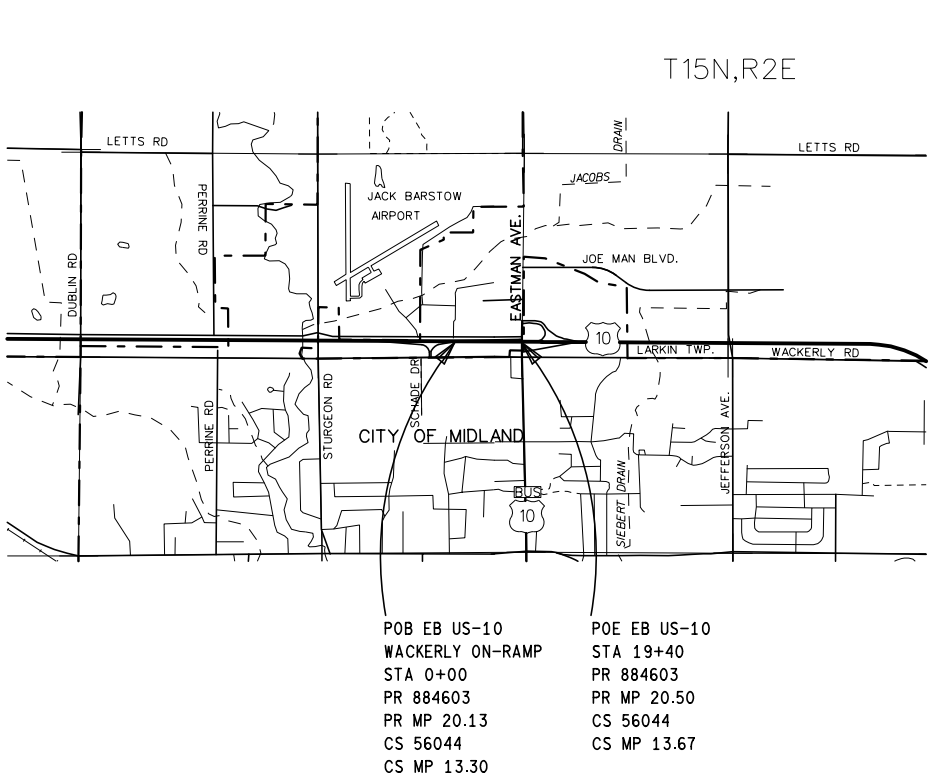


# MICHIGAN DEPARTMENT OF TRANSPORTATION

ROUTE: EB US-10  
CITY OF MIDLAND  
MIDLAND COUNTY

SECTION	CONTROL SEC	JOB NO.	FEDERAL PROJECT	ITEM
	56044	15-5602		

ROAD	YEAR	TRAFFIC DATA			SPEED DATA		LIMITS OF TRAFFIC DATA
		ADT	DHV	COMM	DESIGN	POSTED	
EB US-10	2012	17100	1280	9%	75	70	EB US-10 FROM STARK RD TO BUS US-10 (EASTMAN AVE)



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 # 14.

MILES: 0.37  
CONTRACT FOR:  
CURB AND GUTTER, DOWNSPOUTS, SPILLWAYS, AND GUARDRAIL RECONSTRUCT



KIRK T. STEUDLE, P.E. - DIRECTOR

DATE: 6/29/15  
DESIGN UNIT: MYERS  
TSC: MT PLEASANT

DRAWING	SHEET
	1

# LOG OF PROJECT

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C.S. 56044

J.N. 15-5602

## **PROGRESS SCHEDULE**

Work may start immediately after receiving approval from MDOT (estimated date: Aug 3, 2015) and the project must be completed by September 28, 2015. Work shall commence on a Monday and be completed within 21 consecutive calendar days. Notice must be provided to Jason Potts at 989-737-0211 three (3) calendar days prior to beginning any work.

## **JOB LOCATION**

Begins in the City of Midland, Midland County on the south side of the Wackerly Road EB US-10 On-Ramp (just past EB US-10 Exit 122) at the beginning of the guardrail section and extends easterly to 37' west of the West Reference Line of S07 of 56044 (EB US-10 over US-10 BR (Eastman Rd)).

### **CS Information**

CS 56044 MP 13.3 to MP 13.67 (EB US-10)

### **PR Information**

PR 884603 MP 20.13 to 20.50 (EB US-10)

Location Length = 0.37 miles

## **DESCRIPTION OF WORK**

The work shall consist of reconstructing the guardrail per the attached Special Provision and placing concrete curb and gutter at the designated areas. Downspouts with concrete headers shall be constructed per Standard Plan R-32 series. Outlet headwalls with baffles shall be constructed per Standard Plan R-85 series. Place outlet headwalls before the tree line, where applicable, and run riprap to the ditch. Concrete shoulder gutters and concrete spillways shall be constructed per Standard Plan R-35-C. Adjust stations of downspouts and spillways as needed to fit between existing guardrail posts. One existing downspout shall be removed, as specified in the table below. One existing HMA spillway shall be removed, as specified in the table below. This is included in the estimated quantity for HMA Surface, Rem. Any existing washout areas shall be filled with embankment and slope restoration. Riprap and drainage markers will be placed at each downspout outlet. Slope restoration will be placed in all of the disturbed areas. Place silt fence between each downspout/spillway location and the ditch to catch any sediment runoff during construction.

## **ESTIMATED QUANTITIES**

The quantities included in the summations below are approximate and for reference only. Contractor will be responsible for verifying quantities before bidding by site inspection and plan review. If any major discrepancies are noted, contractor must contact Krista Hickman at (989) 245-2173.

**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.**

# LOG OF PROJECT

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C.S. 56044

J.N. 15-5602

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
Embankment, CIP	400 Cyd
Excavation, Earth	60 Cyd
Culv, Rem	25 Ft
Culv, Cl A, 12"	100 Ft
Dr Marker Post	4 Ea
Conc, Grade S2	3.2 Cyd
Reinforcement, Steel, Culv and Headwall	160 Lb
Curb and Gutter, Conc, Det D2	1,940 Ft
Shoulder Gutter, Conc, Det 1	3 Ea
Shoulder Gutter, Conc, Det 2	1 Ea
Spillway, Conc	18 Ft
Downspout Header, Conc	4 Ea
Guardrail, Reconst, Type T	1,940 Ft
Riprap, Plain	100 Syd
Slope Restoration, Type C	1500 Syd
Slope Restoration, Type D	220 Syd
Trenching	20 Sta
Erosion Control, Silt Fence	150 Ft

# LOG OF PROJECT

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## Tables (For Information Only)

EB US-10							
Station	Down-spout (Ea)	Culvert Length (Ft)	Spillway (Ea)	Spillway Length (Ft)	Slope Rest Type D (Syd)	Riprap Qty (Syd)	Comments
00+00			1	8	16	5	Start of guardrail. Place shoulder gutter and spillway. Begin curb and gutter.
02+20					35		Ex downspout to remove
02+60	1	20			30	5	Place new downspout with conc header, and outlet headwall.
05+50	1	26			35	5	Place new downspout with conc header, and outlet headwall.
08+20	1	29			40	5	Place new downspout with conc header, and outlet headwall.
11+00	1	23			32	5	Place new downspout with conc header, and outlet headwall.
13+05			1	6	15	65	Place new concrete shoulder gutter and spillway. Place riprap to ditch (approx. 70')
14+75			1	3	10	0	Remove ex HMA spillway. Construct new concrete shoulder gutter and spillway.
17+00			1	1	7	10	Place new concrete shoulder gutter and spillway. Place 11' of riprap.
19+40							Ex Downspout on bridge to remain. End curb and gutter, blend into existing curb and gutter on bridge.

# **LOG OF PROJECT**

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## **MAINTAINING TRAFFIC**

### **Traffic Restrictions**

Maintaining traffic will be accomplished with shoulder closures and traffic shifts utilizing Maintaining Traffic Typical M0020a, M0070a, M0880a, and M0990a. 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.

The Contractor shall not create any unsafe conditions within the Construction Influence Area (CIA) that form a hazard for motorists. The CIA shall extend as far as the required advanced construction signing, detour 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.

All lanes on EB US-10 must be open to traffic from Saturday at 3:00pm through Monday at normal starting time.

No work shall be performed or lane closures/traffic shifts allowed during the Labor Day holiday period starting from Thursday at noon until Tuesday at normal starting time.

Once work is initiated that includes any lane restrictions, that work shall be continuous until completed. A lack of work activity for more than two calendar days will require the removal and replacement of lane or shoulder restrictions, at the Contractor's expense.

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](http://elocate.missdig.org) for single address or [rte.missdig.org](http://rte.missdig.org), a minimum of 3 business days prior to excavating, excluding weekends and holidays.

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J.N. 15-5602

## OLD ROAD PLANS

The following old road plans were referred to in the design of this project.

Job No. 31290

In addition, other old road plans that predate this project may be available. These plans may be reviewed in the Transportation Service Center (TSC) during normal working hours.

## 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 and Gutter .....	R-30-G
Approach Curb & Gutter, Downspouts .....	R-32-E
Concrete Shoulder Gutter and Spillway .....	R-35-C
Guardrail Types A, B, BD, T, and TD .....	R-60-I
Guardrail Approach Terminal Types 1B & 1T .....	R-61-G
Guardrail Anchorage, Bridge, Details .....	R-67-F
Outlet Headwalls.....	R-85-D
Ground Driven Sign Supports for Temp Signs.....	WZD-100-A*
Temporary Traffic Control Devices.....	WZD-125-E*

*\* indicates Special Detail*

## PUBLIC UTILITIES

### Utility Owner

AT&T  
136 E. 4th St.  
Clare, Michigan 48617  
Ph: 989-980-7801(W)  
Attn: Rob Augustine

### Type of Utility

Telecom

# LOG OF PROJECT

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C.S. 56044

J.N. 15-5602

## Utility Owner

## Type of Utility

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: 989-837-3353(W)  
Attn: Brian McManus

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: Kevin Couturier

Gas

Consumers Energy  
1945 West Parnall Road, P23-228  
Jackson, Michigan 49201  
Ph: 517-788-0998(W)  
Attn: Timothy Coppernoll

Gas

DOW Chemical Co.  
921 Building  
Midland, Michigan 48667  
Ph: 989-636-6779(W)  
Attn: Martin Hill

Other

# LOG OF PROJECT

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C.S. 56044

J.N. 15-5602

## Utility Owner

## Type of Utility

METC

Electric

27175 Energy Way  
Novi, Michigan 48377  
Ph: 248-946-3298(W)  
Attn: Erin Keeler

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

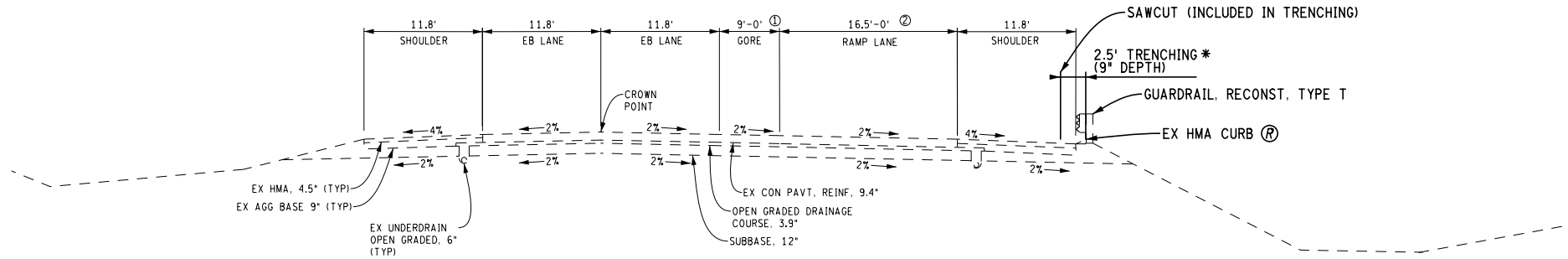
Windstream KDL  
4074 S. Linden Road  
Flint, Michigan 48507  
Ph: 810-691-1035(W)  
Attn: Dirk Welte

