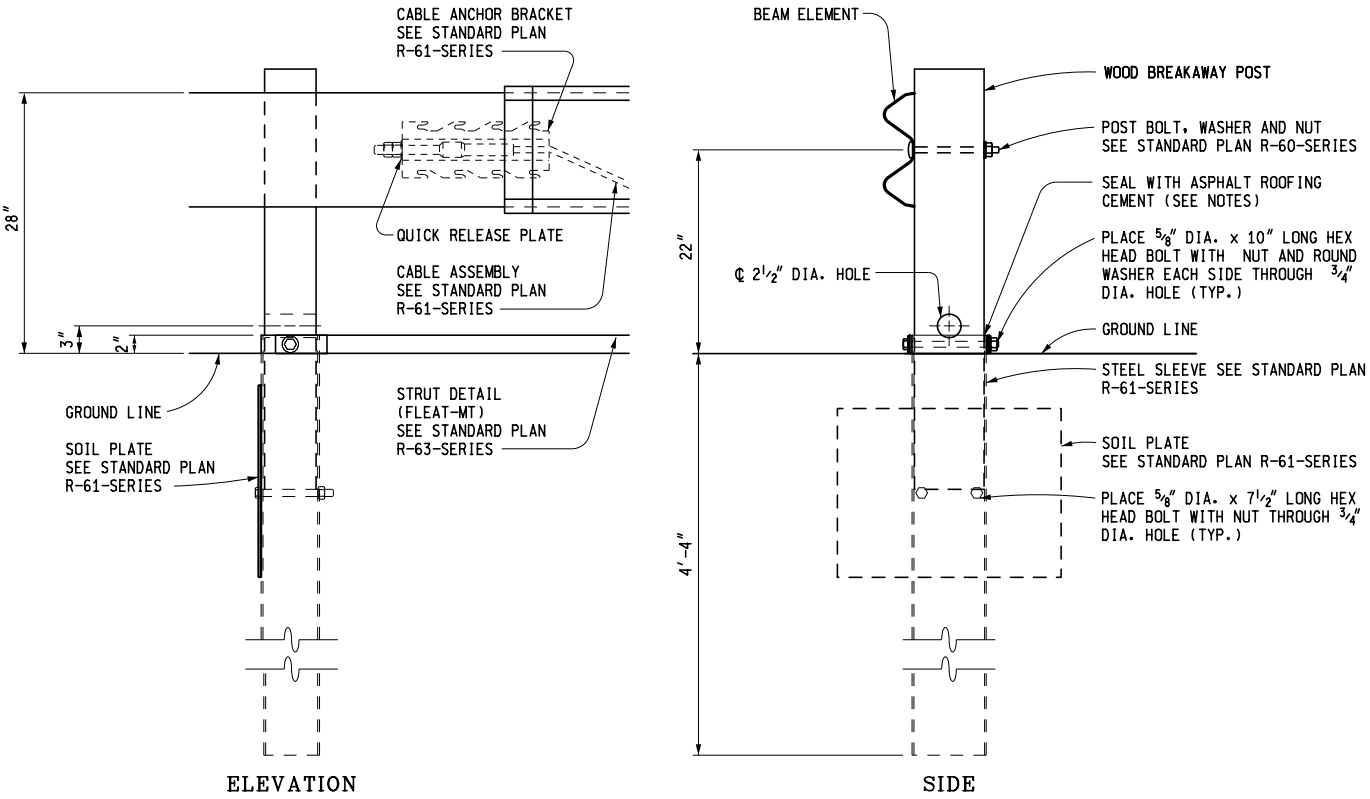
GUARDRAIL APPROACH TERMINAL TYPE 2T
"SKT"

GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T
(SKT & ET-PLUS)

R-62-H-LAP



POST 1 DETAIL
(SKT)



POST 2 DETAIL
(SKT)

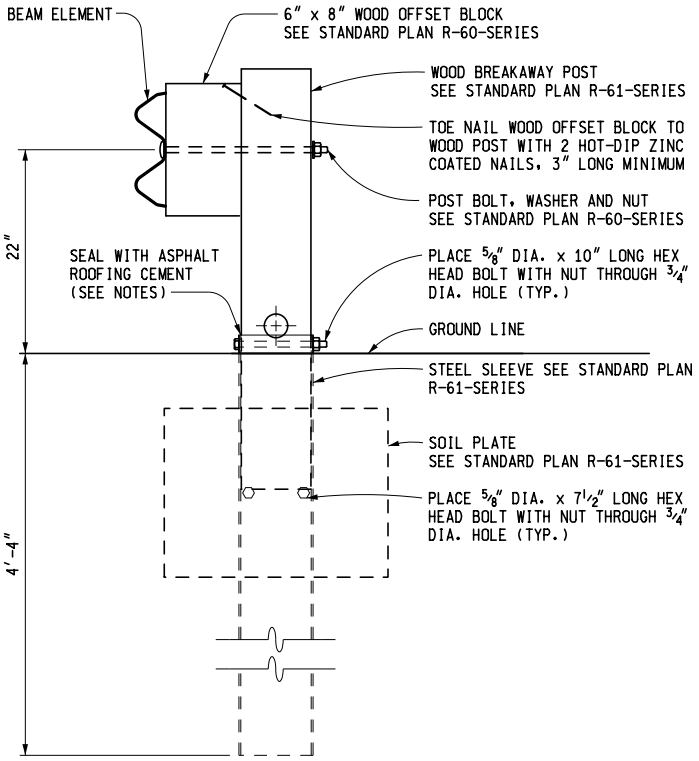
NOTE:

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.

GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T
(SKT & ET-PLUS)

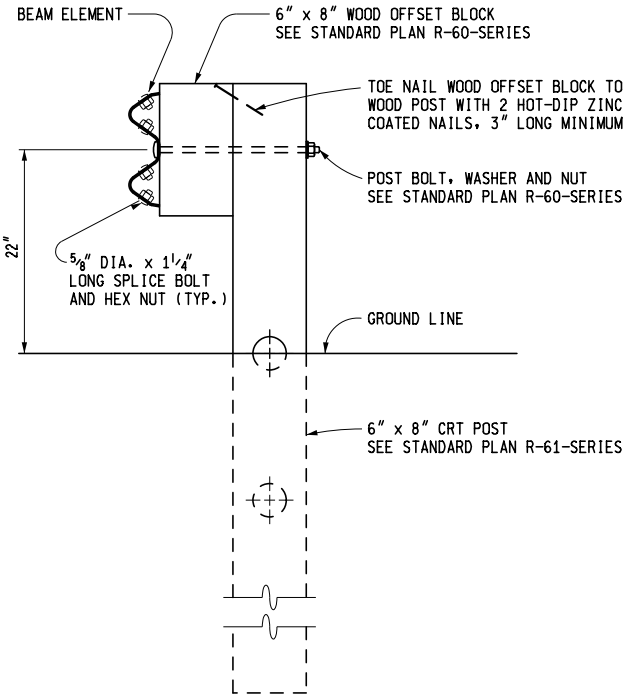
		R-62-H-LAP	SHEET 3 OF 9



POST 3 AND 4 DETAIL

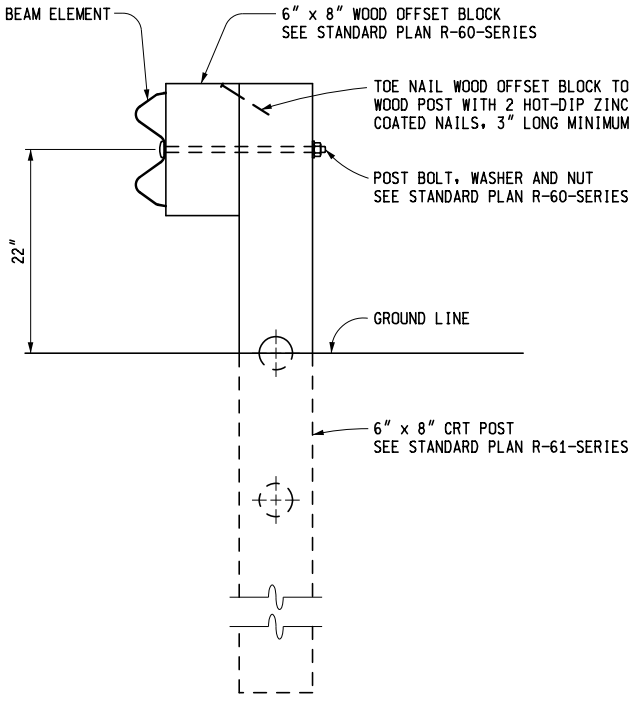
NOTE: BEAM ELEMENTS ARE SPLICED TOGETHER AT POST 3

(SKT)



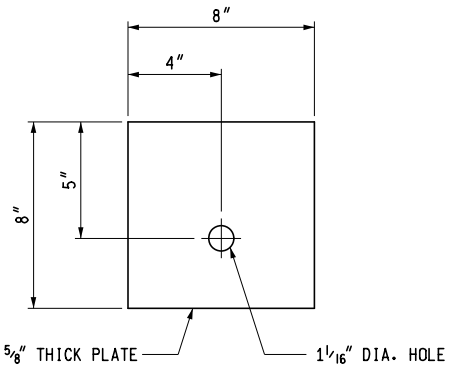
POST 5 AND 7 DETAIL

(SKT)



POST 6 AND 8 DETAIL

(SKT)



BEARING PLATE

(SKT & ET-PLUS)

NOTE:

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

THE SECOND, THIRD, AND FOURTH BEAM ELEMENTS ARE STANDARD RAIL. (POSTS 3 THROUGH 9)

POST 9 IS A STANDARD LINE POST.

GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T

(SKT & ET-PLUS)

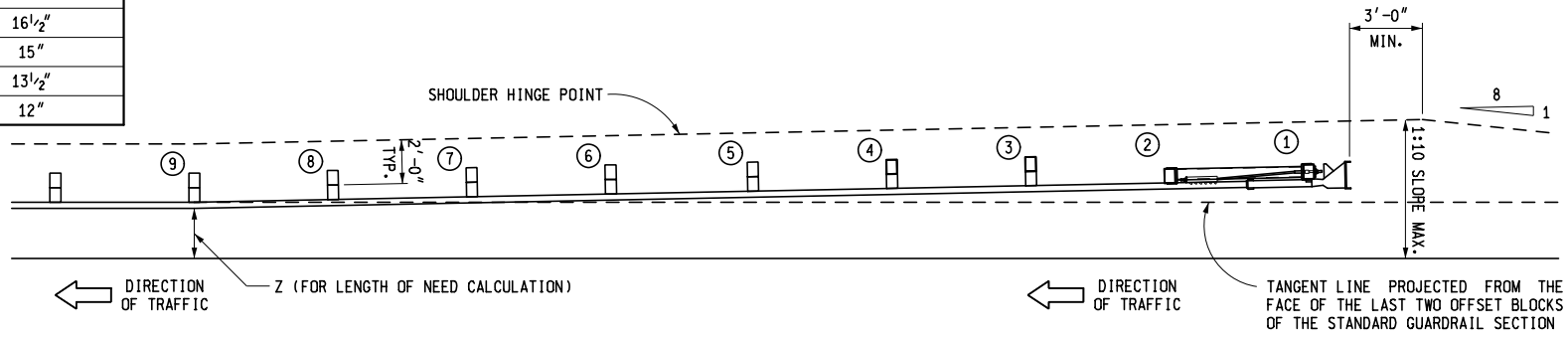
		R-62-H-LAP	SHEET 4 OF 9

POST	** POST OFFSET DISTANCE (FROM TANGENT LINE TO CENTER OF POST)
1	16″
2	14½″
3	21″
4	19½″
5	18″
6	16½″
7	15″
8	13½″
9	12″

** USING 1:50 FLARE

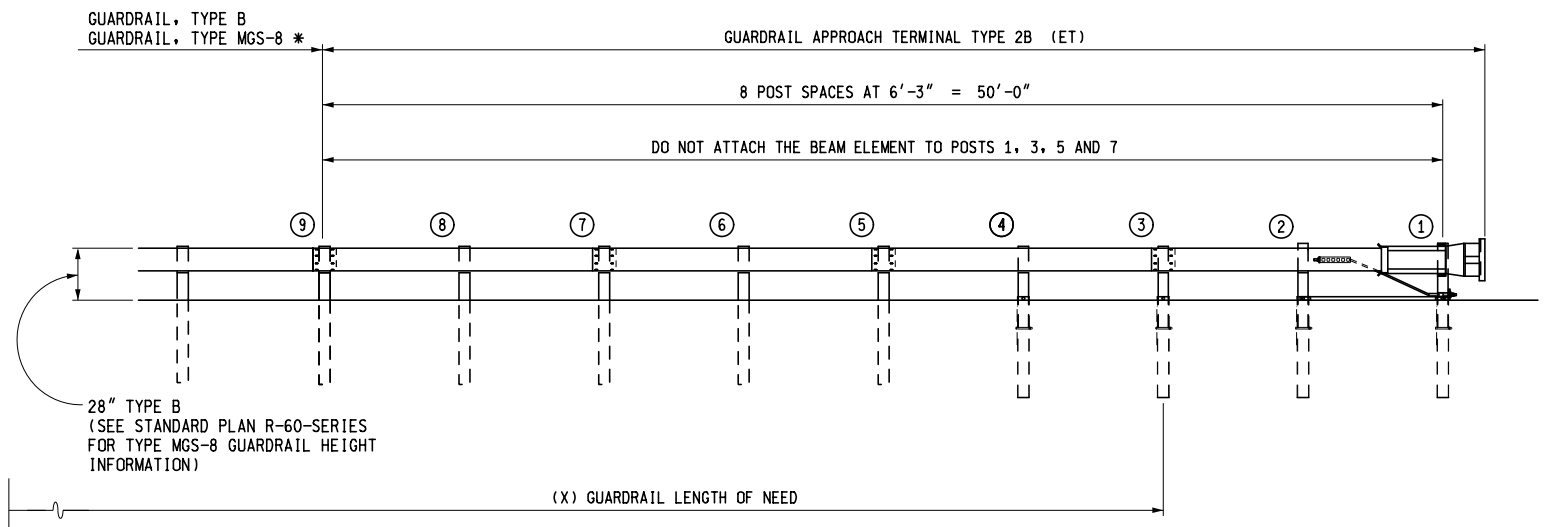
OPTION 2

(DETAILED ON SHEETS 5 THROUGH 8 AND 9)



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 2B



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 2B "ET-PLUS"

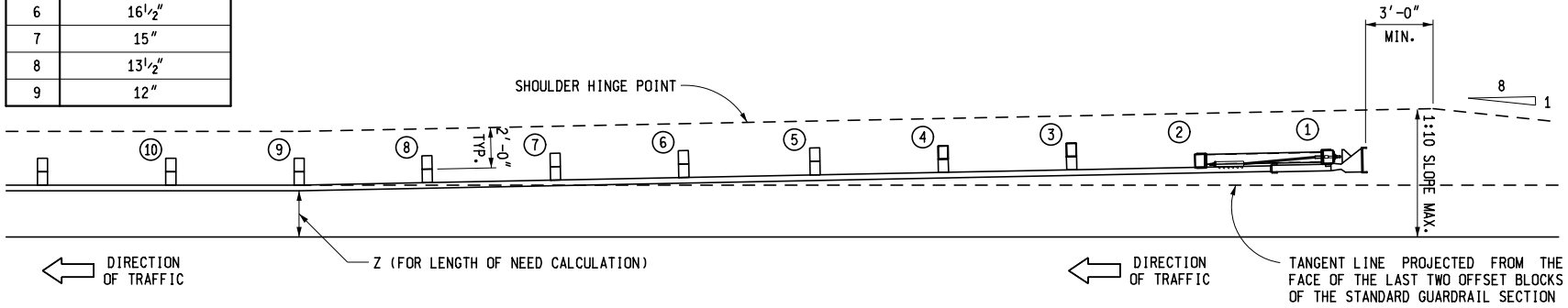
GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T (SKT & ET-PLUS)

R-62-H-LAP

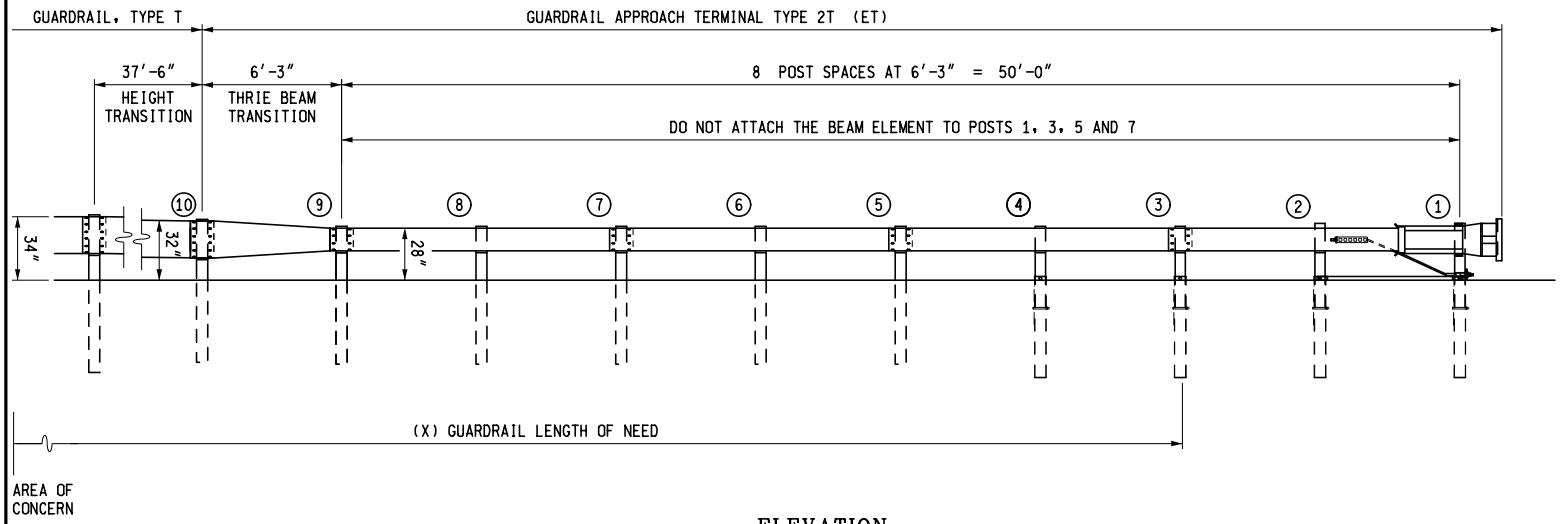
SHEET 5 OF 9

POST	** POST OFFSET DISTANCE (FROM TANGENT LINE TO CENTER OF POST)
1	16″
2	14½″
3	21″
4	19½″
5	18″
6	16½″
7	15″
8	13½″
9	12″

** USING 1:50 FLARE



PLAN VIEW



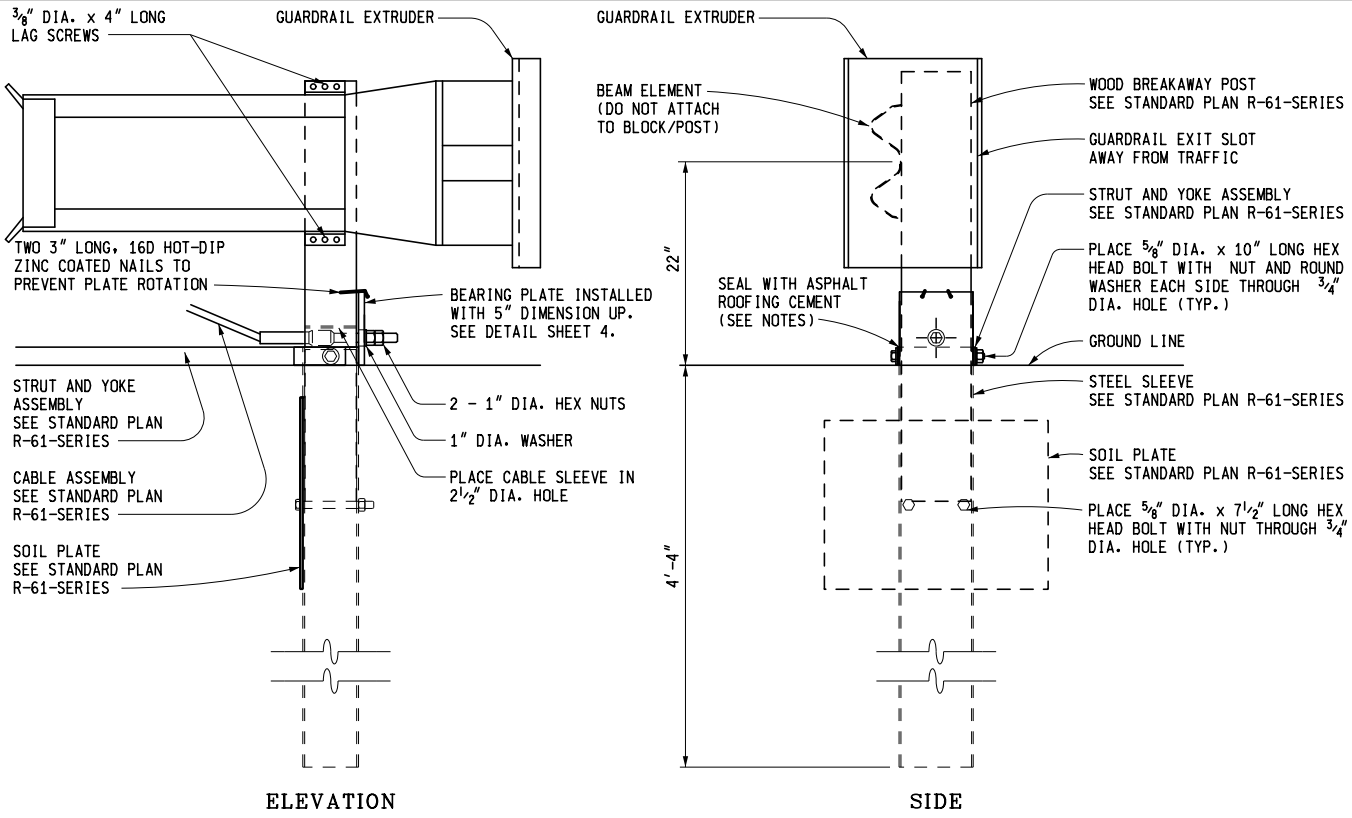
ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 2T
"ET-PLUS"

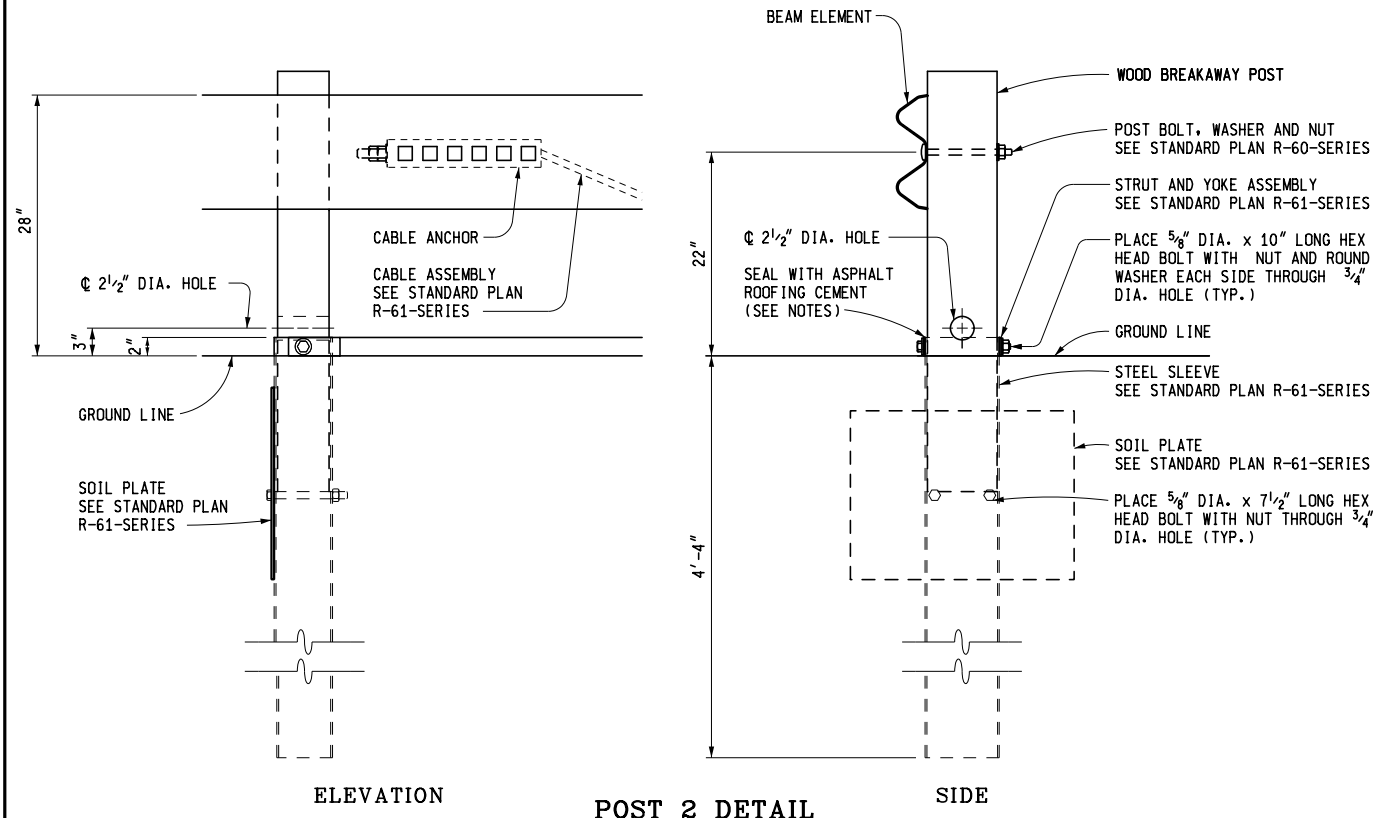
GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T
(SKT & ET-PLUS)

R-62-H-LAP

SHEET 6 OF 9



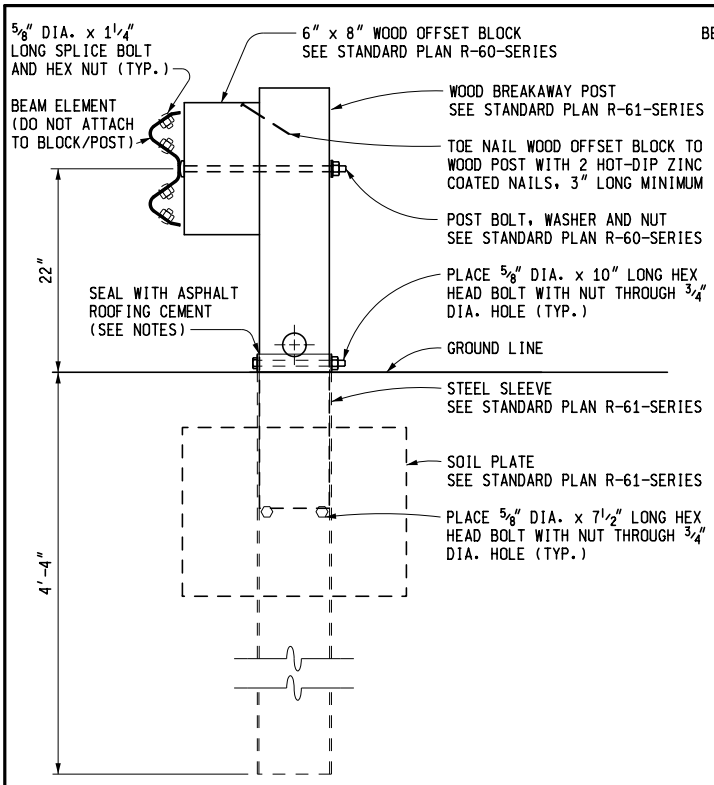
POST 1 DETAIL
(ET-PLUS)



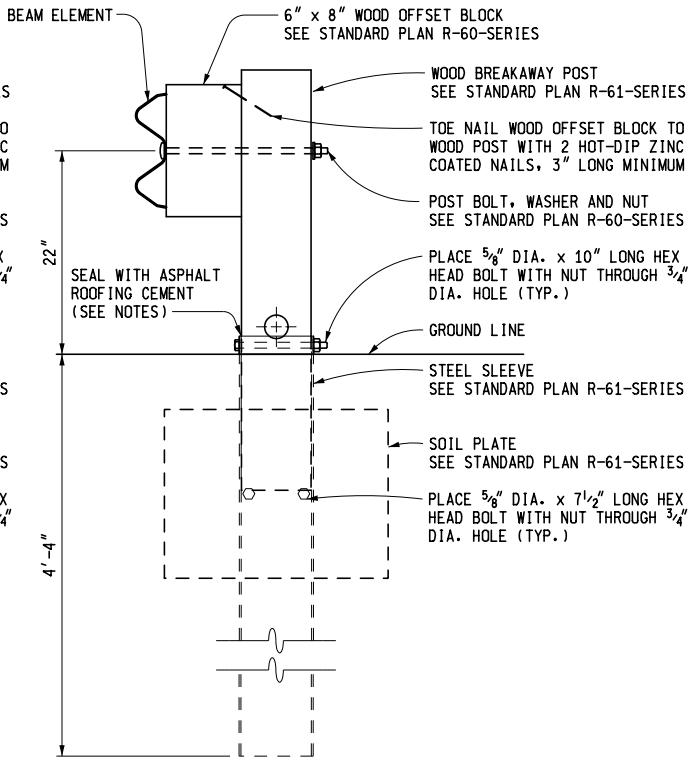
POST 2 DETAIL
(ET-PLUS)

GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T
(SKT & ET-PLUS)

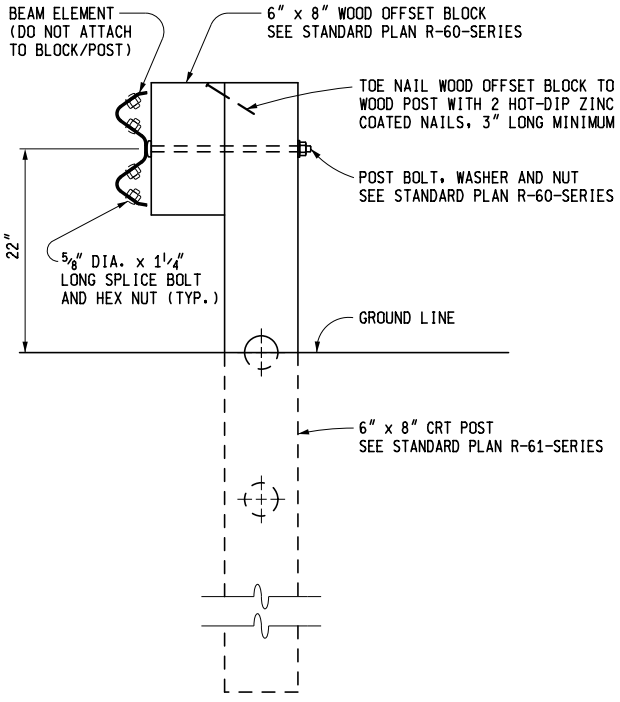
		R-62-H-LAP	SHEET 7 OF 9



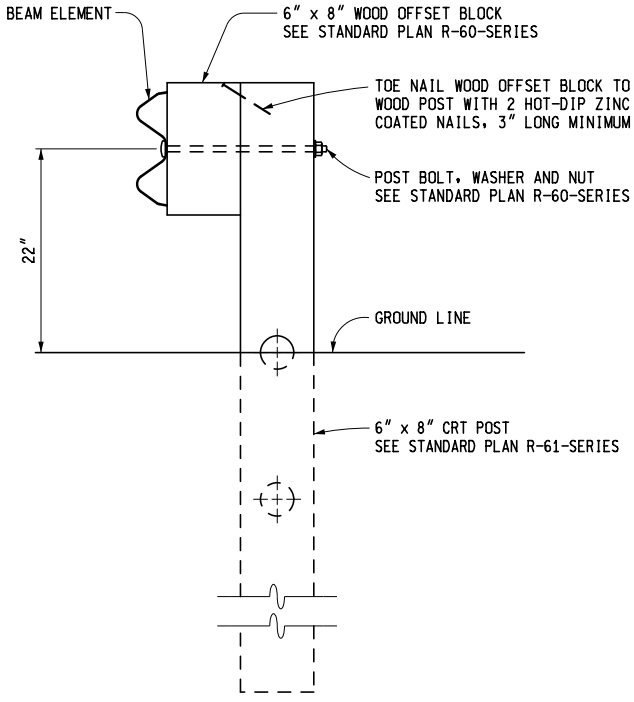
POST 3 DETAIL
(ET-PLUS)



POST 4 DETAIL
(ET-PLUS)



POST 5 AND 7 DETAIL
(ET-PLUS)



POST 6, AND 8 DETAIL
(ET-PLUS)

NOTE: POST 9 IS A STANDARD LINE POST.