Telecom



US-10 E

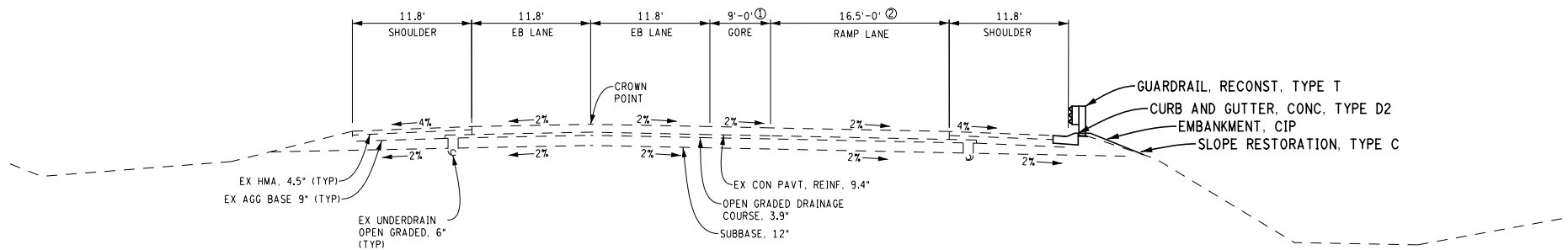
EX LA ROW VARIES



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

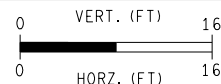
US-10 E

EX LA ROW VARIES



① GORE SECTION APPLIES:  
9' AT STA 0+00 TO 0' AT STA 2+85

② RAMP LANE APPLIES:  
16.5' FROM STA 0+00 TO STA 2+85  
16.5' AT STA 2+85 TO 0' AT STA 18+06



DATE: 6/29/15

DESIGN UNIT: MYERS

TSC: MT PLEASANT

CS: 56044

JN: 15-5602

TYPICAL SECTIONS

DRAWING SHEET

SECT 1

9

FILE:

MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
  
SPECIAL PROVISION  
FOR  
**ADJUSTING OR RECONSTRUCTING GUARDRAIL**

OPR:CT

1 of 4

C&T:APPR:JKG:DBP:06-27-06  
FHWA:APPR:06-01-11

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

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

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

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

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

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

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

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

**c. Construction.**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1. Removal of existing guardrail, w-beam backed guardrail, guardrail approach terminals, guardrail departing terminals, thrie-beam retrofits, and guardrail anchorages.
2. Furnishing, as necessary, new posts, offset blocks, spacer blocks, wood blockouts, bolts, reflectors, and other pertinent fittings.
3. Backfilling old postholes.
4. Field drilling beam elements and repairing damaged galvanized surfaces.
5. Drilling holes in bridge railings, concrete barriers, and other concrete structures.
6. Transporting beam elements within the project limits.
7. Dismantling, separating and stockpiling elements and disposing of waste or scrap material.

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

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

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

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

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

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

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

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

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

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

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

MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
  
SPECIAL PROVISION  
FOR  
**SLOPE RESTORATION, FREEWAY**

C&amp;T:DMG

1 of 3

C&amp;T:APPR:TWK:DBP:04-25-12

**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:

<b>Property</b>	<b>Test Method</b>	<b>Requirement</b>
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

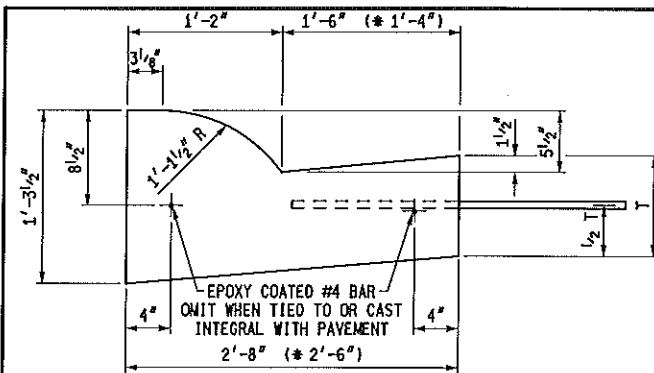
Anchoring which will not be paid for separately but included in the contract unit price for **Slope Restoration, Type A**.

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**.

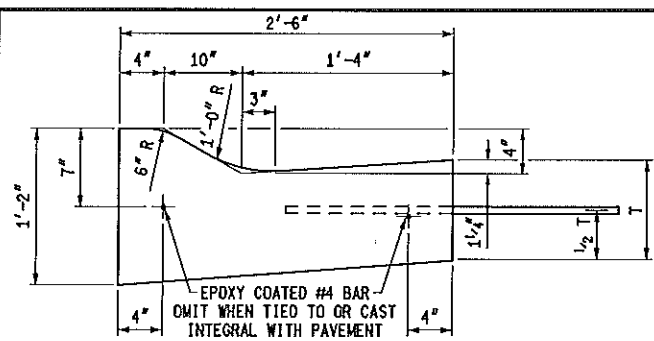




(\* GUTTER PAN WIDTH MAY BE REDUCED WHEN APPROVED BY THE ENGINEER)

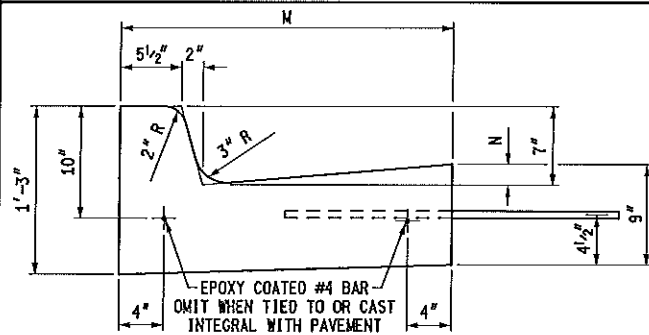
DETAIL	DIMENSION	LANE TIES	CONCRETE CYD / LFT	CONCRETE CYD / LFT
	T			
B1	9"	AS SHOWN	0.0900	(* 0.0855)
B2	9"	OMITTED	0.0900	(* 0.0855)
B3	10"	AS SHOWN	0.0941	(* 0.0894)

B



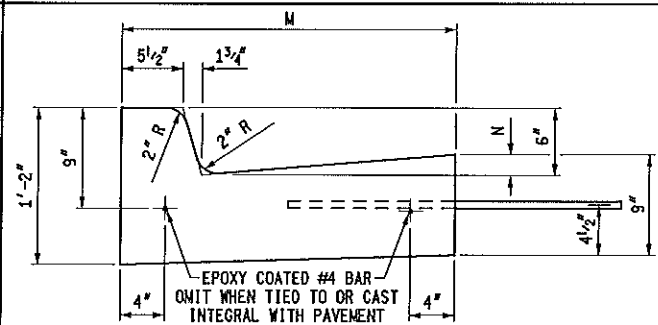
DETAIL	DIMENSION	LANE TIES	CONCRETE CYD / LFT
	T		
D1	9"	AS SHOWN	0.0788
D2	9"	OMITTED	0.0788
D3	10"	AS SHOWN	0.0826

D



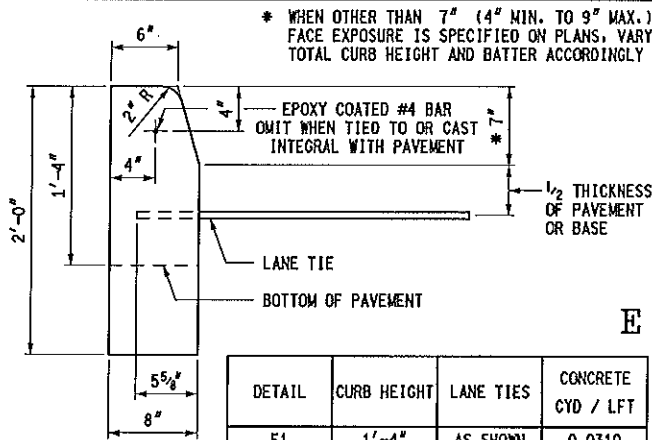
DETAIL	DIMENSION		LANE TIES	CONCRETE CYD / LFT
	M	N		
C1	1'-6"	7/8"	AS SHOWN	0.0506
C2	1'-6"	7/8"	OMITTED	0.0506
C3	2'-0"	1 3/8"	AS SHOWN	0.0632
C4	2'-0"	1 3/8"	OMITTED	0.0632
C5	2'-6"	1 1/8"	AS SHOWN	0.0757
C6	2'-6"	1 1/8"	OMITTED	0.0757

C



DETAIL	DIMENSION		LANE TIES	CONCRETE CYD / LFT
	M	N		
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 1/8"	AS SHOWN	0.0737
F6	2'-6"	1 1/8"	OMITTED	0.0737

F



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

E



PREPARED  
BY  
DESIGN DIVISION  
DRAWN BY: B.L.T.  
CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR  
Kirk T. Steudle

APPROVED BY: *Randy Van Pelt*  
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: *Mark A. Van Pelt*  
DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

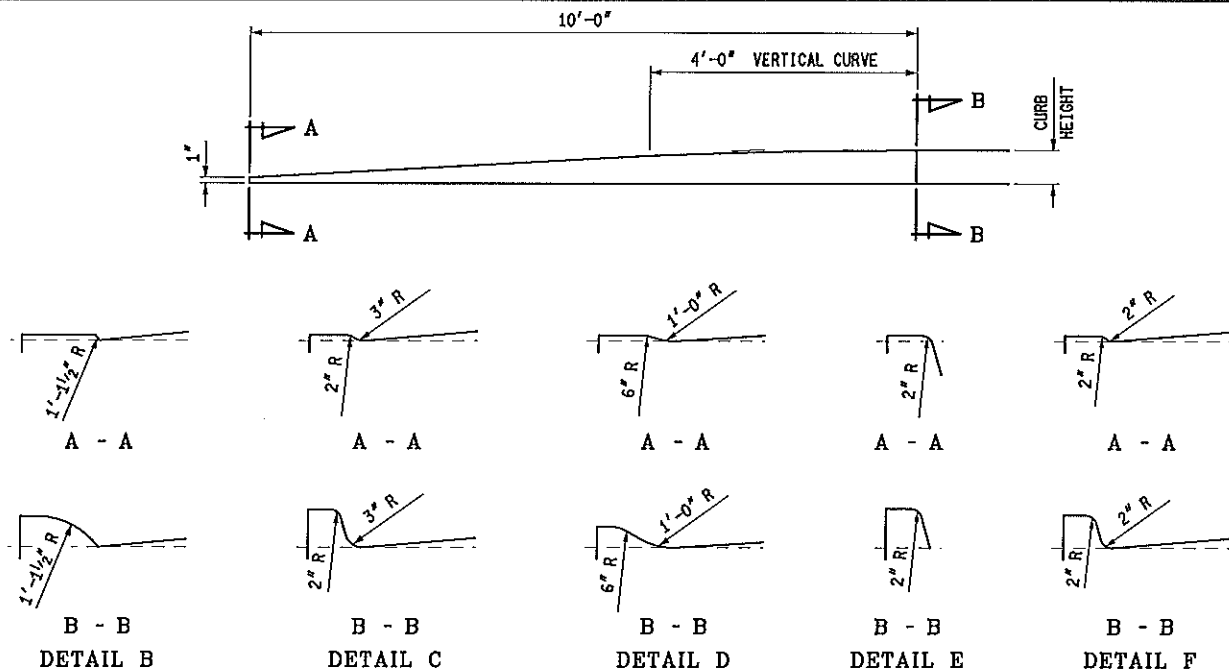
## CONCRETE CURB AND CONCRETE CURB & GUTTER