NOTE:

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

THE SECOND, THIRD, AND FOURTH BEAM ELEMENTS ARE STANDARD RAIL. (POSTS 3 THROUGH 9)

POST 9 IS A STANDARD LINE POST.

GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T
(SKT & ET-PLUS)

		R-62-H-LAP	SHEET 8 OF 9

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.

WHEN SITE CONDITIONS WARRANT AND WITH THE APPROVAL OF THE ENGINEER, GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T CAN BE INSTALLED STRAIGHT (WITHOUT THE 1'-0" OFFSET FROM THE TANGENT LINE TO THE TRAFFIC FACE OF POST 1).

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

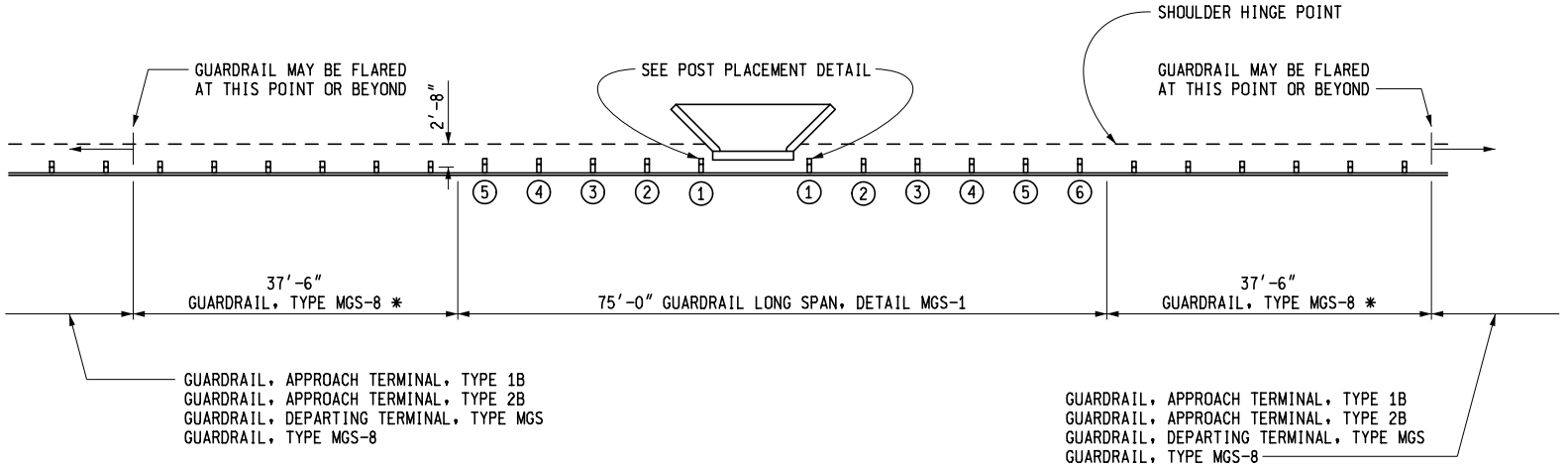
TRAFFIC PASSING ON THE RIGHT SIDE

THE PORTION OF THE IMPACT HEAD ASSEMBLY FACING TRAFFIC SHALL BE COMPLETELY COVERED WITH HIGH INTENSITY ADHESIVE REFLECTIVE SHEETING.

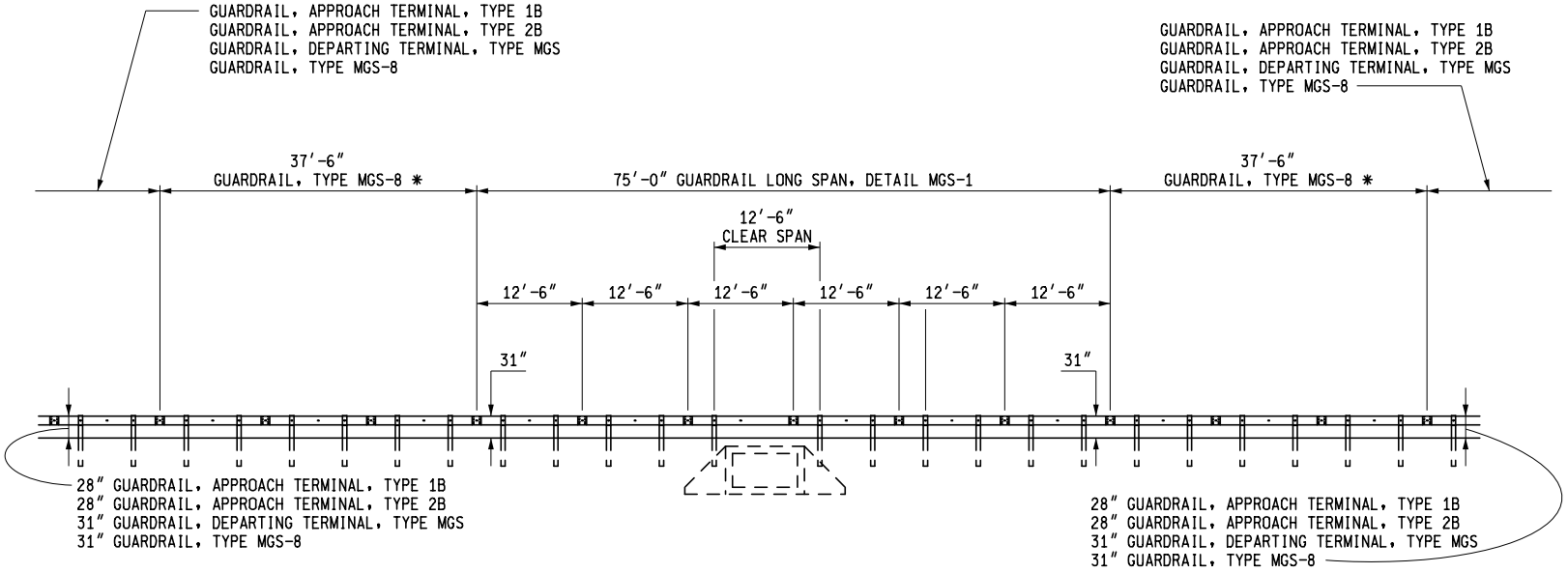
GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T
(SKT & ET-PLUS)

		R-62-H-LAP	SHEET 9 OF 9

* 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

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

F.H.W.A. APPROVAL	2-7-2019 PLAN DATE	R-72-D

SHEET 1 OF 11

APPROVED BY: _____ DIRECTOR, BUREAU OF DEVELOPMENT

APPROVED BY: _____ DIRECTOR, BUREAU OF FIELD SERVICES

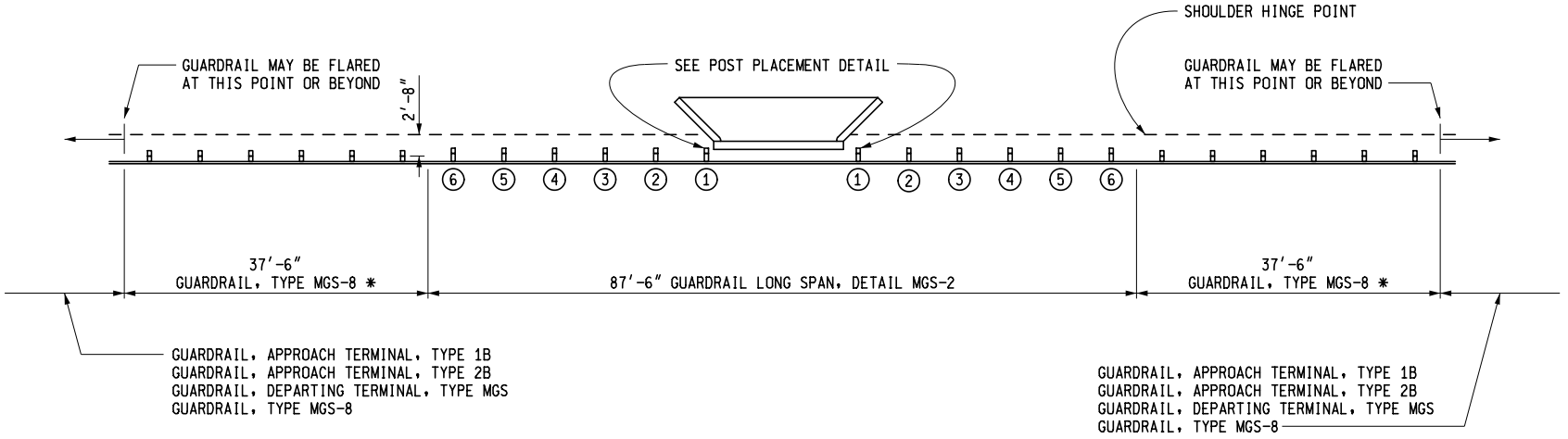
DEPARTMENT DIRECTOR
Paul C. Ajegba

PREPARED BY DESIGN DIVISION

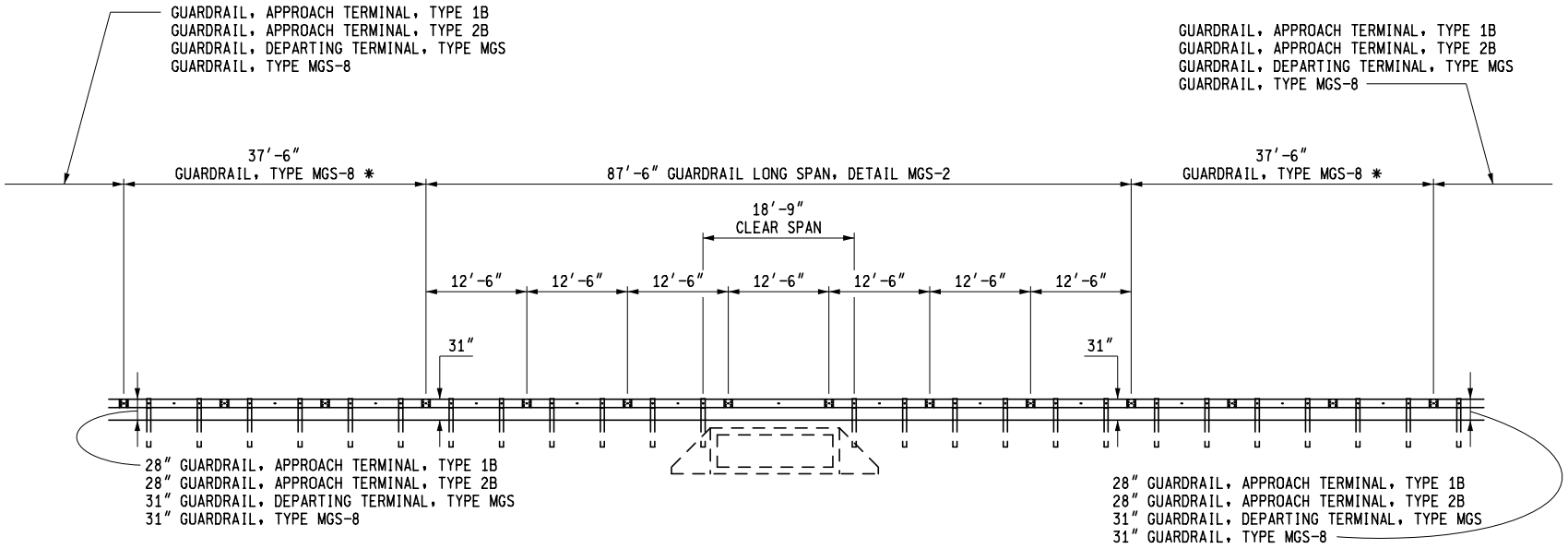
DRAWN BY: B.L.T.