9-30-2014  
F.H.W.A. APPROVAL

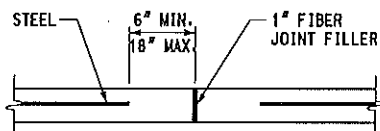
2-6-2014  
PLAN DATE

R-30-G

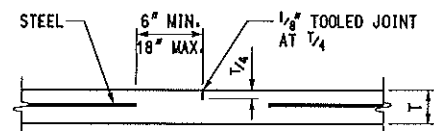
SHEET  
1 OF 2



### CONCRETE CURB, CURB AND GUTTER ENDINGS



1" FIBER JOINT FILLER



CONTRACTION JOINT

#### NOTES:

CURB AND GUTTER RADIUS 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 1/2" 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:

- PLACE 1" FIBER JOINT FILLER AT 400' MAXIMUM INTERVALS.
- PLACE 1" FIBER JOINT FILLER AT SPRING POINTS OF INTERSECTING STREETS.
- PLACE 1/2" ISOLATION JOINT AT CATCH BASINS PER STANDARD PLAN R-37-SERIES.
- PLACE CONTRACTION JOINTS AT 40' MAXIMUM INTERVALS.

#### JOINTS IN CURB OR CURB AND GUTTER TIED TO JOINTED PAVEMENT

- PLACE 1" FIBER JOINT FILLER OPPOSITE ALL TRANSVERSE EXPANSION JOINTS IN PAVEMENT.
- PLACE 1/2" ISOLATION JOINT AT CATCH BASINS PER STANDARD PLAN R-37-SERIES.
- PLACE CONTRACTION JOINTS OPPOSITE ALL TRANSVERSE CONTRACTION JOINTS IN PAVEMENT.
- 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

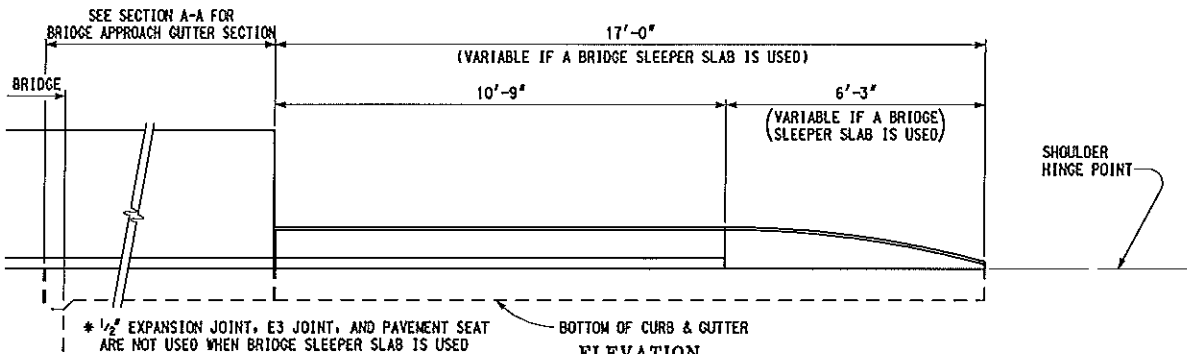
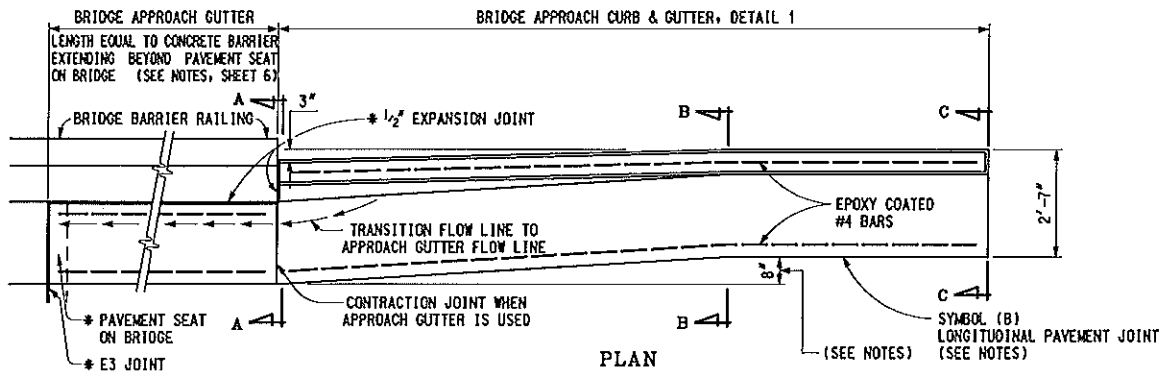
### CONCRETE CURB AND CONCRETE CURB & GUTTER

9-30-2014  
F.H.W.A. APPROVAL

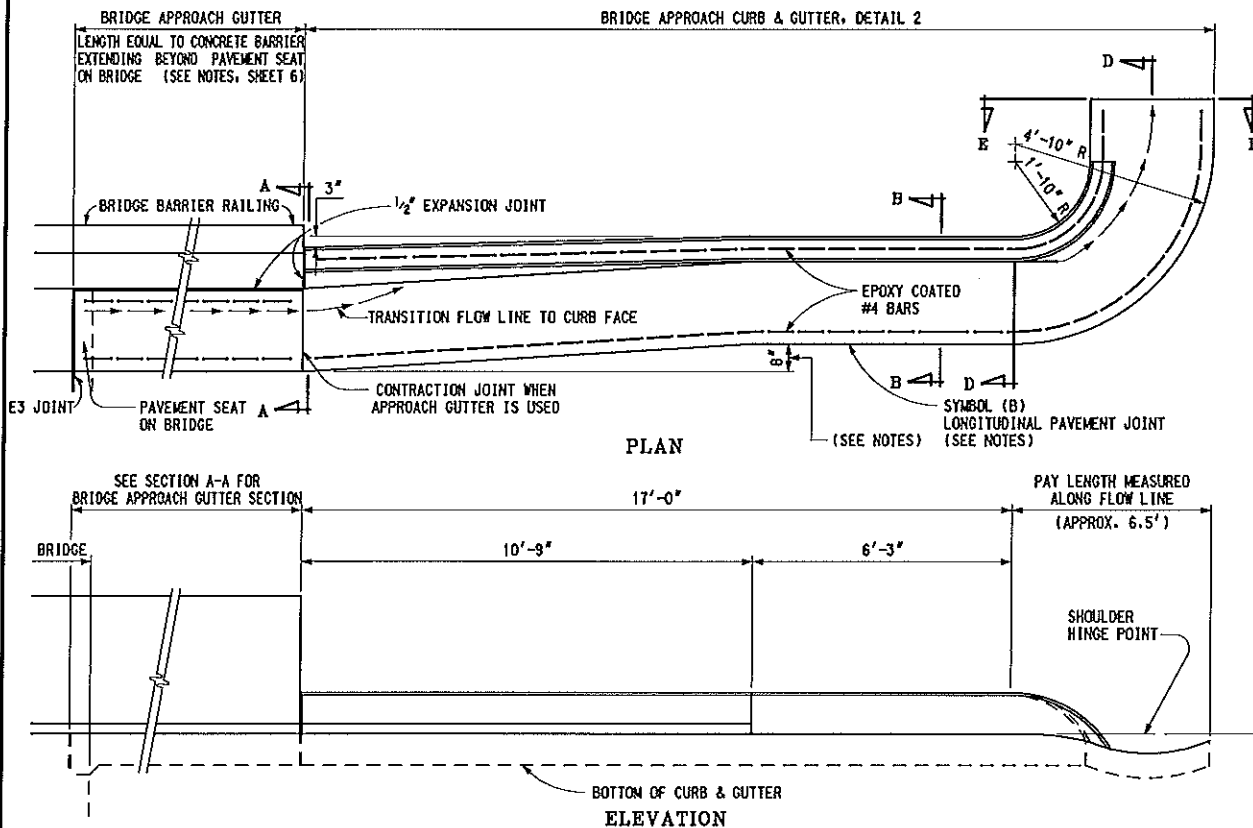
2-6-2014  
PLAN DATE

R-30-G




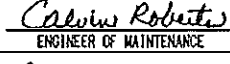
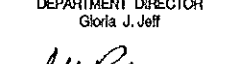


SHEET  
2 OF 2

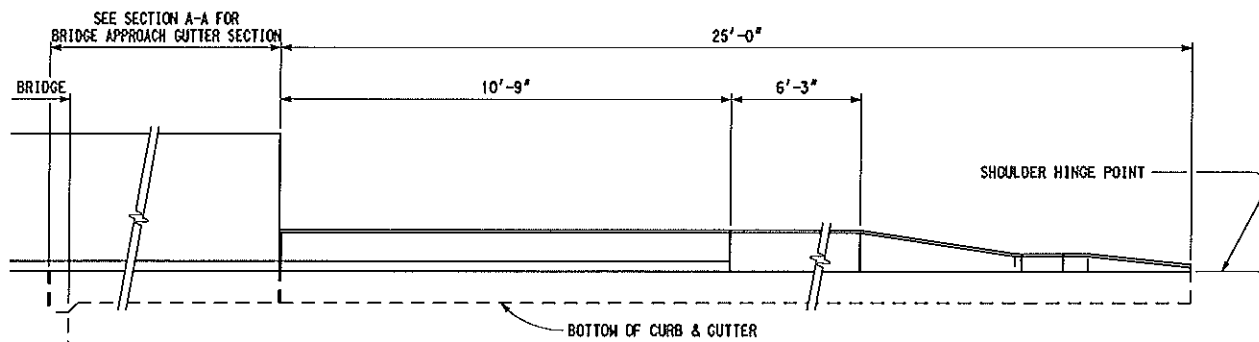
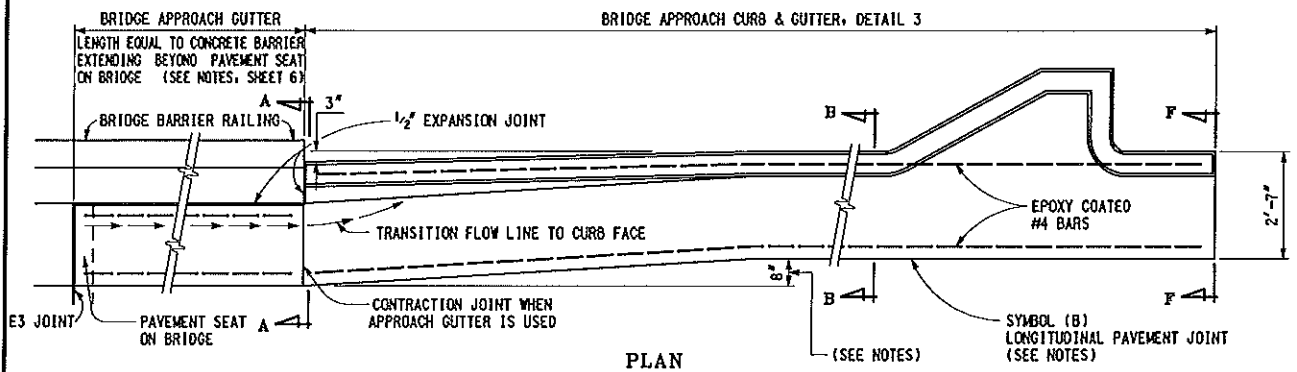


BRIDGE APPROACH CURB & GUTTER, DETAIL 1

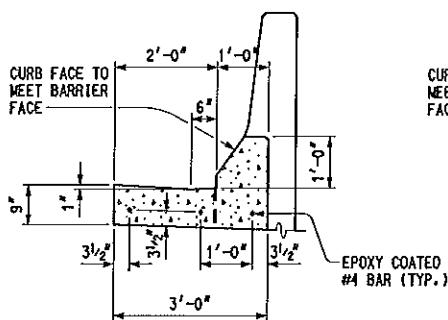


BRIDGE APPROACH CURB & GUTTER, DETAIL 2

 MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR <b>APPROACH CURB &amp; GUTTER DOWNSPOUTS</b> (FOR BRIDGE BARRIER ON RURAL HIGHWAYS)	 ENGINEER OF CONSTRUCTION & TECHNOLOGY	 ENGINEER OF DESIGN SUPPORT AREA DEPARTMENT DIRECTOR Gloria J. Jeff	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR <b>APPROACH CURB &amp; GUTTER DOWNSPOUTS</b> (FOR BRIDGE BARRIER ON RURAL HIGHWAYS)		
	PREPARED BY DESIGN SUPPORT AREA	 ENGINEER OF MAINTENANCE	 DEPARTMENT DIRECTOR Gloria J. Jeff	10-27-2004 F.H.W.A. APPROVAL	4-28-2004 PLAN DATE
	DRAWN BY: B.L.T. CHECKED BY: W.K.P.	 ENGINEER OF TRAFFIC AND SAFETY	 ENGINEER OF DEVELOPMENT	R-32-E	SHEET 1 OF 6

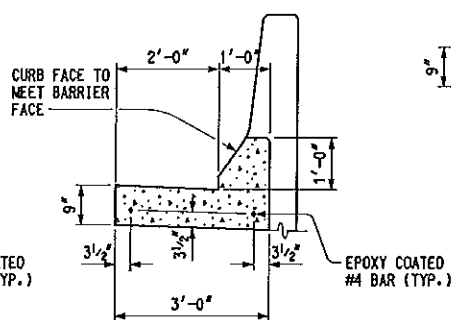


BRIDGE APPROACH CURB & GUTTER, DETAIL 3



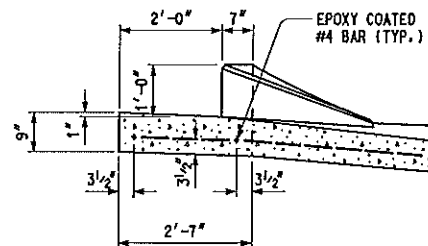
CROSS SECTION WHEN  
APPROACH GUTTER IS USED

SECTION A - A  
(SEE NOTES, SHEET 6)

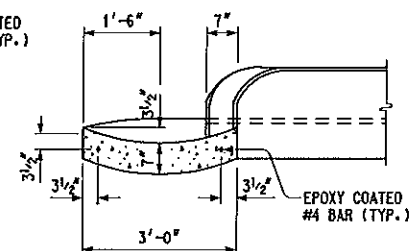


CROSS SECTION WHEN  
APPROACH GUTTER IS NOT USED

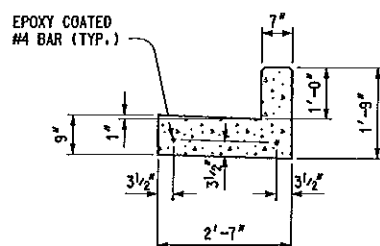
SECTION B - B



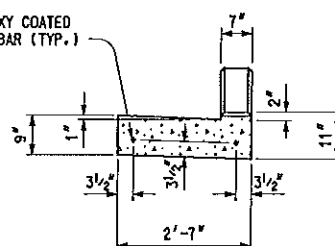
SECTION D - D



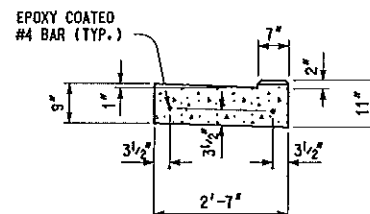
SECTION E - E



SECTION B - B



SECTION C - C



SECTION F - F

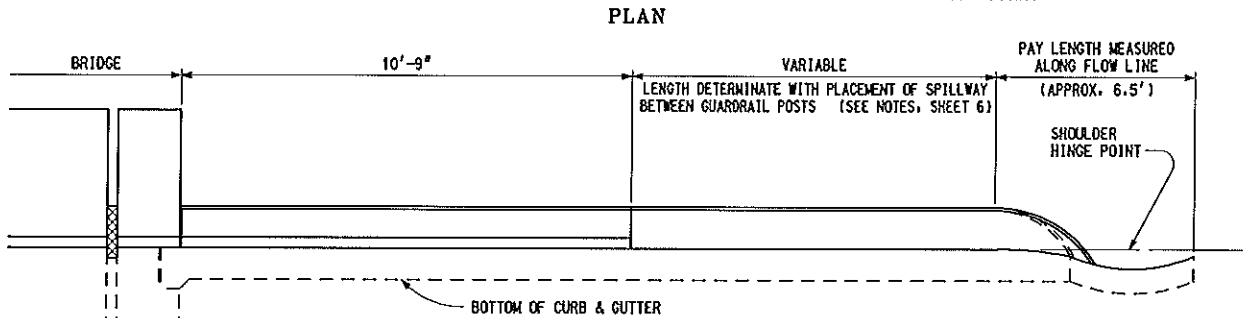
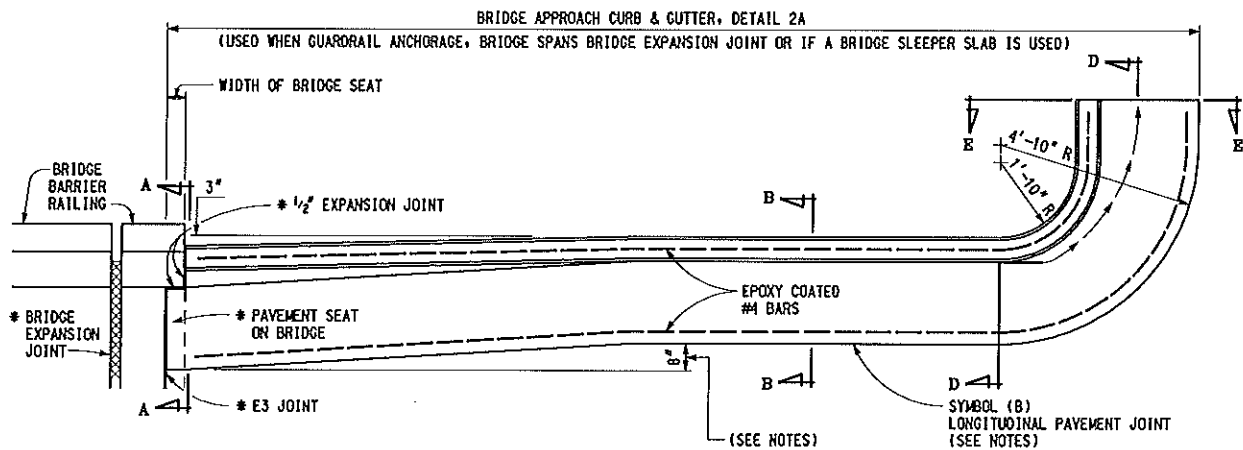
MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR  
**APPROACH CURB & GUTTER  
DOWNSPOUTS**  
(FOR BRIDGE BARRIER ON RURAL HIGHWAYS)

10-27-2004  
F.H.W.A. APPROVAL

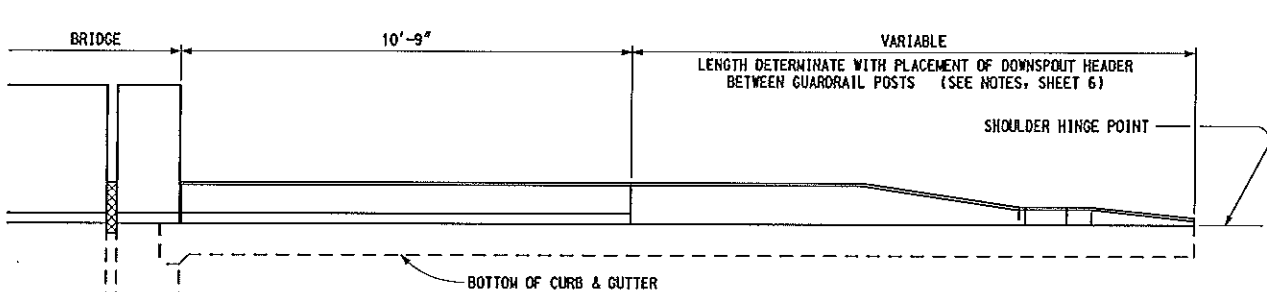
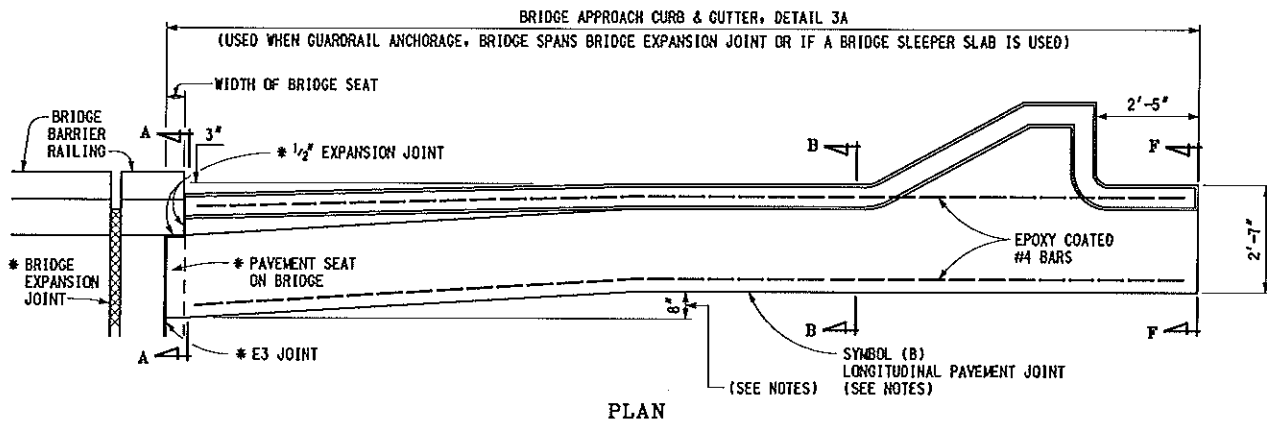
4-28-2004  
PLAN DATE