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-2

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

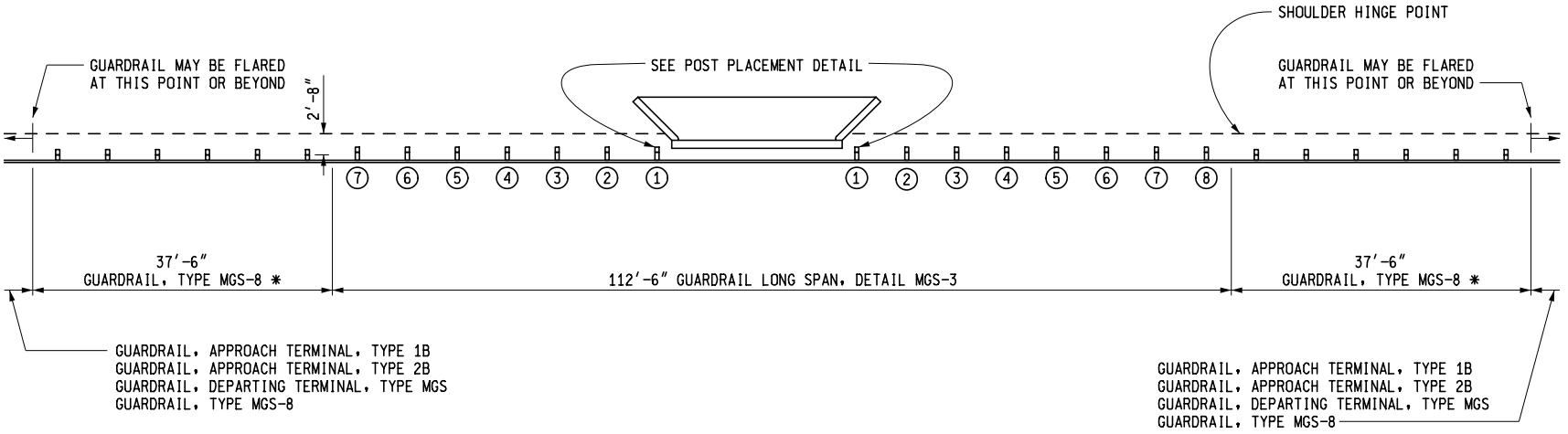
F.H.W.A. APPROVAL

2-7-2019
PLAN DATE

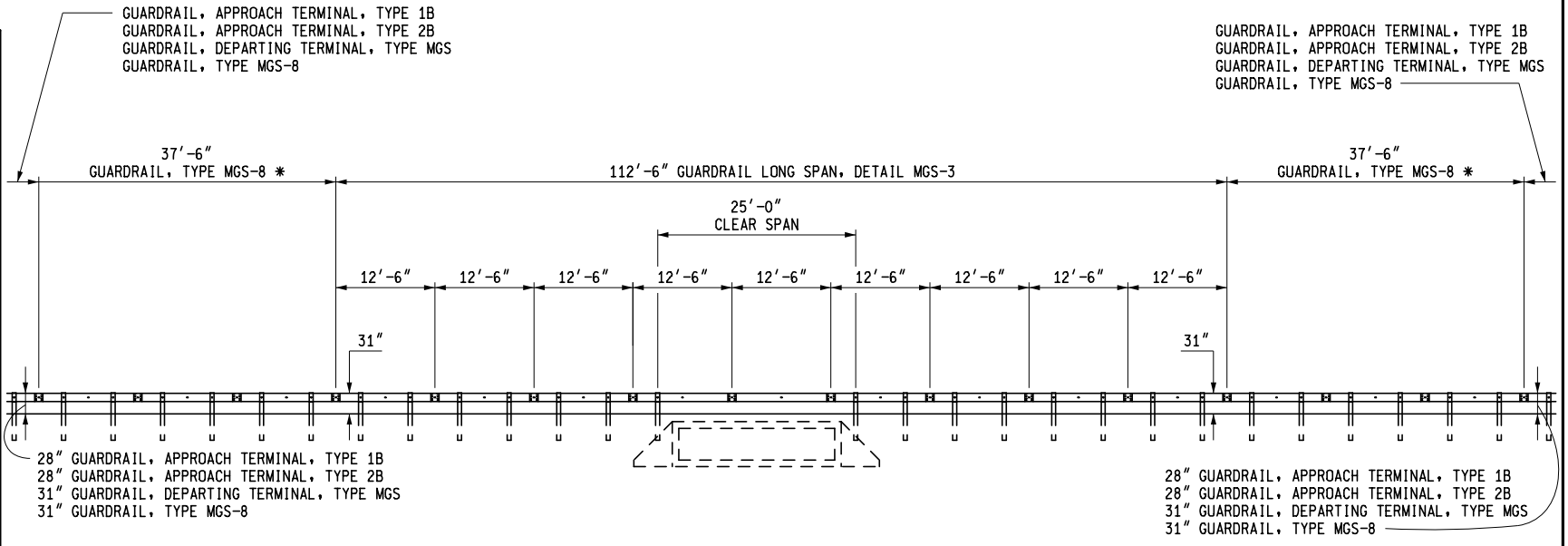
R-72-D

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

2-7-2019
PLAN DATE

R-72-D

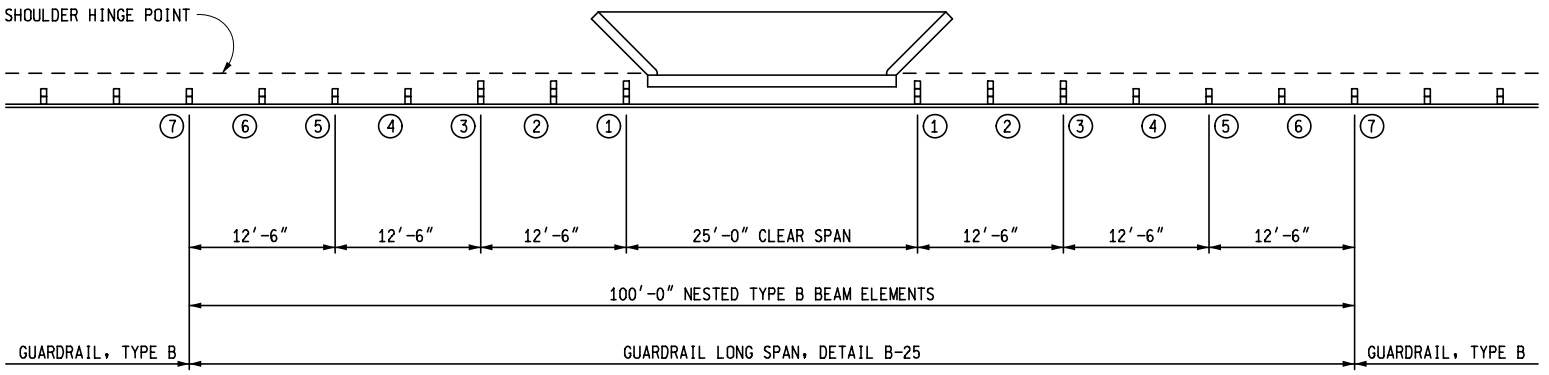
SHEET 3 OF 11

NOTES:

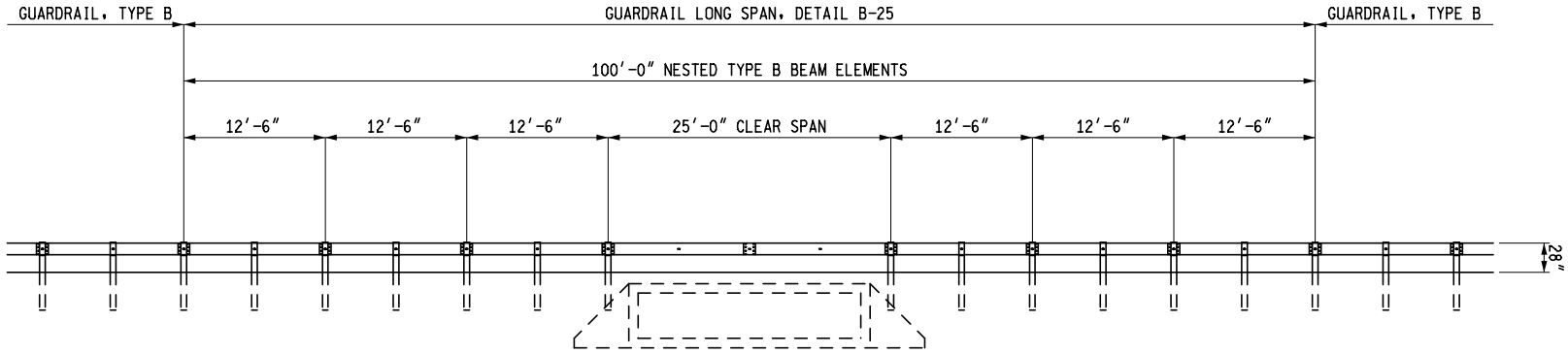
POSTS 1, 2, AND 3 ARE CRT POSTS WITH TWO STANDARD WOOD OFFSET BLOCKS ATTACHED TO THE POST. SEE SHEET 10 FOR CRT POST DETAIL.

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

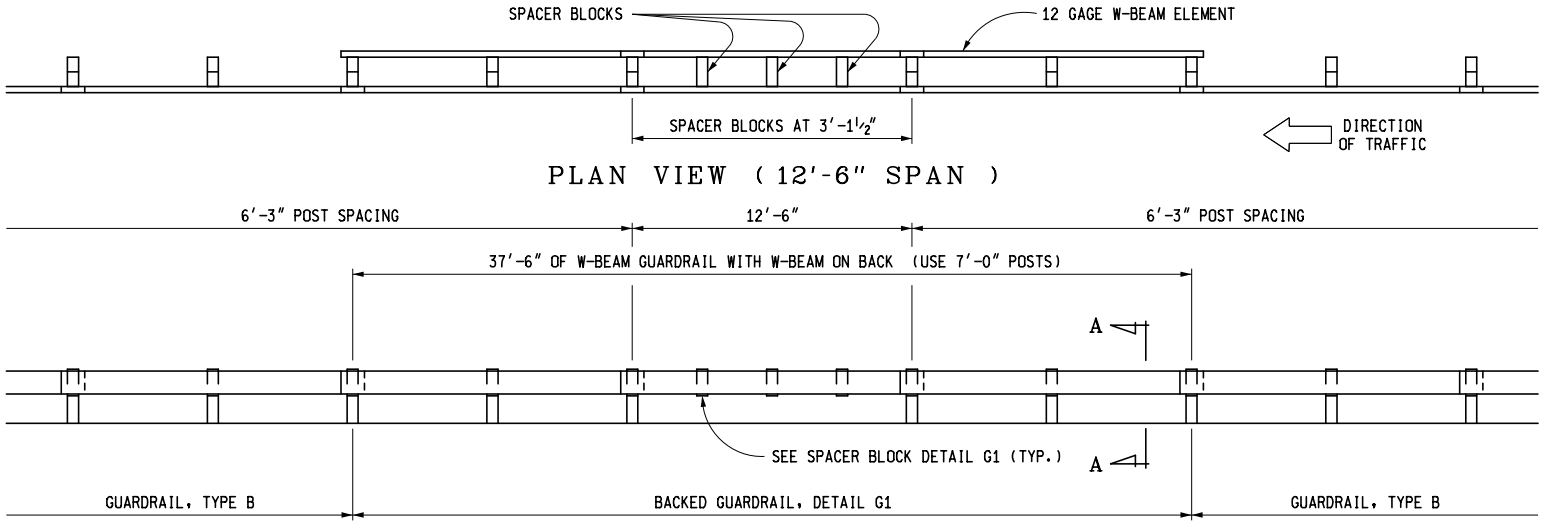
W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

F.H.W.A. APPROVAL

2-7-2019
PLAN DATE

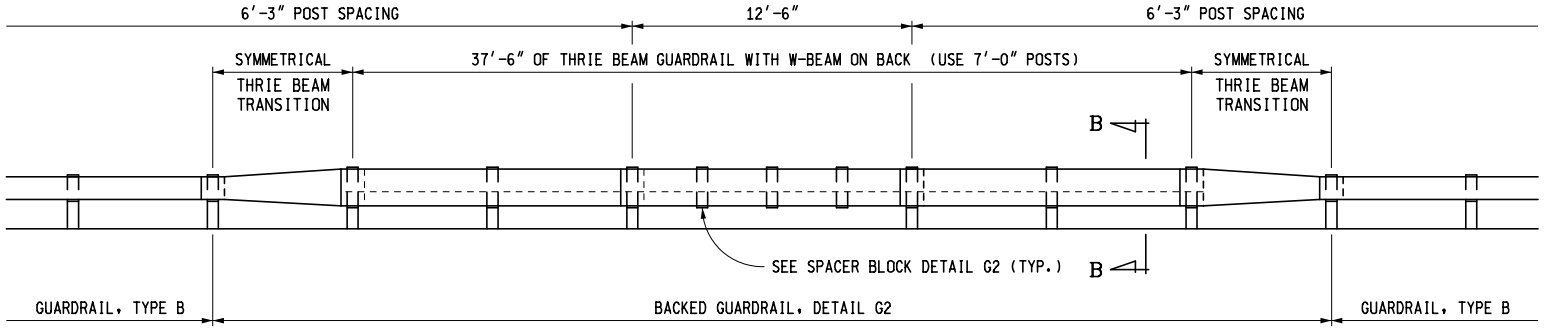
R-72-D

SHEET 4 OF 11



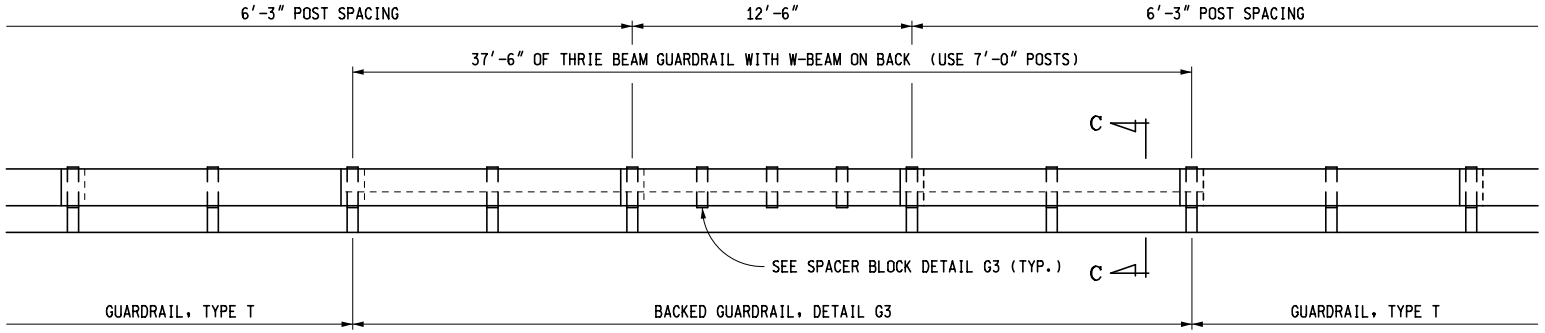
PLAN VIEW (12′-6″ SPAN)

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



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

(USE AT DEEP THROATED DOWNSPOUT HEADERS)



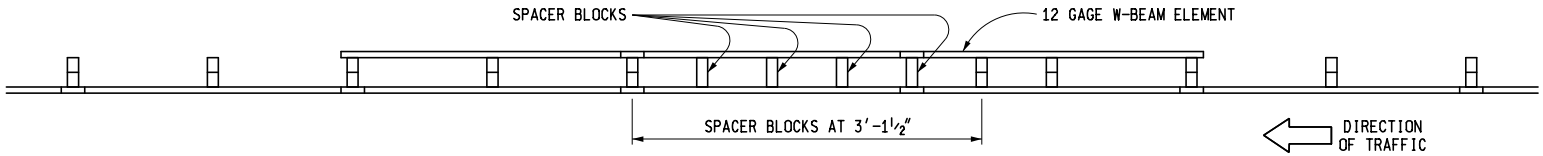
W-BEAM BACKED GUARDRAIL, TYPE T (12′-6″ SPAN)

MICHIGAN DEPARTMENT OF TRANSPORTATION

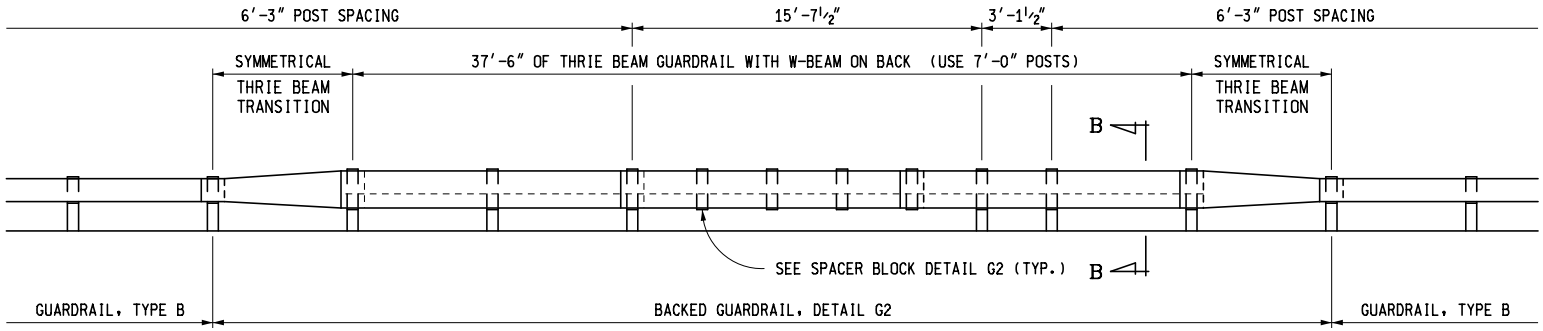
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

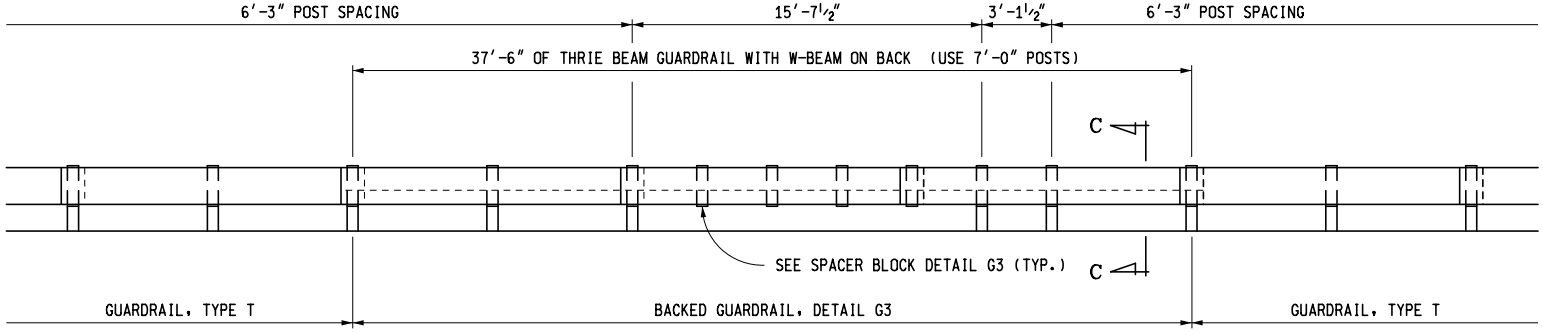
F.H.W.A. APPROVAL	2-7-2019 PLAN DATE	R-72-D	SHEET 5 OF 11