R-32-E

SHEET  
2 OF 6



**BRIDGE APPROACH CURB & GUTTER, DETAIL 2A**



**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

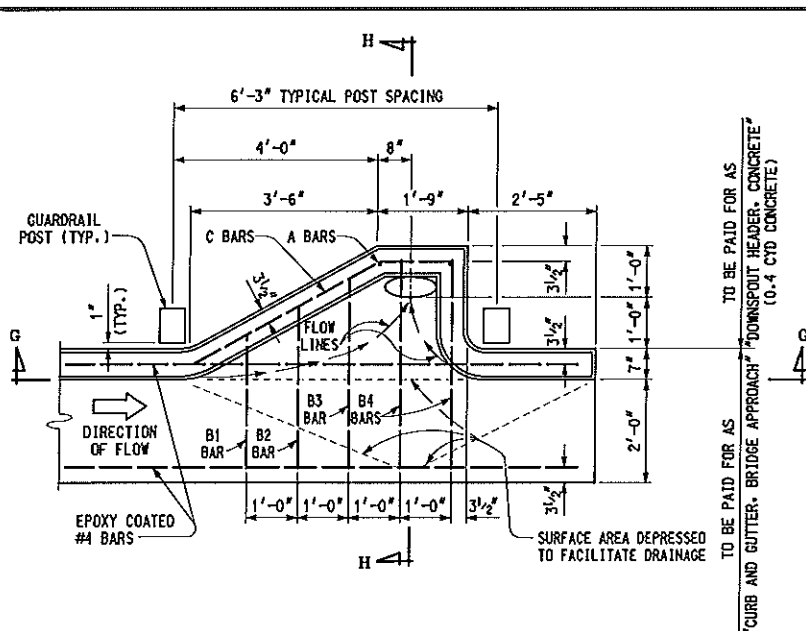
MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR  
**APPROACH CURB & GUTTER  
DOWNSPOUTS**  
(FOR BRIDGE BARRIER ON RURAL HIGHWAYS)

10-27-2004  
F.H.W.A. APPROVAL

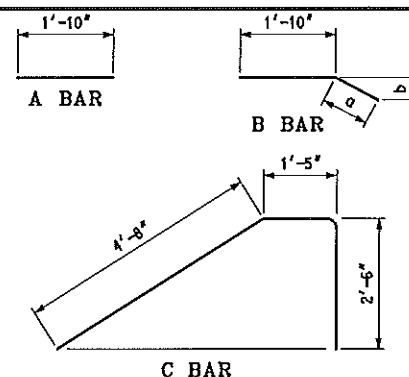
4-28-2004  
PLAN DATE

**R-32-E**

SHEET  
3 OF 6

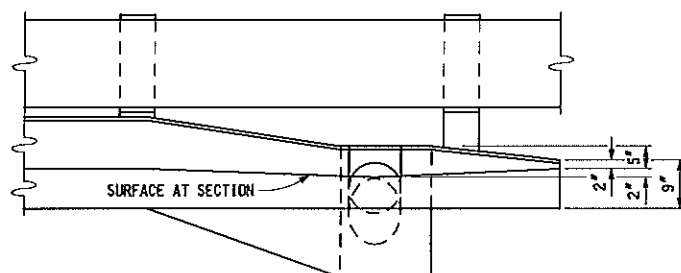


PLAN OF CONCRETE DOWNSPOUT HEADER



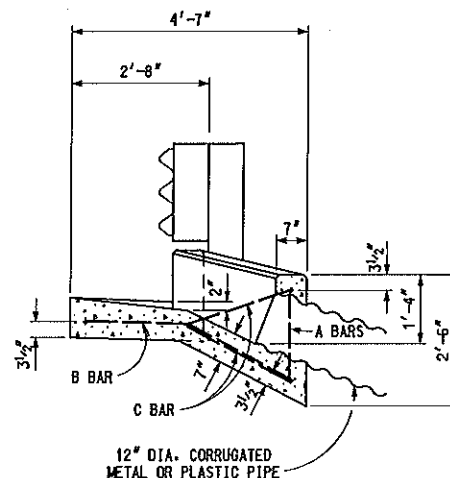
NOTE: ALL BARS ARE EPOXY COATED

DOWNSPOUT STEEL REINFORCEMENT					
BAR	DIMENSIONS		BAR SIZE	NUMBER REQUIRED	TOTAL LENGTH
	a	b			
A			#4	2	3'-8"
B1	11"	5"	#4	1	2'-9"
B2	1'-7"	8 1/2"	#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					

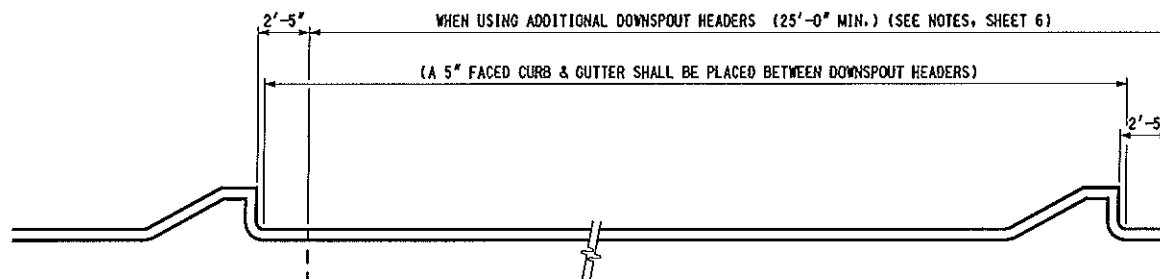


DETAIL SHOWS RELATIONSHIP OF  
GUARDRAIL WITH DOWNSPOUT HEADER

SECTION G - G



SECTION H - H



PLAN OF ADDITIONAL CONCRETE DOWNSPOUT HEADERS

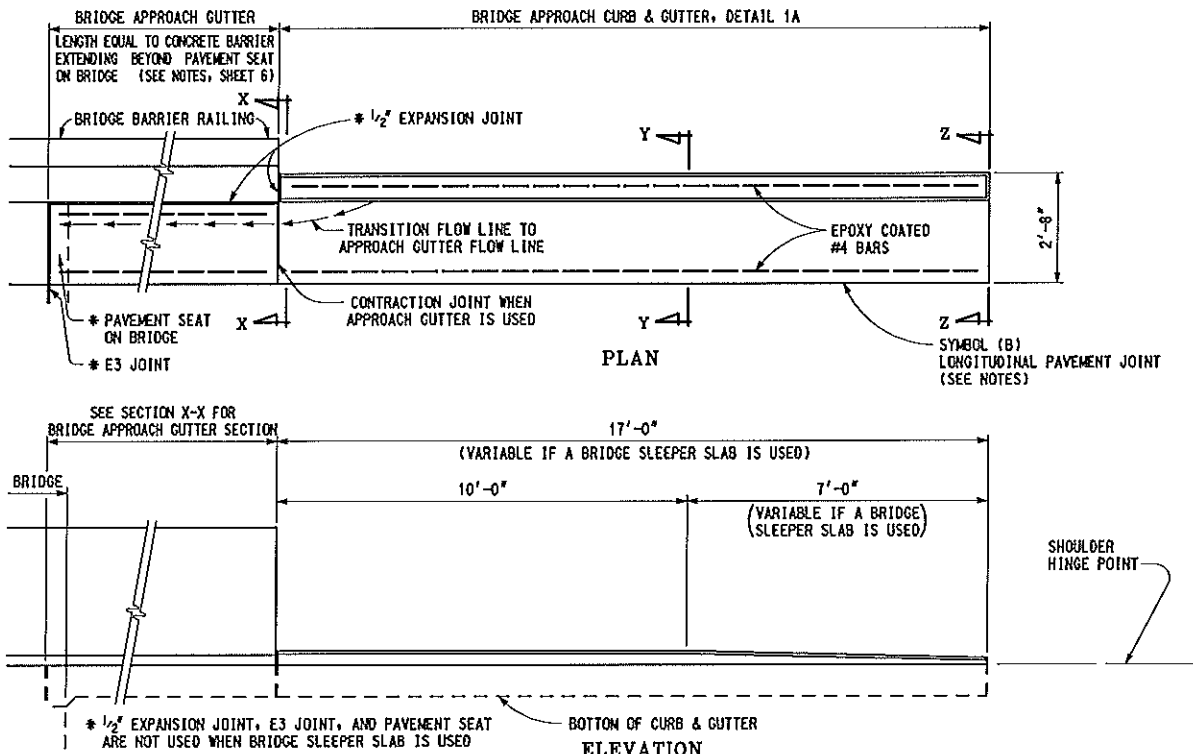
MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR  
**APPROACH CURB & GUTTER  
DOWNSPOUTS**  
(FOR BRIDGE BARRIER ON RURAL HIGHWAYS)

10-27-2004  
F.H.W.A. APPROVAL

4-28-2004  
PLAN DATE

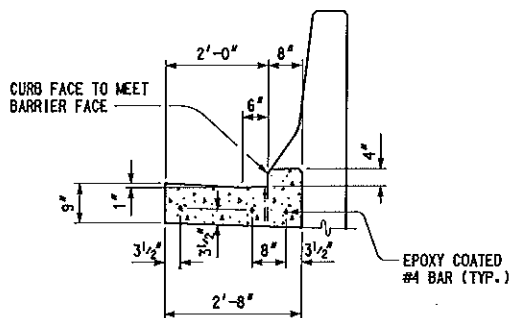
R-32-E

SHEET  
4 OF 6

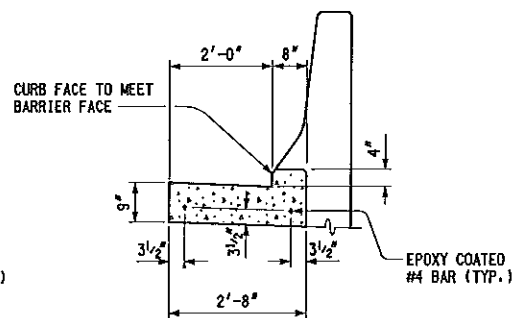


### BRIDGE APPROACH CURB & GUTTER, DETAIL 1A

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

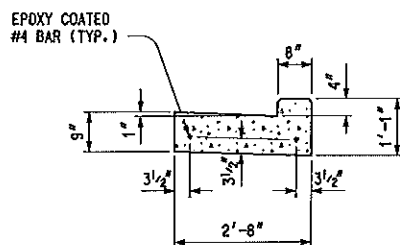


CROSS SECTION WHEN  
DEPARTING GUTTER IS USED

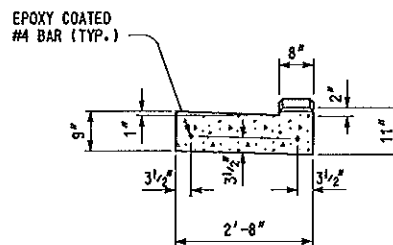


CROSS SECTION WHEN  
DEPARTING GUTTER IS NOT USED

### 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  $\frac{3}{4}$ ".

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)