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

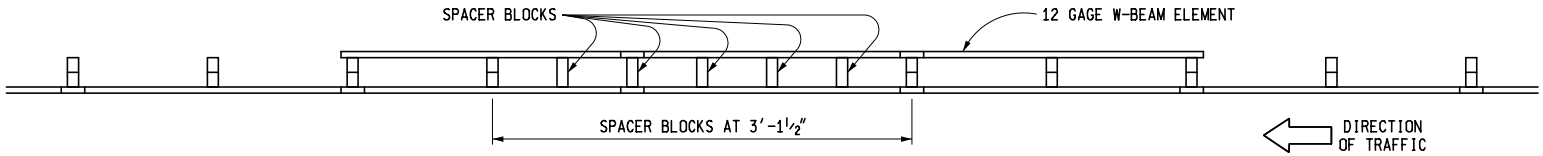
W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

F.H.W.A. APPROVAL

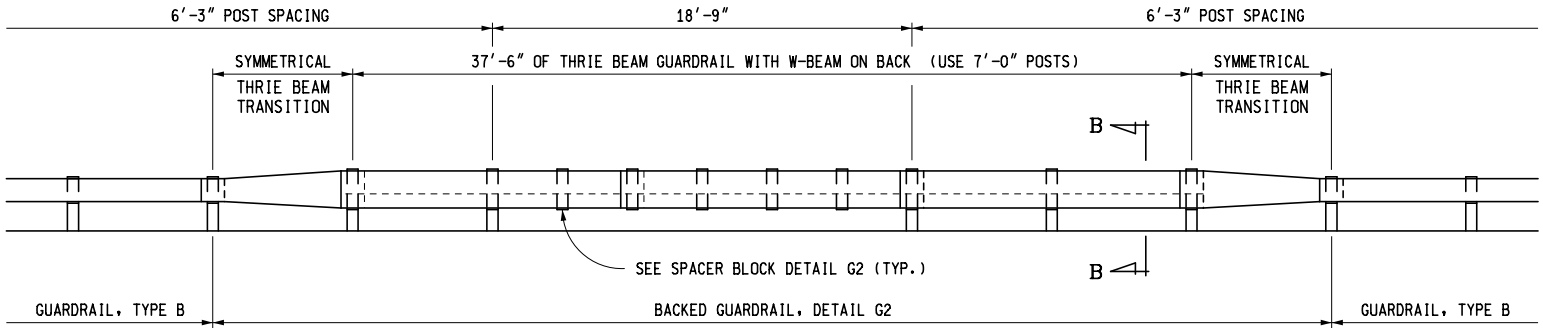
2-7-2019
PLAN DATE

R-72-D

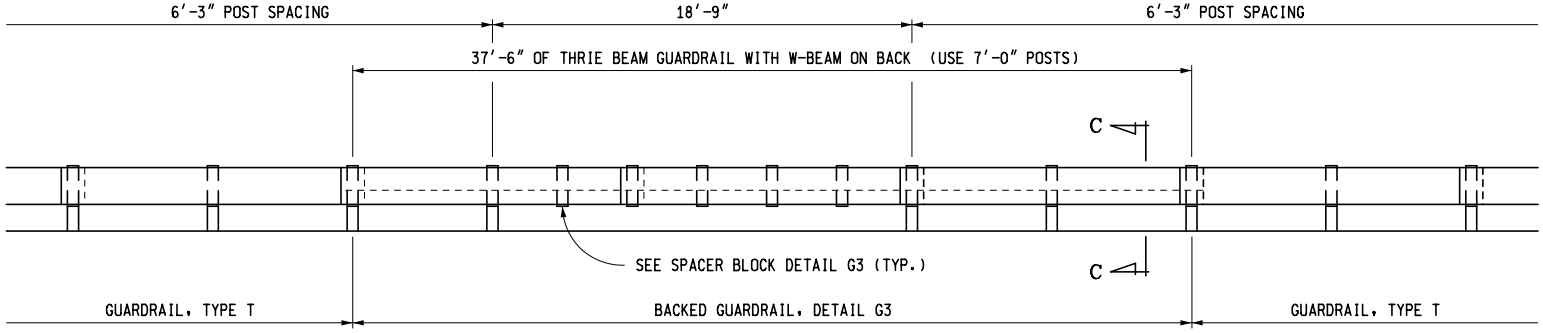
SHEET 6 OF 11



PLAN VIEW (18'-9" SPAN)



W-BEAM BACKED GUARDRAIL, TYPE T (18'-9" SPAN)

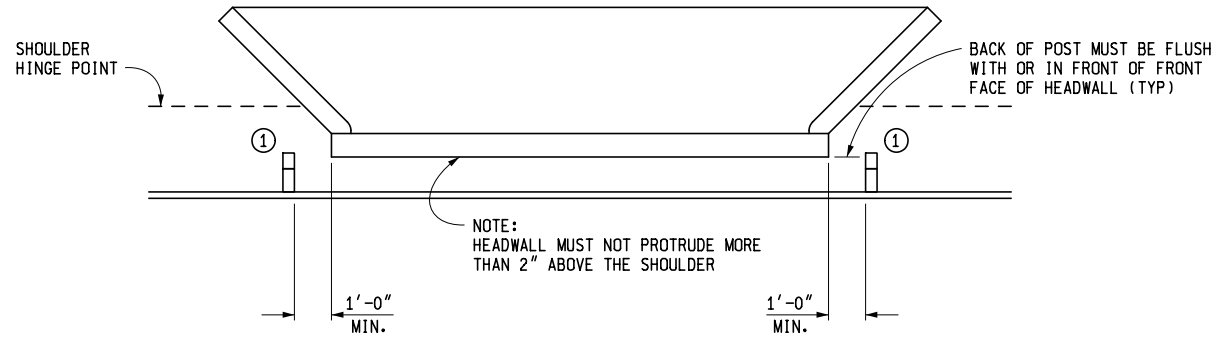


W-BEAM BACKED GUARDRAIL, TYPE T (18'-9" SPAN)

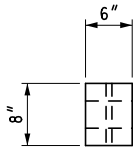
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

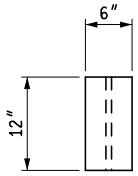
F.H.W.A. APPROVAL	2-7-2019 PLAN DATE	R-72-D	SHEET 7 OF 11



POST PLACEMENT DETAIL



PLAN



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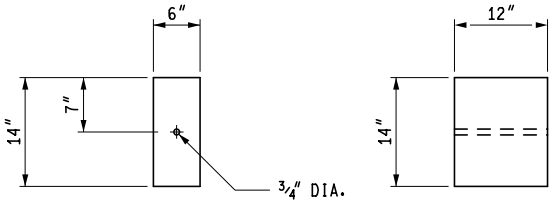
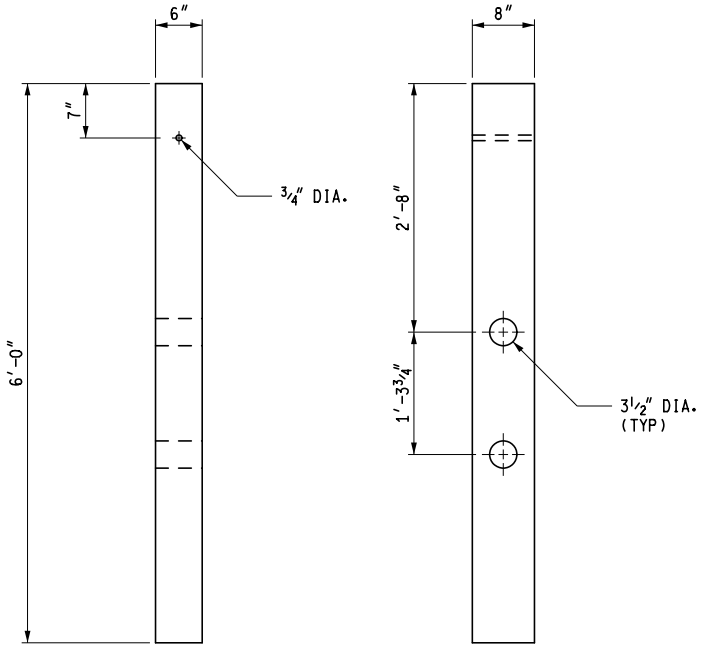


FRONT SIDE

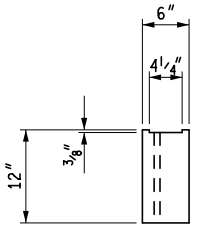
MGS 12" OFFSET BLOCK

FOR USE ON WOOD POSTS



FRONT SIDE

MGS-CRT POST



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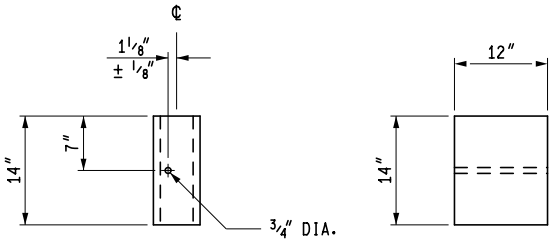


FRONT SIDE

MGS 12" OFFSET BLOCK

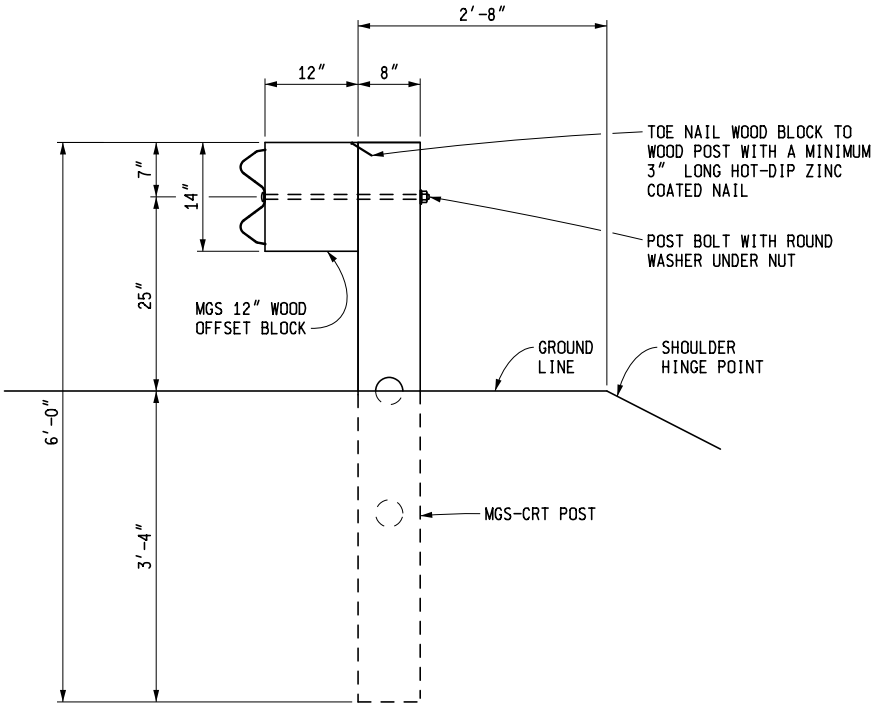
FOR USE ON STEEL POSTS

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

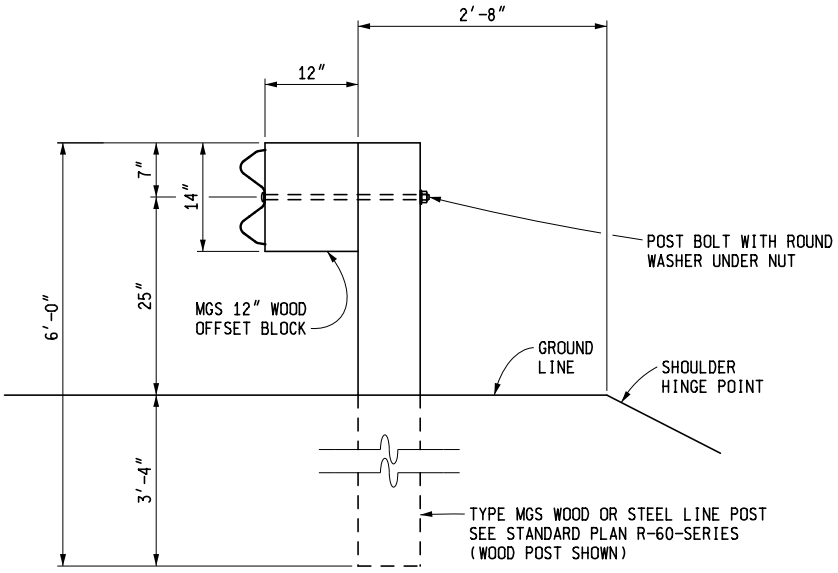
W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

F.H.W.A. APPROVAL	2-7-2019 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

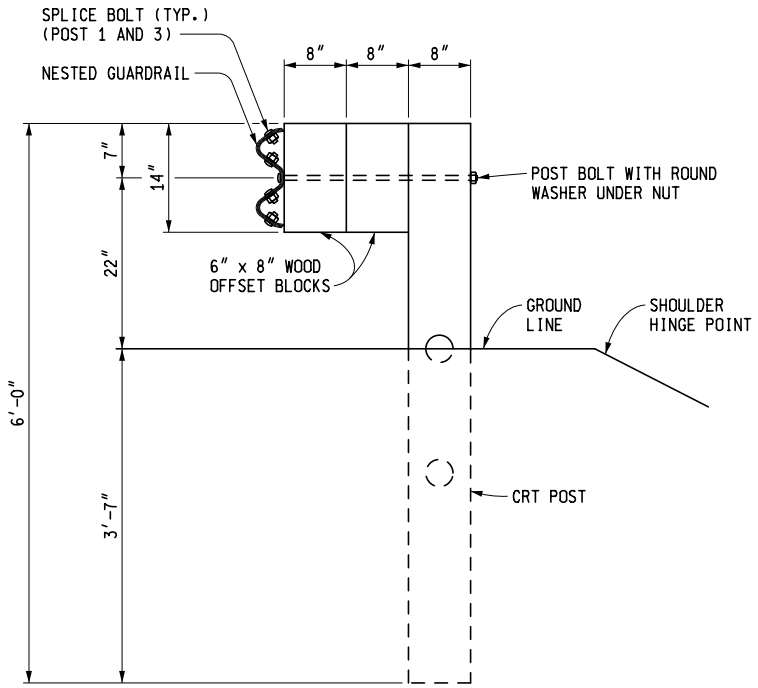
GUARDRAIL LONG SPAN DETAIL MGS-3

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

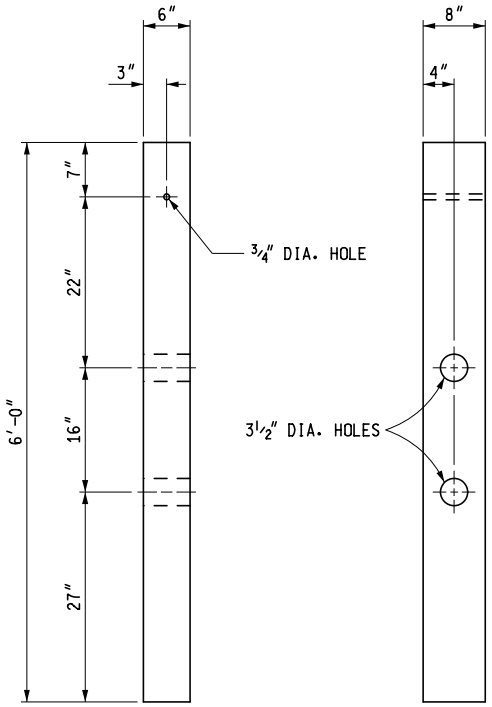
W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

F.H.W.A. APPROVAL	2-7-2019 PLAN DATE	R-72-D	SHEET 9 OF 11

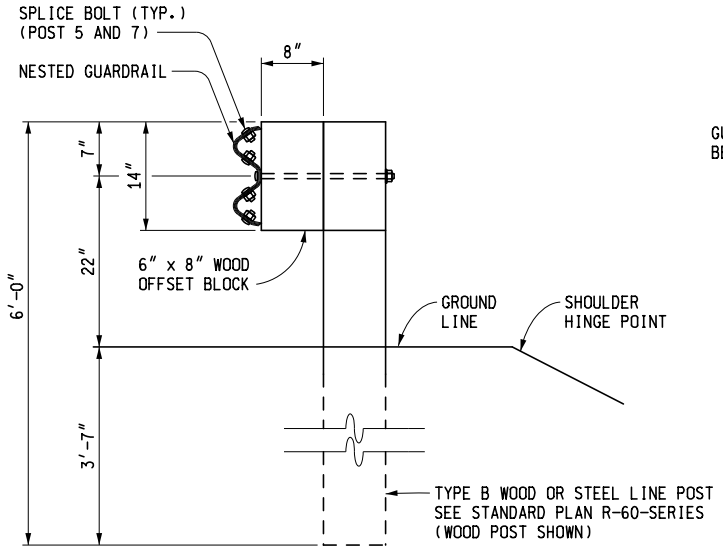


POST 1 THROUGH 3 DETAIL

GUARDRAIL LONG SPAN DETAIL B-25

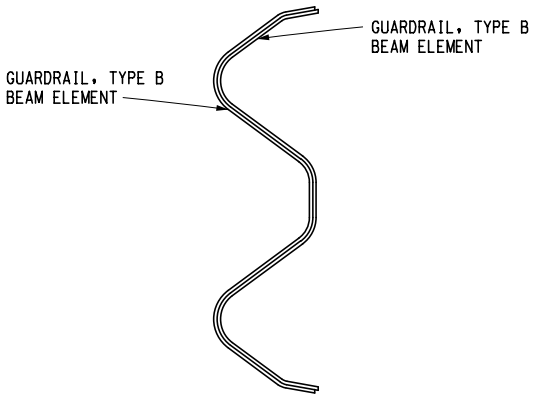


CONTROLLED RELEASING
TERMINAL POST
(CRT)



POST 4 THROUGH 7 DETAIL

GUARDRAIL LONG SPAN DETAIL B-25



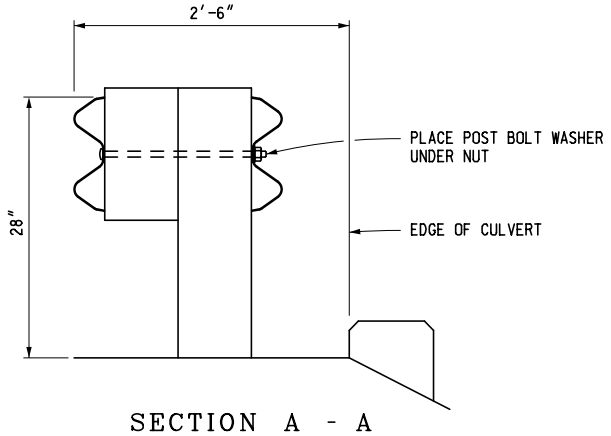
NESTED GUARDRAIL
DETAIL

MICHIGAN DEPARTMENT OF TRANSPORTATION

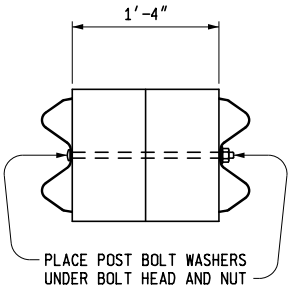
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

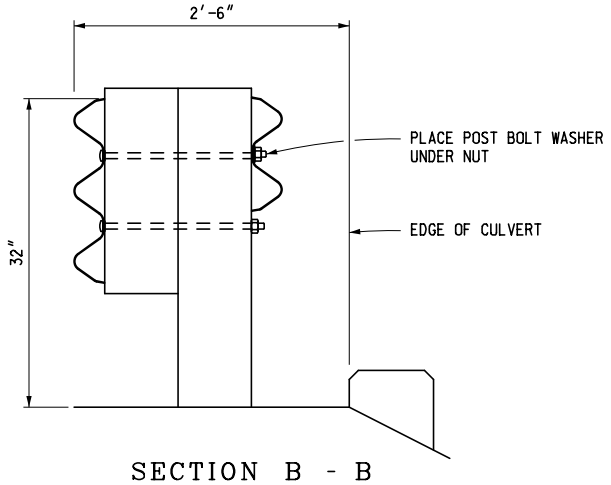
F.H.W.A. APPROVAL	2-7-2019 PLAN DATE	R-72-D	SHEET 10 OF 11



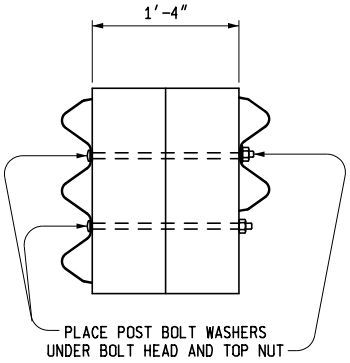
SECTION A - A



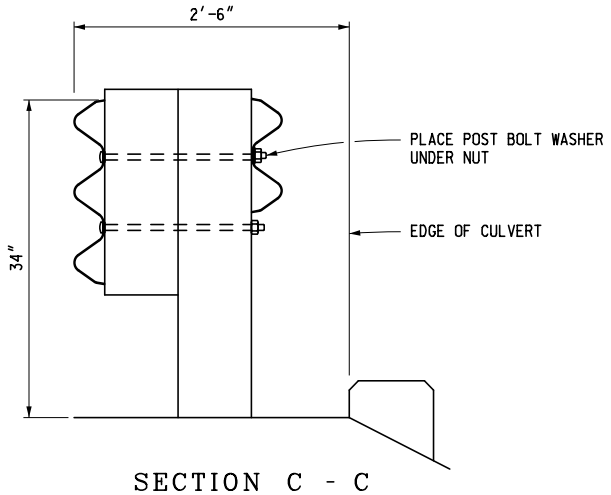
SPACER BLOCK DETAIL G1



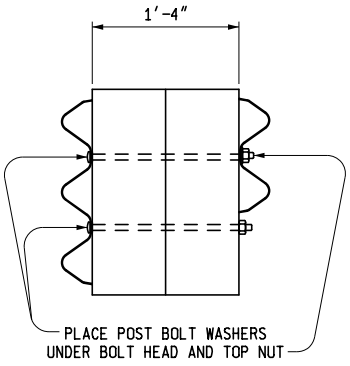
SECTION B - B



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.

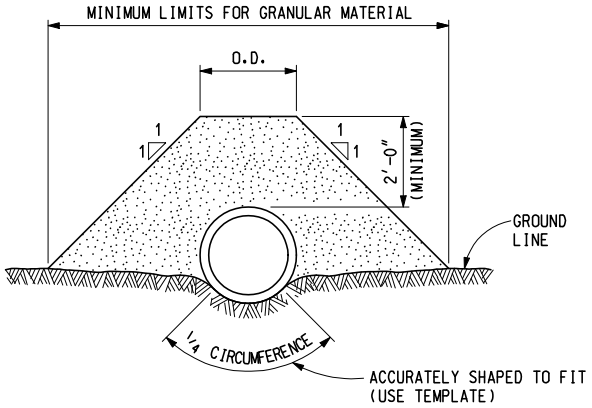
MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

W-BEAM BACKED GUARDRAIL AND GUARDRAIL LONG SPAN INSTALLATIONS

F.H.W.A. APPROVAL	2-7-2019 PLAN DATE	R-72-D	SHEET 11 OF 11

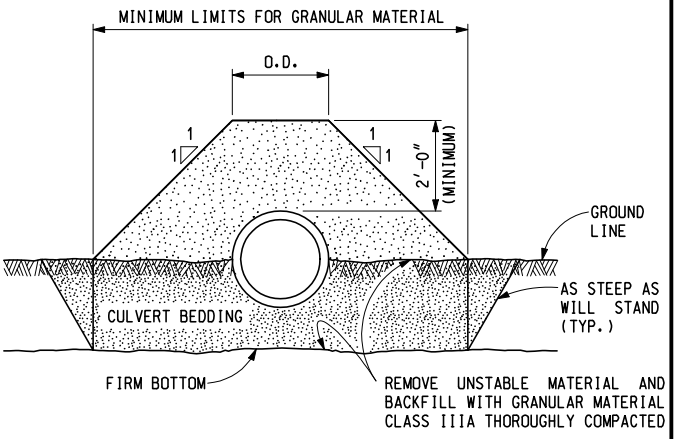
EMBANKMENT BETWEEN GROUND LINE AND 2′-0″ MINIMUM ABOVE TOP OF PIPE CULVERT SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA COMPACTED TO 95% OF ITS MAXIMUM UNIT WEIGHT. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10″ IN THICKNESS.



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

CROSS-SECTION SHOWING CULVERT INSTALLATION IN STABLE SOIL

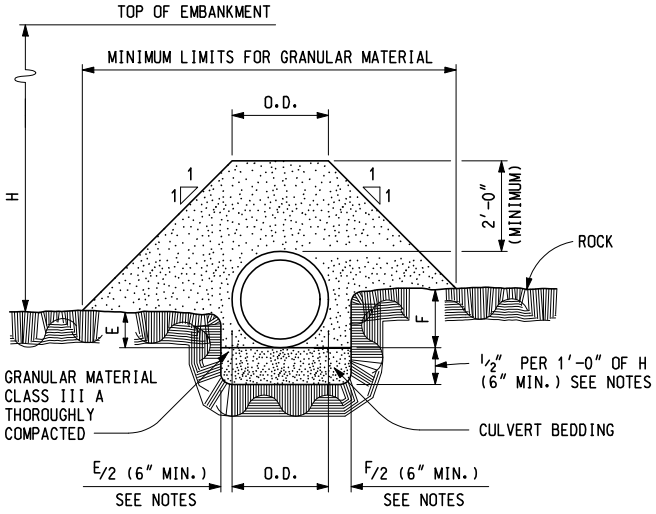
EMBANKMENT BETWEEN GROUND LINE AND 2′-0″ MINIMUM ABOVE TOP OF PIPE CULVERT SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA COMPACTED TO 95% OF ITS MAXIMUM UNIT WEIGHT. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10″ IN THICKNESS.



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

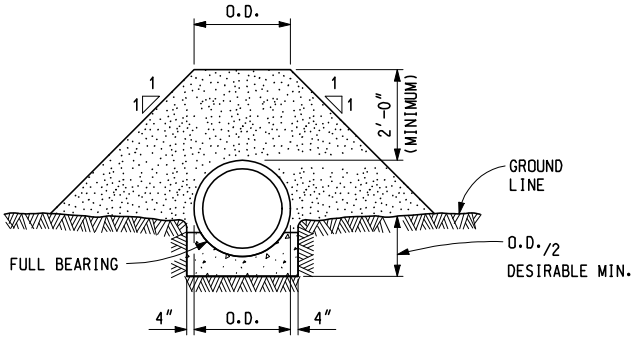
ENGINEER OF DEVELOPMENT

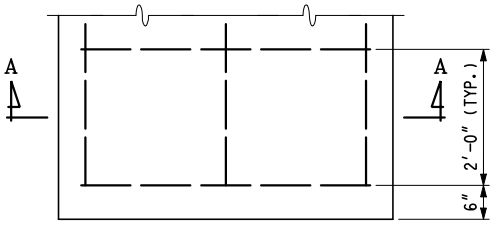
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

BEDDING AND FILLING AROUND PIPE CULVERTS

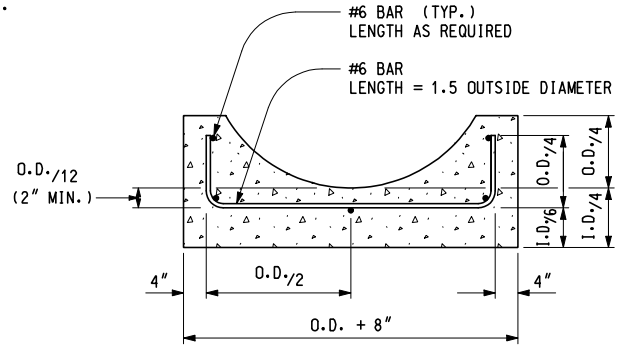
11-14-2003	6-25-2002	R-82-D	SHEET 1 OF 2
F.H.W.A. APPROVAL	PLAN DATE		

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

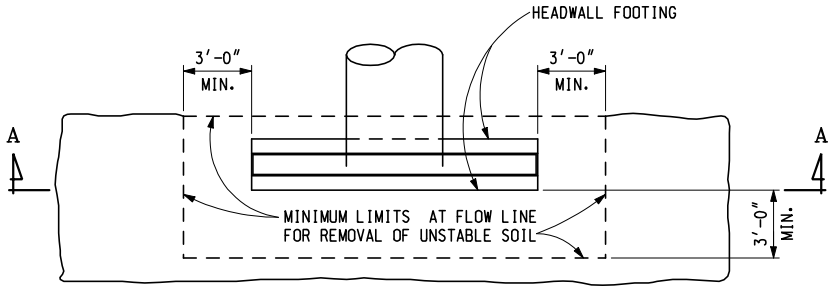
ALL CONCRETE SHALL BE GRADE M.

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.

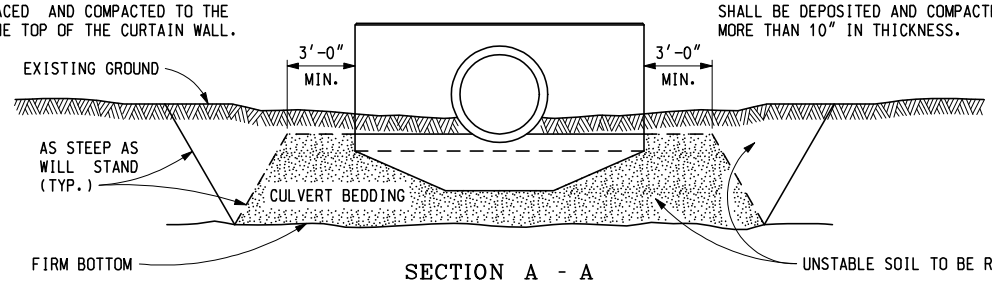
CULVERT INSTALLATION WITH CONCRETE CRADLE



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

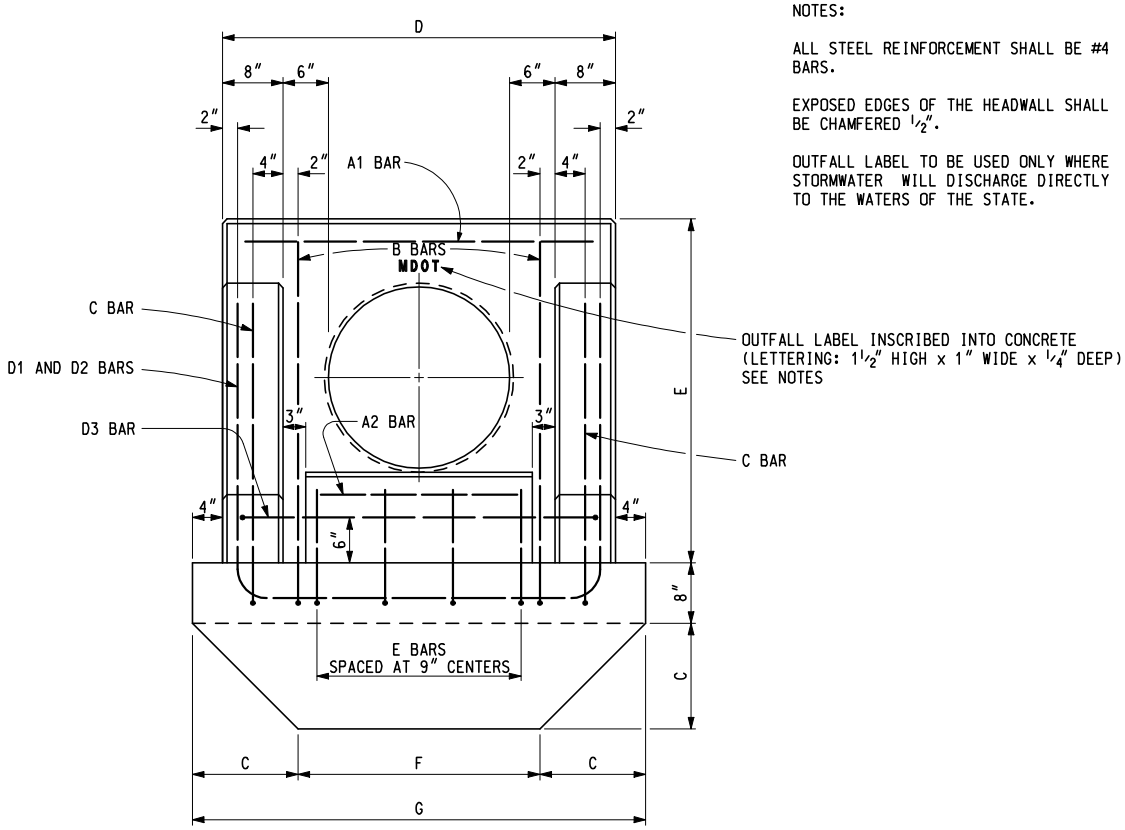
11-14-2003 F.H.W.A. APPROVAL	6-25-2002 PLAN DATE	R-82-D	SHEET 2 OF 2