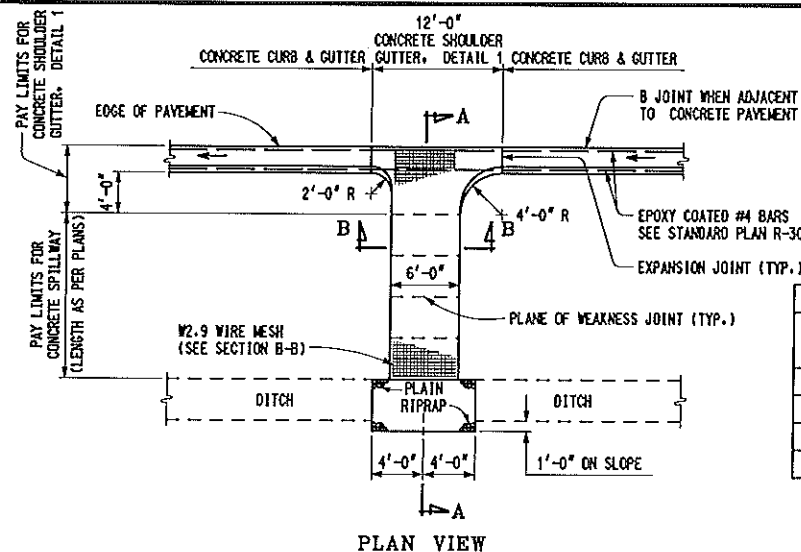
10-27-2004  
F.H.W.A. APPROVAL

4-28-2004  
PLAN DATE

**R-32-E**

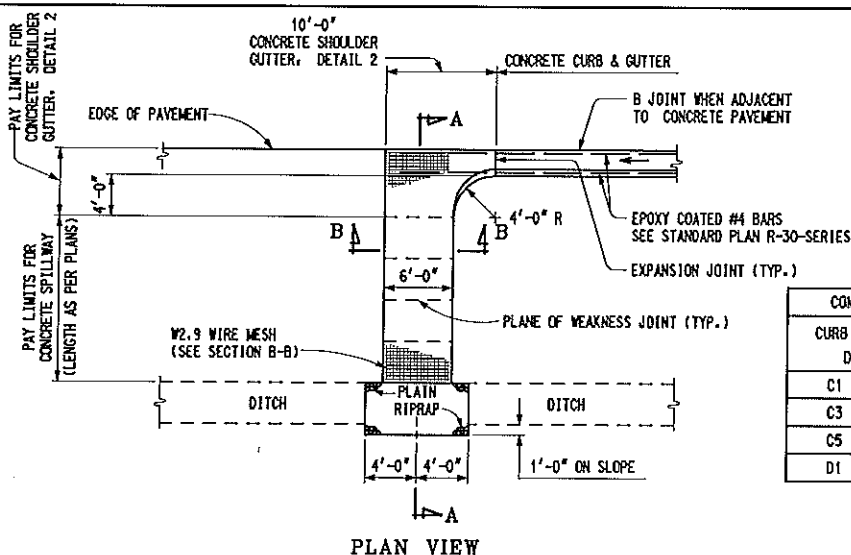
SHEET  
6 OF 6





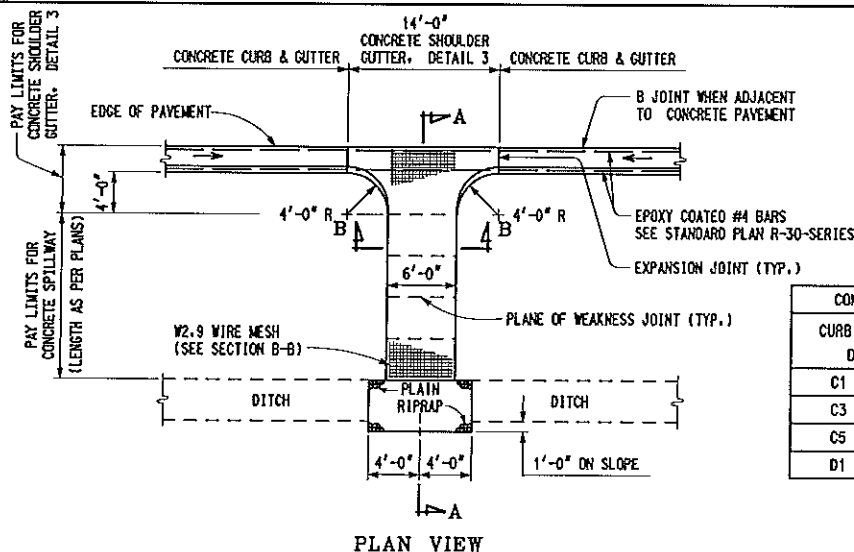
COMPONENTS OF CONCRETE SHOULDER GUTTER, DETAIL 1		
CURB & GUTTER DETAIL	STEEL REINFORCEMENT LBS	CONCRETE CYD
C1 OR C2	39	1.5
C3 OR C4	39	1.7
C5 OR C6	39	1.8
D1 OR D2	39	1.8

**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



PREPARED  
BY  
DESIGN DIVISION

DRAWN BY: B.L.T.  
CHECKED BY: W.K.P.

*James D. Culp*  
ENGINEER OF CONSTRUCTION & TECHNOLOGY  
*Calvin Roberts*  
ENGINEER OF MAINTENANCE  
*John X. [Signature]*  
ENGINEER OF TRAFFIC AND SAFETY

ENGINEER - ROAD DESIGN  
*[Signature]*  
ENGINEER OF DESIGN  
DEPARTMENT DIRECTOR  
Gregory J. Rosline  
BY: *[Signature]*  
CHIEF ENGINEER/DEPUTY DIRECTOR  
BUREAU OF HIGHWAY TECHNICAL SERVICES

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

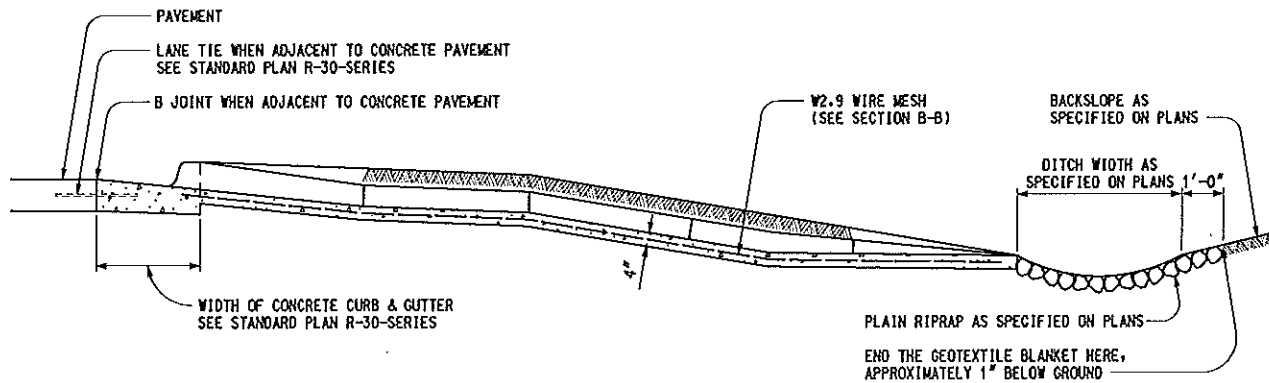
## CONCRETE SHOULDER GUTTER AND SPILLWAY

9-14-2001  
F.H.W.A. APPROVAL

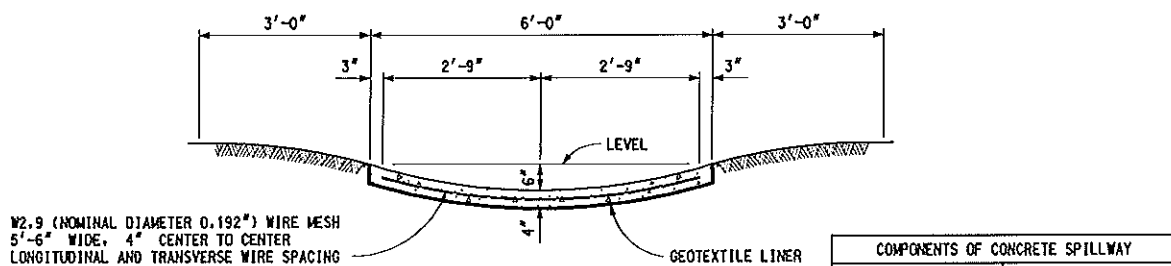
2-23-2001  
PLAN DATE

R-35-C

SHEET  
1 OF 2



SECTION A - A



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 FOSLOPES WILL BE UNDERLAID WITH GEOTEXTILE BLANKET FROM THE BACK SIDE OF CURB TO THE FAR END OF THE PLAIN RIPRAP. WHEN USING SPILLWAYS IN OTHER AREAS, SUCH AS BACKSLOPES, THE GEOTEXTILE BLANKET SHALL UNDERLAY THE FULL LENGTH OF THE SPILLWAY. THE GEOTEXTILE BLANKET 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 FOSLOPE, IT MAY BE USED ON THE BACKSLOPE, AS SPECIFIED ON THE PLANS. CONCRETE SHOULDER GUTTER WOULD BE CORRESPONDINGLY OMITTED.

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

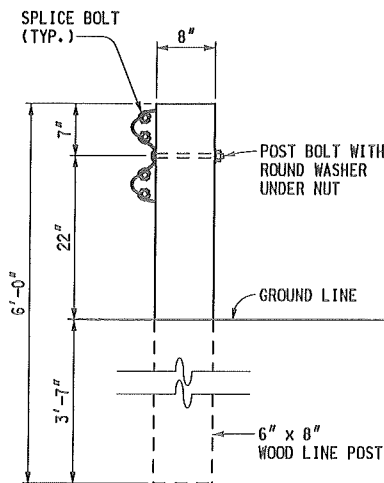
CONCRETE SHOULDER GUTTER  
AND SPILLWAY

9-14-2001  
F.H.W.A. APPROVAL

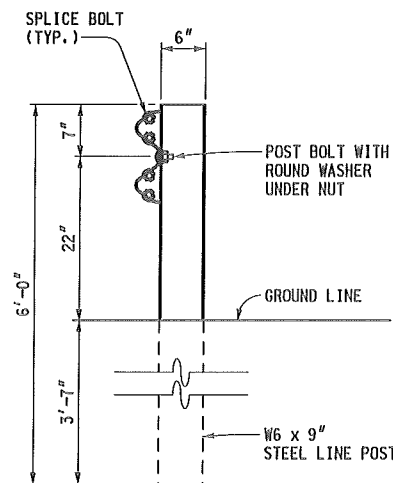
2-23-2001  
PLAN DATE

R-35-C

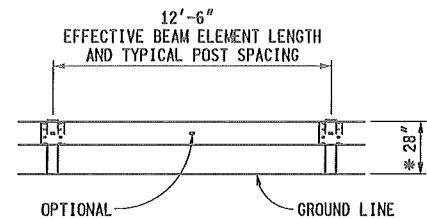
SHEET  
2 OF 2



WOOD POST

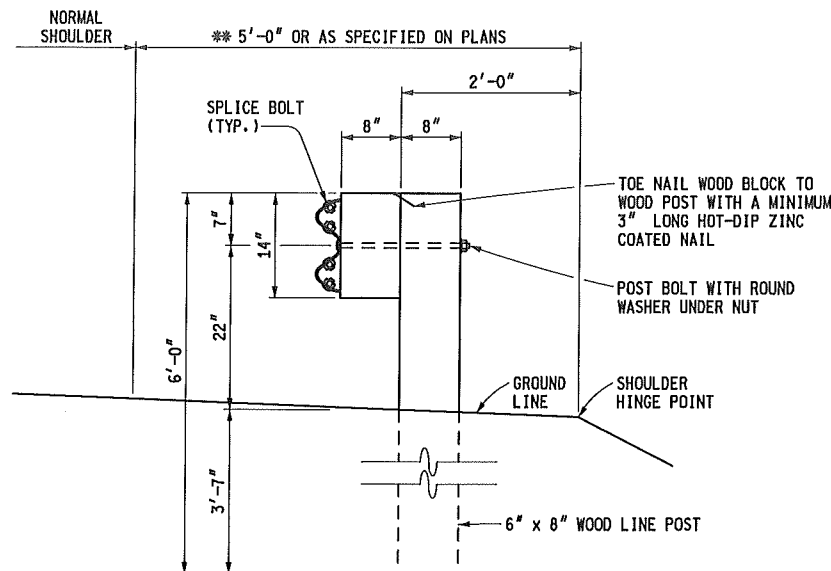


STEEL POST

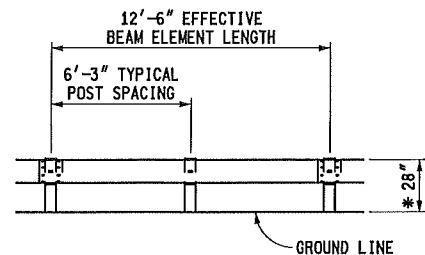


ELEVATION SHOWING POST SPACING  
\* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

### 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 )



PREPARED  
BY  
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR  
Kirk T. Steudle

APPROVED BY: Randy Van Pelt  
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: Mark A. Van Pelt  
DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

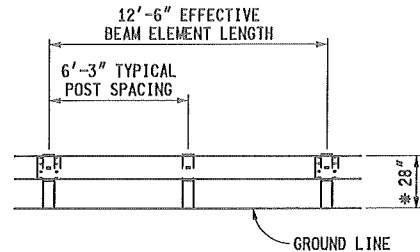
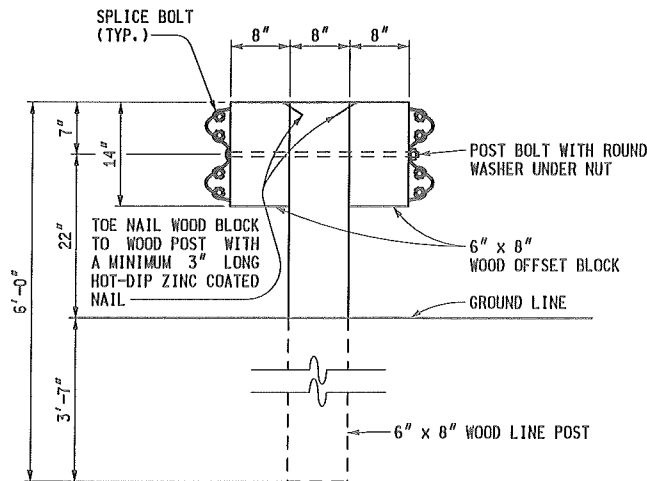
### GUARDRAIL, TYPES A, B, BD, T, & TD

9-30-2014  
F.H.W.A. APPROVAL

7-5-2013  
PLAN DATE

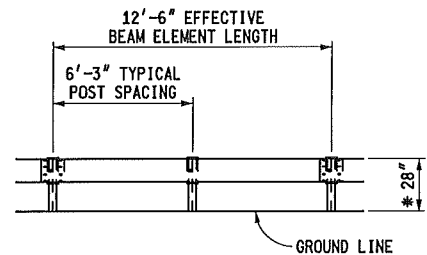
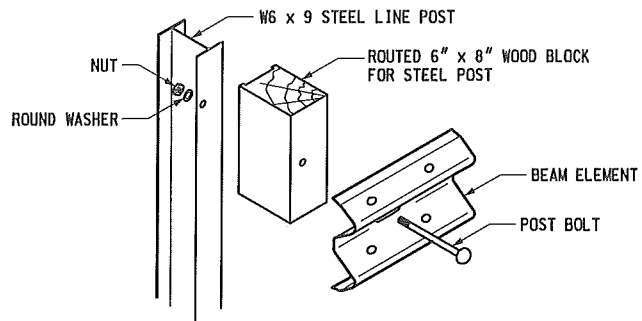
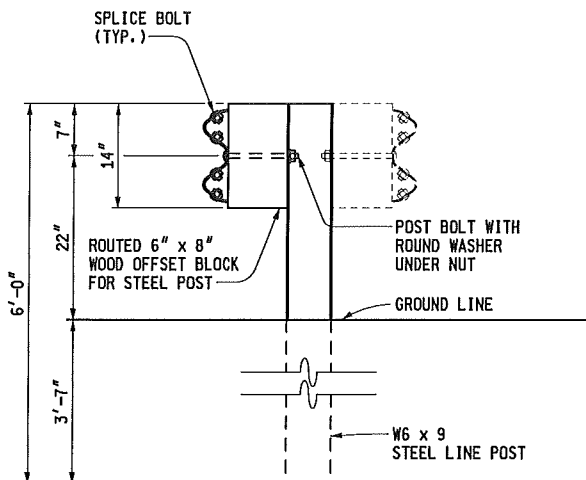
R-60-I

SHEET  
1 OF 10



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 HIGHWAY DEVELOPMENT STANDARD PLAN FOR

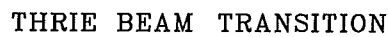
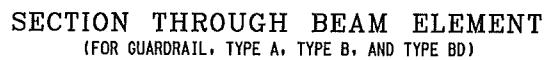
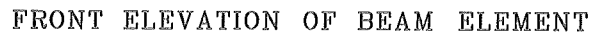
# GUARDRAIL, TYPES A, B, BD, T, & TD

9-30-2014  
F.H.W.A. APPROVAL

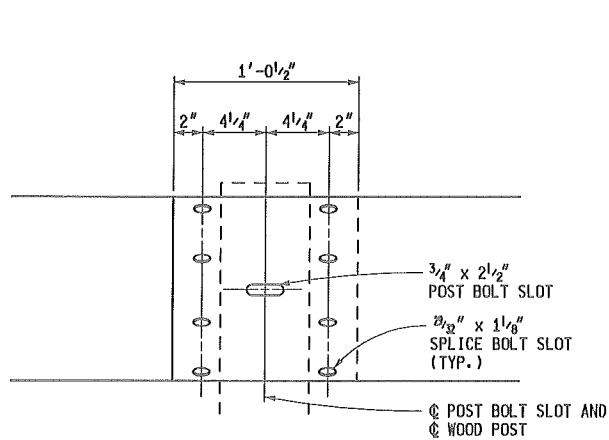
7-5-2013  
PLAN DATE

R-60-I

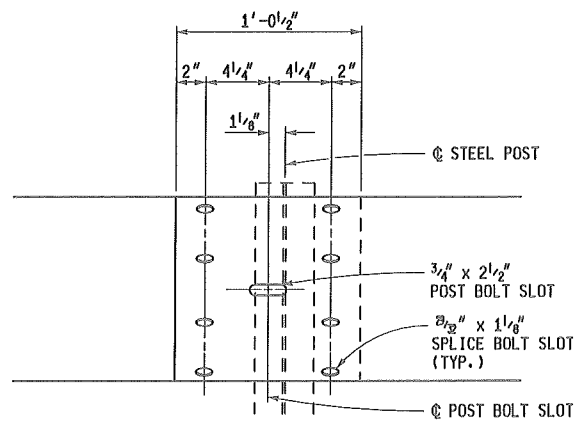
SHEET  
2 OF 10



SHEET  
3 OF 10

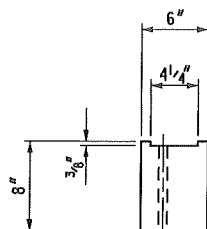


WOOD POST

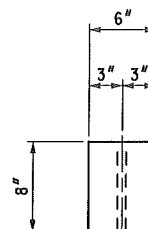


STEEL POST

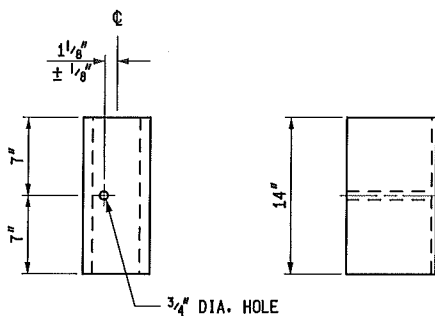
BEAM ELEMENT SPLICE DETAILS



TOP



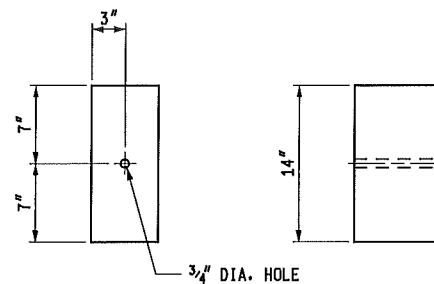
TOP



FRONT

SIDE

FOR USE ON STEEL POSTS



FRONT

SIDE

FOR USE ON WOOD POSTS  
(SEE NOTES ON SHEET 10 OF 10)

WOOD OFFSET BLOCKS FOR GUARDRAIL, TYPE B AND TYPE BD

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

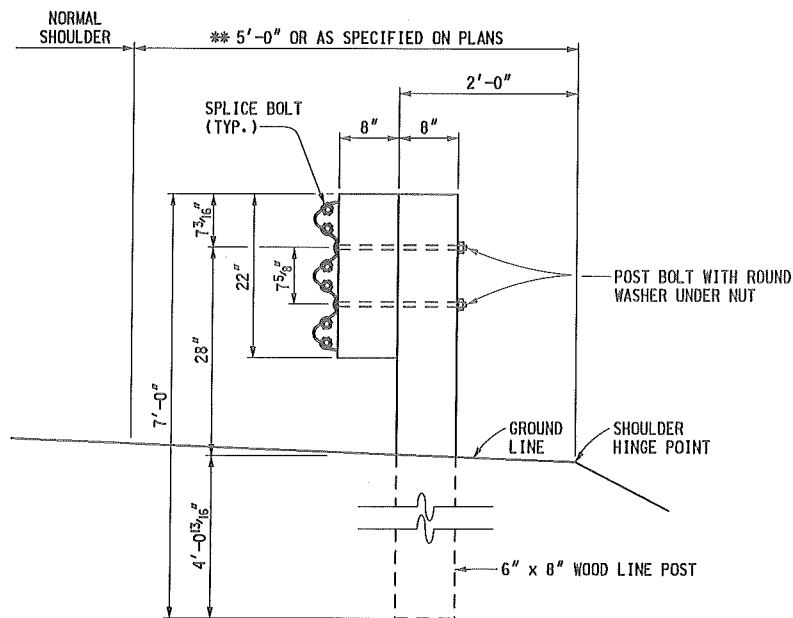
GUARDRAIL,  
TYPES A, B, BD, T, & TD

9-30-2014  
F.H.W.A. APPROVAL

7-5-2013  
PLAN DATE

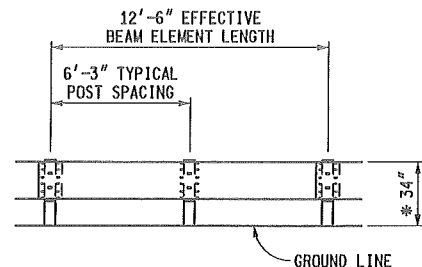
R-60-I

SHEET  
4 OF 10

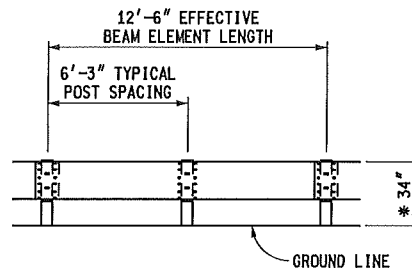
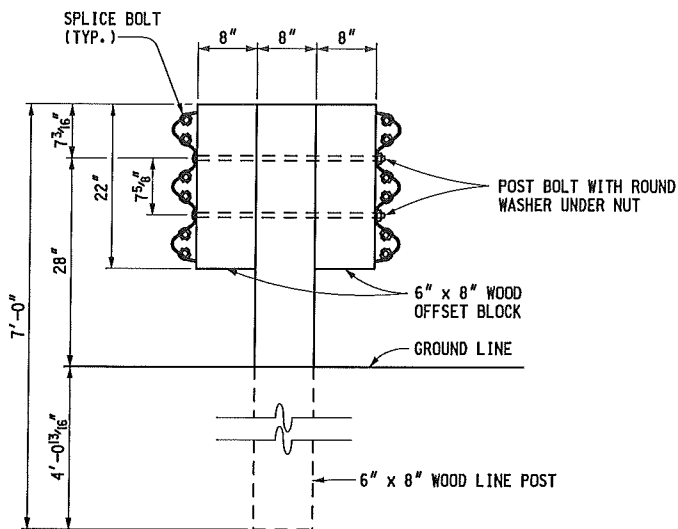


\*\* FOR PAVED SHOULDER WIDTHS OF AT LEAST 12', USE 3'-0".