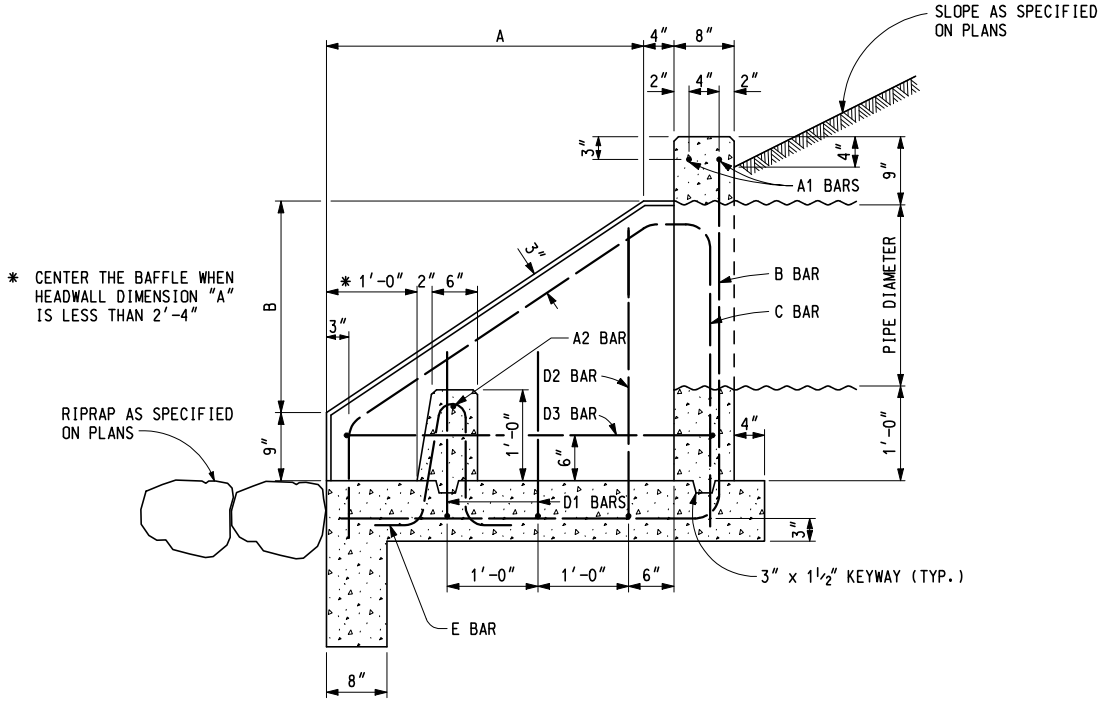
NOTES:

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.

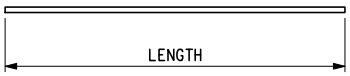




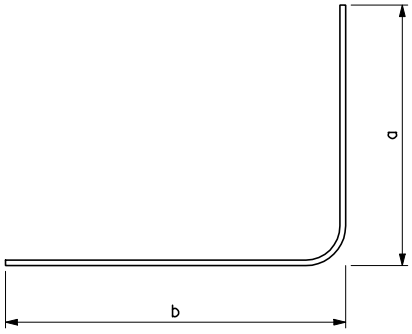
* CENTER THE BAFFLE WHEN HEADWALL DIMENSION "A" IS LESS THAN 2'-4"

OUTLET HEADWALL
(SHOWN WITH BAFFLE)

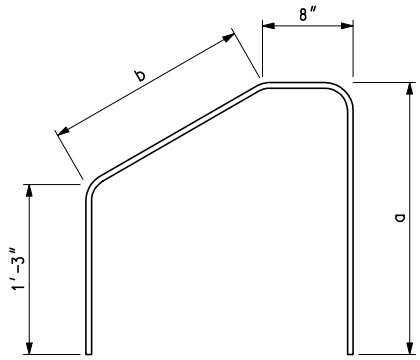
MDOT Michigan Department of Transportation PREPARED BY DESIGN SUPPORT AREA DRAWN BY: B.L.T. CHECKED BY: W.K.P.	DEPARTMENT DIRECTOR Gloria J. Jeff APPROVED BY: John C. Friend ENGINEER OF DELIVERY APPROVED BY: ENGINEER OF DEVELOPMENT	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR OUTLET HEADWALLS		
		11-17-2005 F.H.W.A. APPROVAL	4-21-2005 PLAN DATE	R-85-D SHEET 1 OF 2



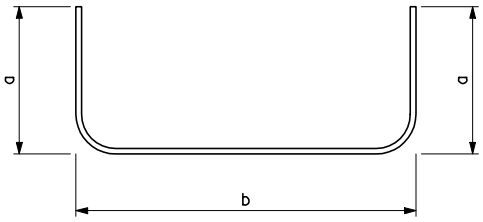
A BAR



B BAR

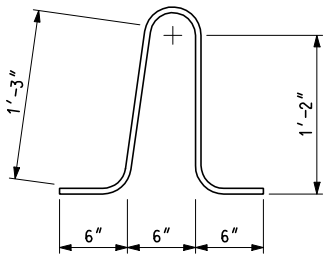


C BAR



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

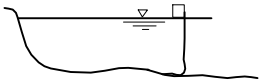
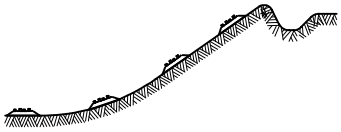
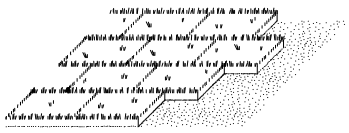
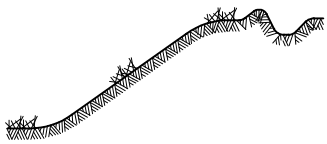
C = SURFACE DRAINAGEWAYS

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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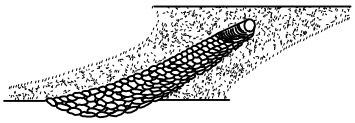
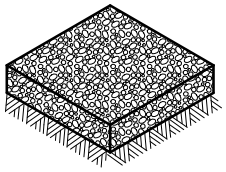
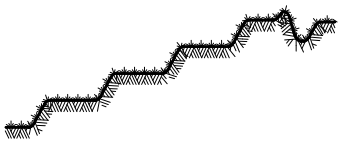
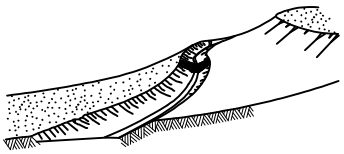
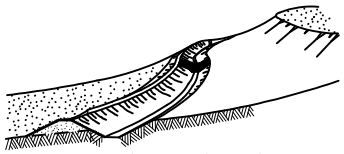
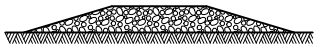
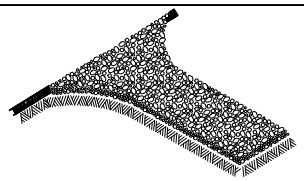
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SOIL EROSION & SEDIMENTATION CONTROL MEASURES

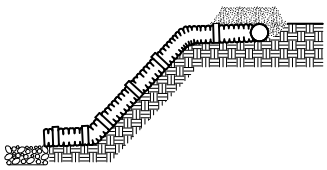
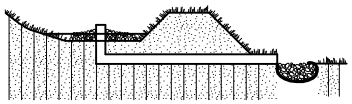
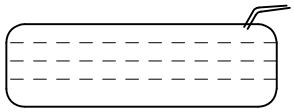
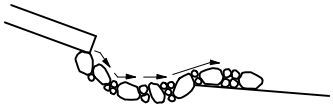
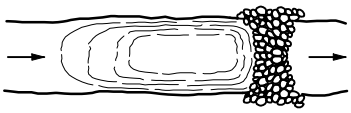
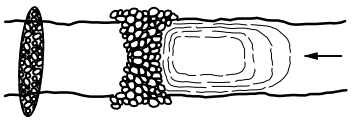
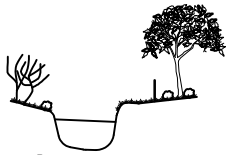
9-10-2010	6-3-2010	R-96-E	SHEET
F.H.W.A. APPROVAL	PLAN DATE		1 OF 6

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

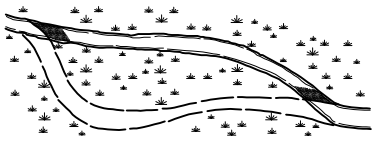
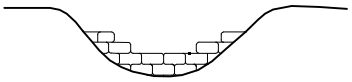
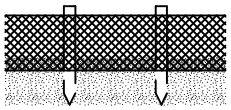
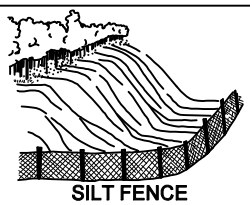
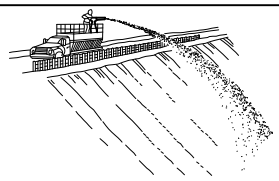
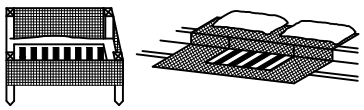
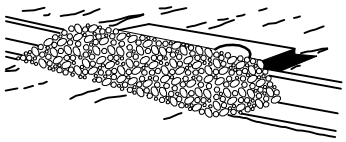
9-10-2010 F.H.W.A. APPROVAL	6-3-2010 PLAN DATE	R-96-E	SHEET 2 OF 6

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

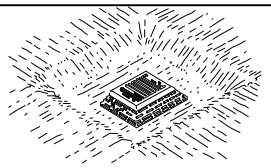
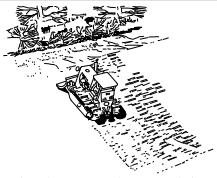
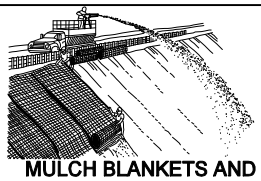
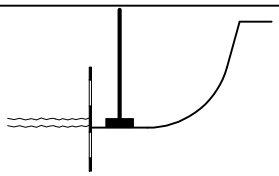
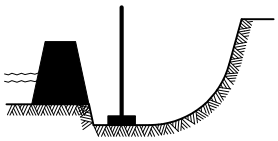
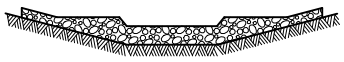
9-10-2010 F.H.W.A. APPROVAL	6-3-2010 PLAN DATE	R-96-E	SHEET 3 OF 6

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.

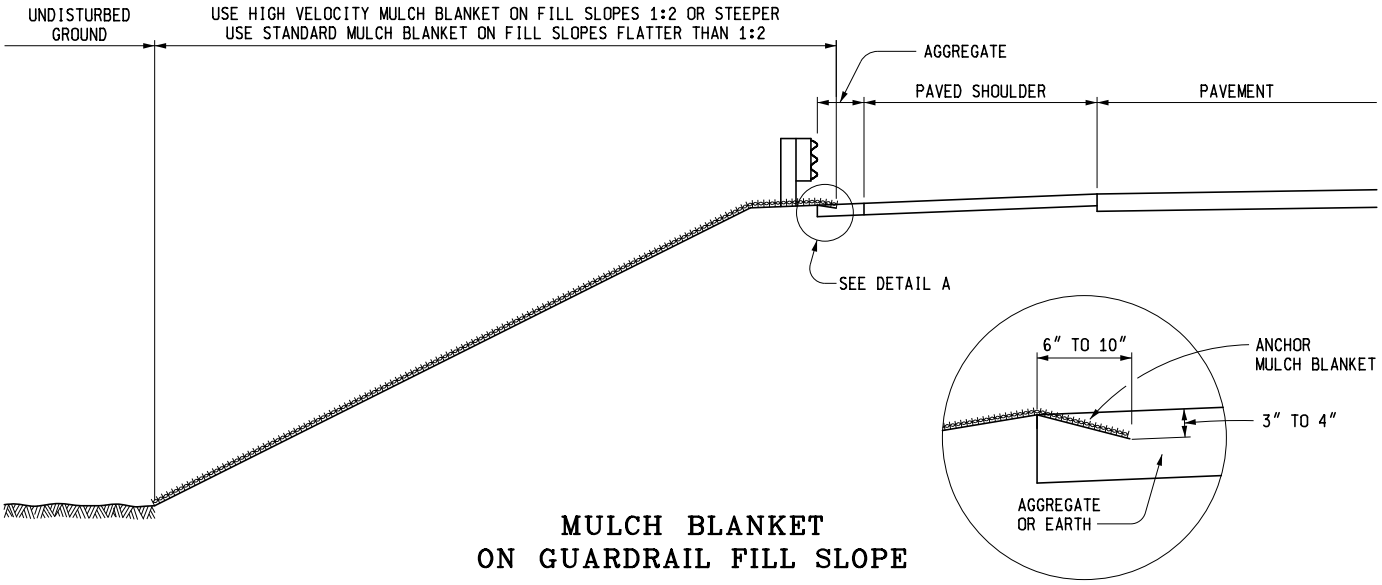
ALL TEMPORARY EROSION CONTROL DEVICES SHALL BE REMOVED AFTER VEGETATION ESTABLISHMENT OR AT THE DISCRETION OF THE ENGINEER. CARE SHALL BE TAKEN DURING REMOVAL TO MINIMIZE SILTATION IN NEARBY DRAINAGE COURSES.

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

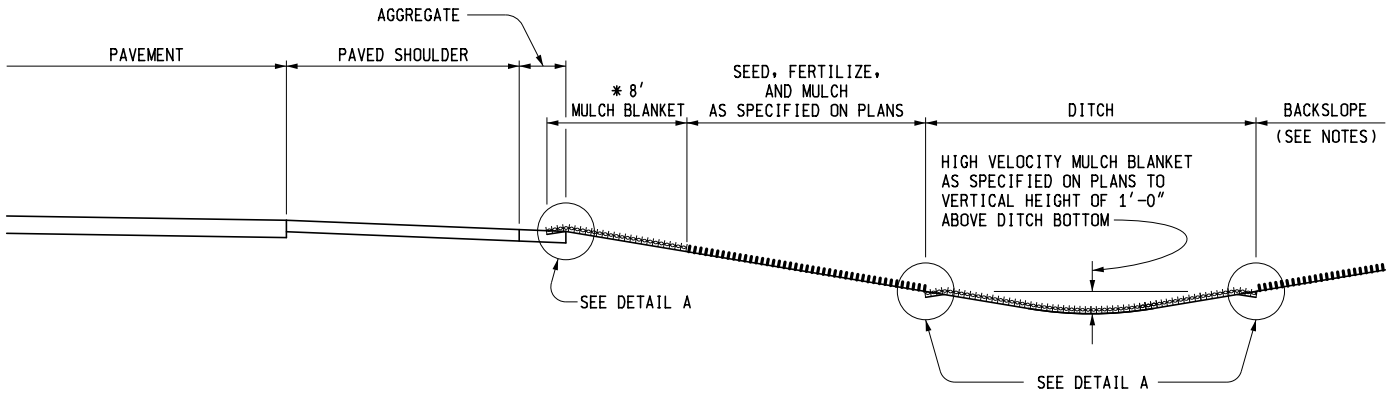
SOIL EROSION & SEDIMENTATION CONTROL MEASURES

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

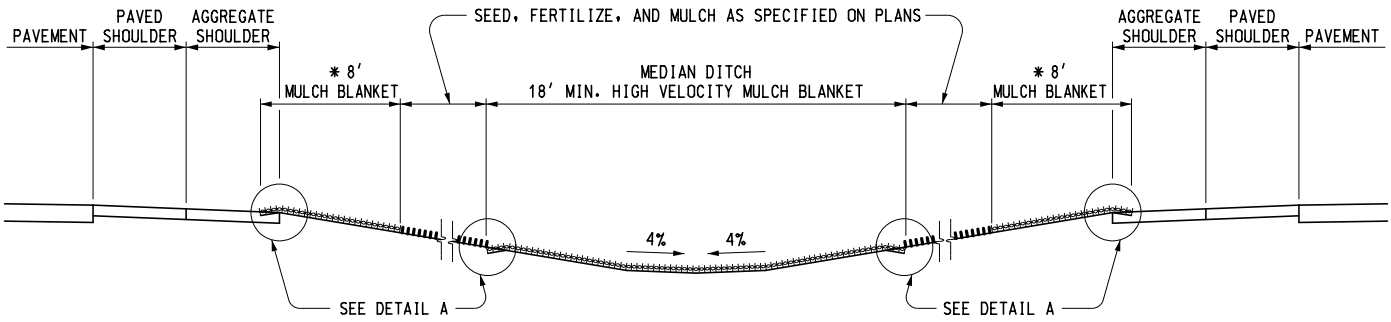


MULCH BLANKET ON GUARDRAIL FILL SLOPE

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.

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DEPARTMENT DIRECTOR
Kirk T. Steudle

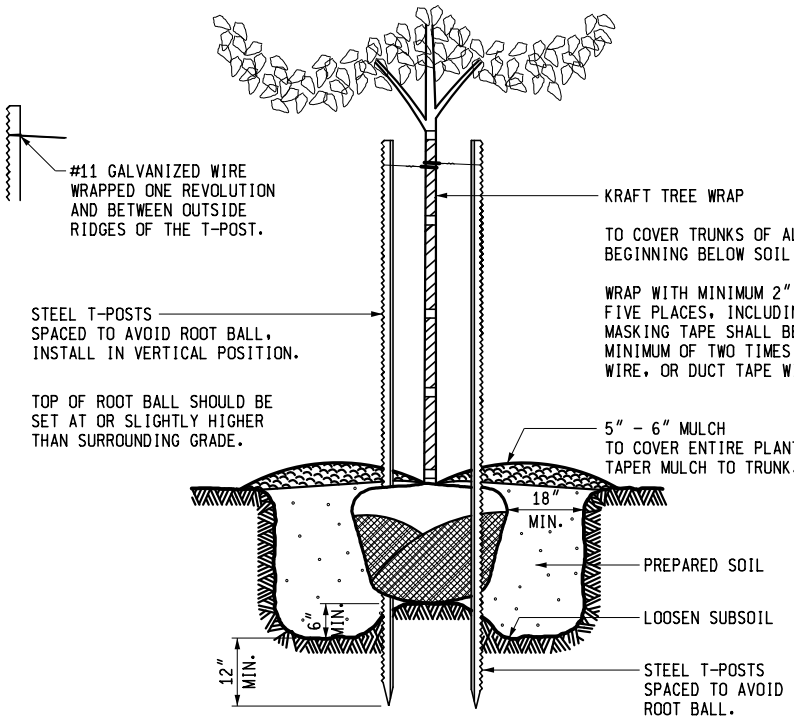
APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

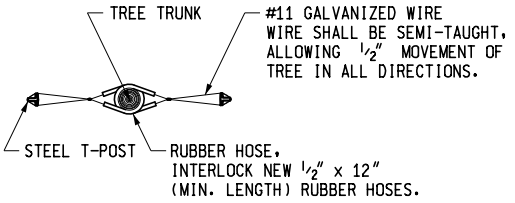
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SEEDING AND TREE PLANTING

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



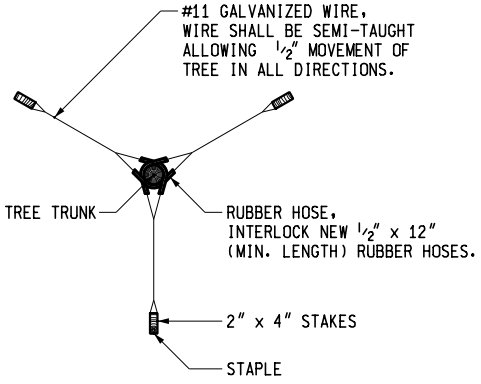
BRACING - VERTICAL STAKES



BRACING DETAIL

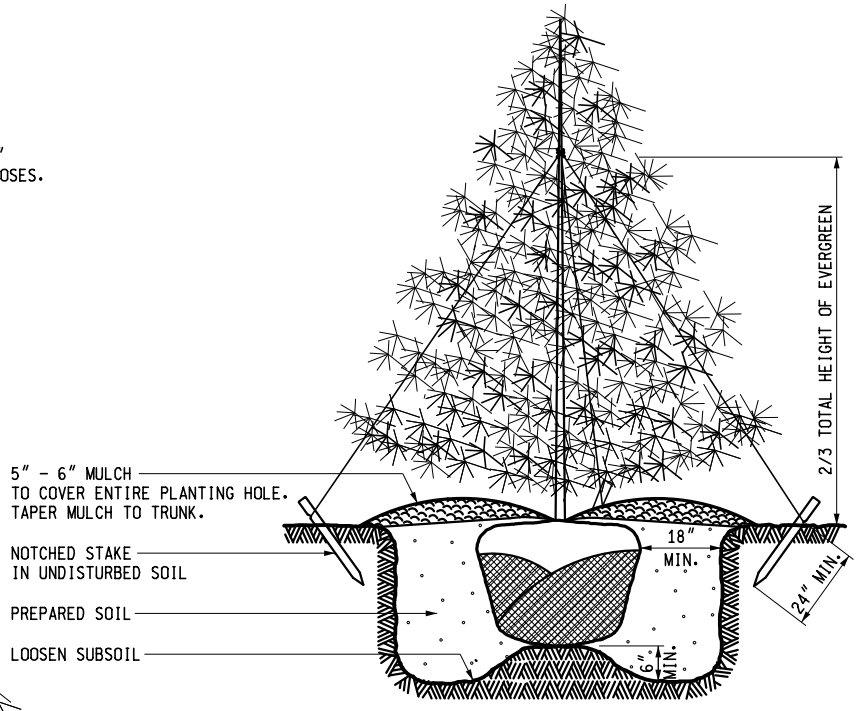
BRACE DECIDUOUS TREES 2" TO 4" IN CALIPER OR 8' OR MORE IN HEIGHT WITH TWO STAKES.

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

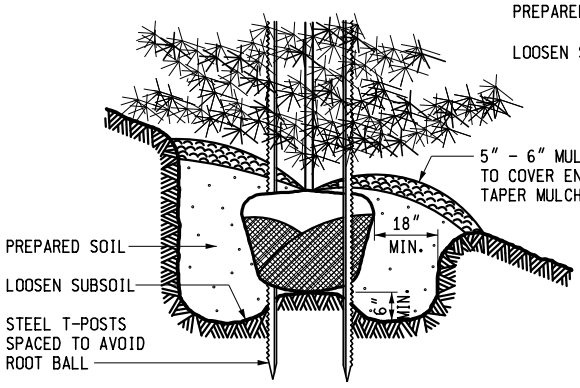


TRIPOD GUYING DETAIL

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



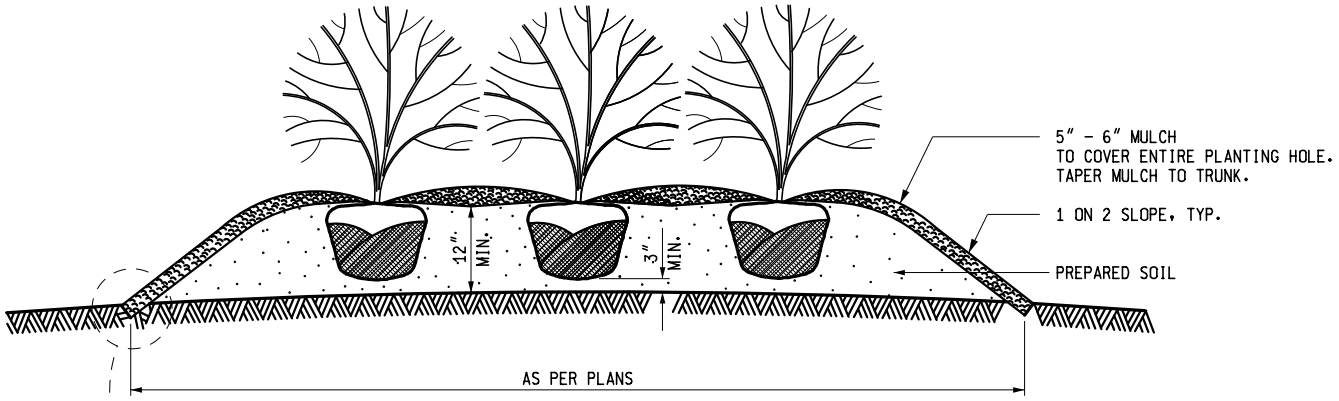
SLOPE PLANTING

MICHIGAN DEPARTMENT OF TRANSPORTATION

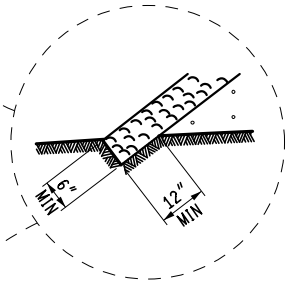
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SEEDING AND TREE PLANTING

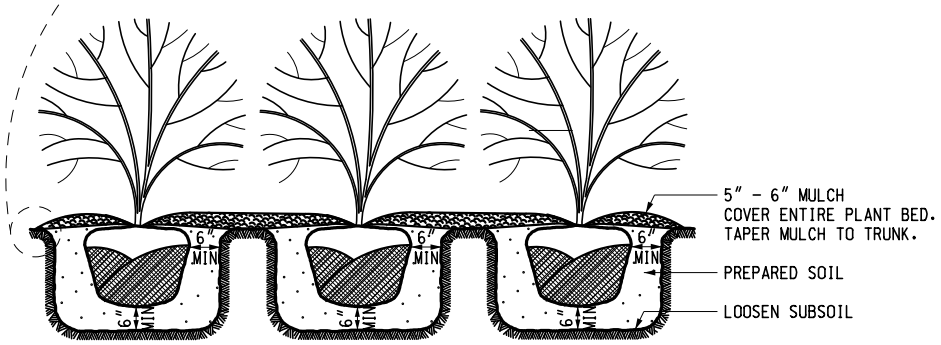
9-30-2014 F.H.W.A. APPROVAL	9-26-2013 PLAN DATE	R-100-H	SHEET 2 OF 4



RAISED SHRUB BED DETAIL



SHRUB BED EDGING DETAIL



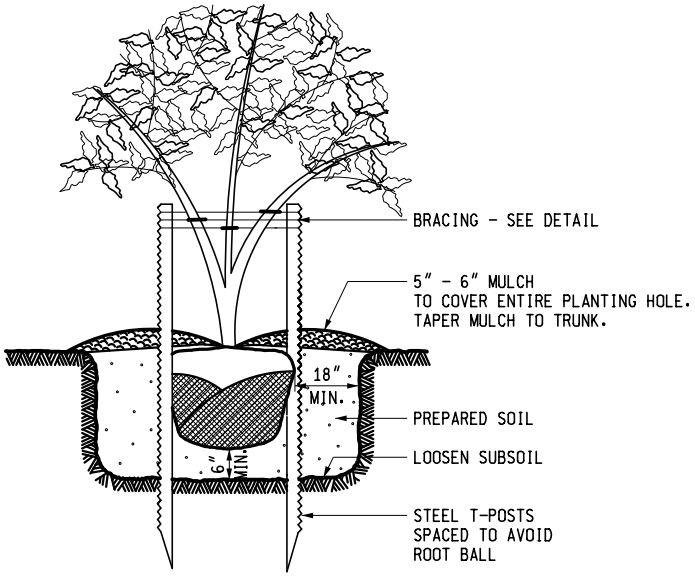
SHRUB BED DETAIL

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.

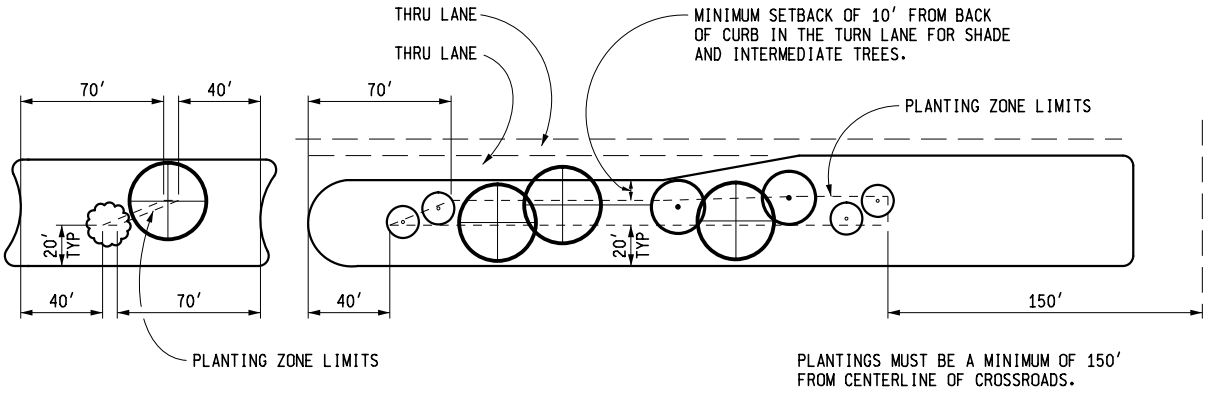
TREE HEIGHTS ARE SHOWN BEFORE PRUNING. TREE PLANTING DEPTHS ARE SHOWN AFTER SETTLING.

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

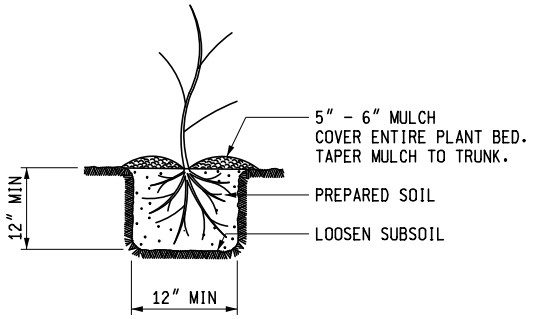
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SEEDING AND TREE PLANTING

9-30-2014 F.H.W.A. APPROVAL	9-26-2013 PLAN DATE	R-100-H	SHEET 3 OF 4



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.

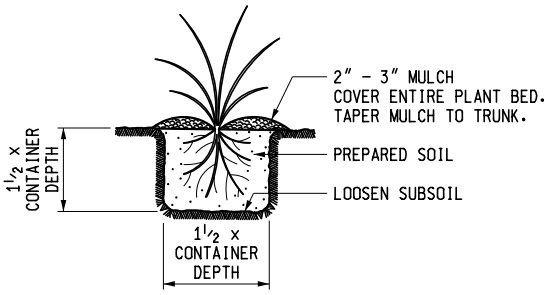
ROOT PRUNE AS NECESSARY TO REMOVE ALL DAMAGED OR BROKEN ROOTS, AND AS REQUIRED BY THE DISTRICT FORESTER OR RESOURCE SPECIALIST.

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

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
ADJUSTING OR RECONSTRUCTING GUARDRAIL

OPR:CT 1 of 4 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.**

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
CRUSHED CONCRETE NEAR WATER

CFS:JFS 1 of 1 APPR:KAS:DBP:02-24-12
FHWA:APPR:02-24-12

Add the following paragraph after the first paragraph of Subsection 902.05 on page 743 of the Standard Specifications for Construction:

The use of crushed concrete is prohibited on the project within 100 feet of any water course (stream, river, county drain, etc.) and lake, regardless of the application or location of the water course or lake relative to the project limits.

Add the following paragraph after the first paragraph of Subsection 902.06 on page 743 of the Standard Specifications for Construction:

The use of crushed concrete is prohibited on the project within 100 feet of any water course (stream, river, county drain, etc.) and lake, regardless of the application or location of the water course or lake relative to the project limits.

Add the following paragraph after the fourth paragraph of Subsection 902.07 on page 744 of the Standard Specifications for Construction:

The use of crushed concrete is prohibited on the project within 100 feet of any water course (stream, river, county drain, etc.) and lake, regardless of the application or location of the water course or lake relative to the project limits.