**GUARDRAIL, TYPE T**  
( WOOD POST )



**ELEVATION SHOWING POST SPACING**  
\* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB



**ELEVATION SHOWING POST SPACING**  
\* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

**GUARDRAIL, TYPE TD**  
( WOOD POST )

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

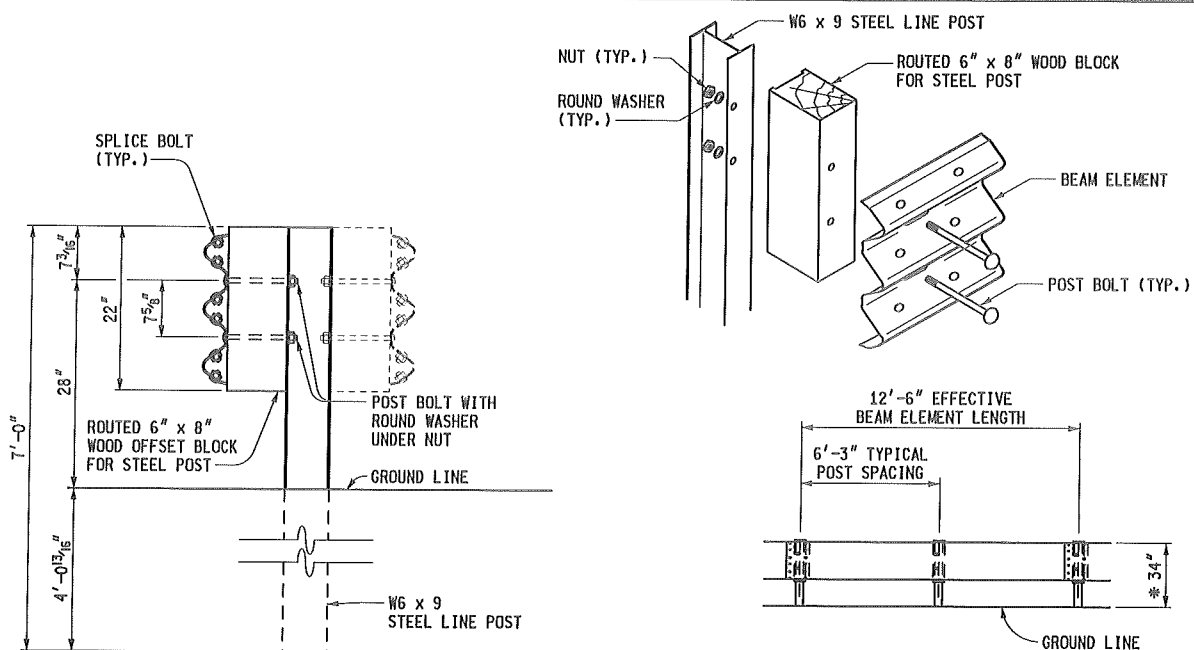
**GUARDRAIL,**  
**TYPES A, B, BD, T, & TD**

9-30-2014  
F.H.W.A. APPROVAL

7-5-2013  
PLAN DATE

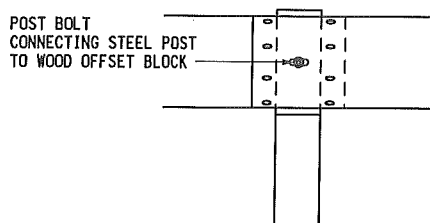
**R-60-I**

SHEET  
5 OF 10

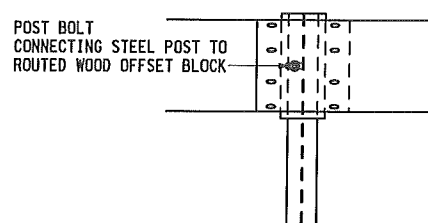


ELEVATION SHOWING POST SPACING  
\* SEE NOTES FOR GUARDRAIL IN CONJUNCTION WITH CURB

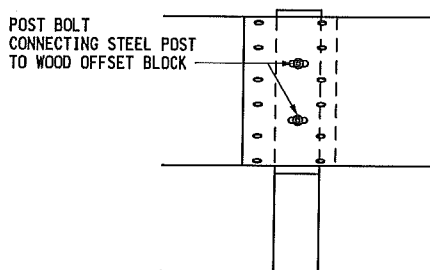
### GUARDRAIL, TYPE T OR TD (STEEL POST)



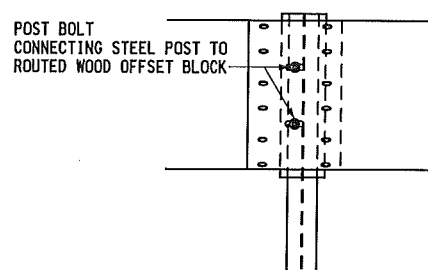
GUARDRAIL, TYPE B  
WOOD POST



GUARDRAIL, TYPE B  
STEEL POST



GUARDRAIL, TYPE T  
WOOD POST



GUARDRAIL, TYPE T  
STEEL POST

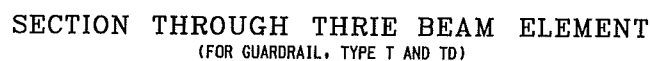
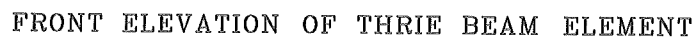
### BLOCK AND POST CONNECTION DETAILS

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

## GUARDRAIL, TYPES A, B, BD, T, & TD

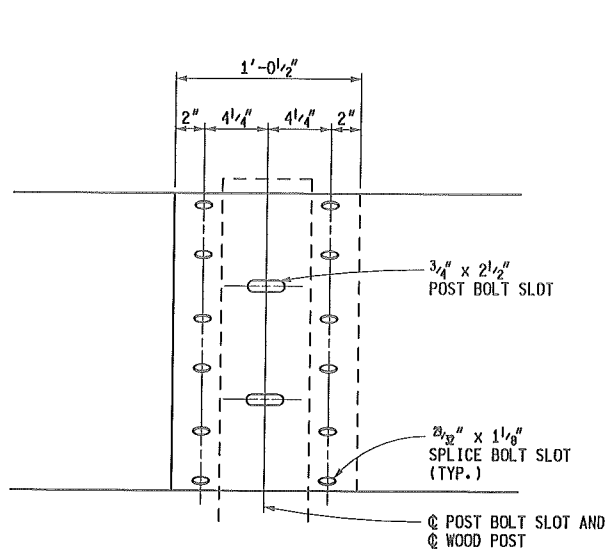
9-30-2014 F.H.W.A. APPROVAL	7-5-2013 PLAN DATE	R-60-I	SHEET 6 OF 10
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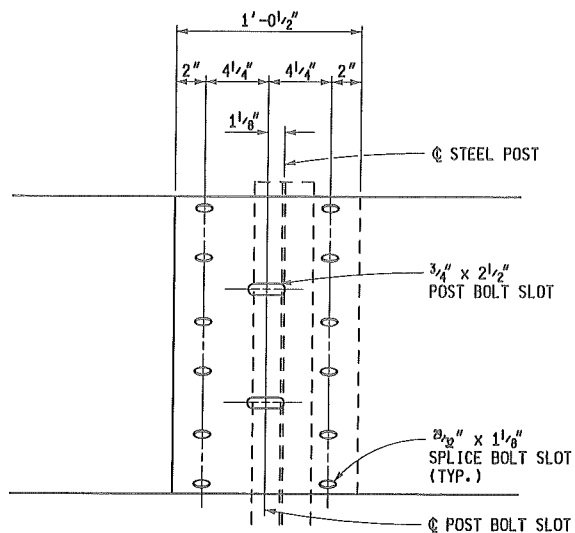


GUARDRAIL,  
TYPES A, B, BD, T, & TD

SHEET  
7 OF 10

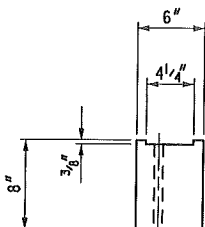


WOOD POST

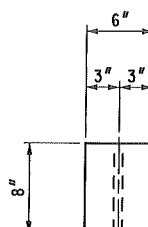


STEEL POST

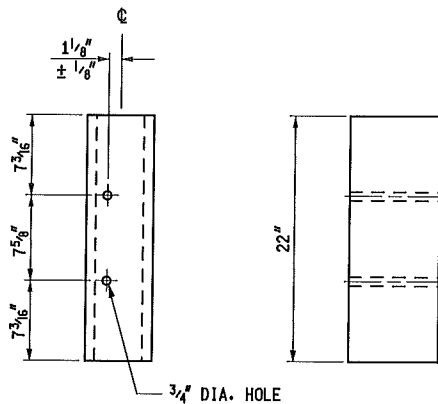
THREE BEAM ELEMENT SPLICE DETAILS



TOP



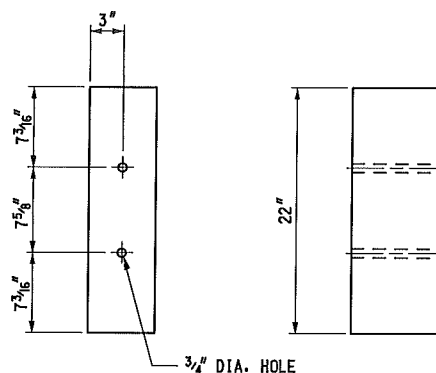
TOP



FRONT

SIDE

FOR USE ON STEEL POSTS



FRONT

SIDE

FOR USE ON WOOD POSTS

(SEE NOTES ON SHEET 10 OF 10)

WOOD OFFSET BLOCKS FOR GUARDRAIL, TYPE T AND TYPE TD

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL,  
TYPES A, B, BD, T, & TD

9-30-2014  
F.H.W.A. APPROVAL

7-5-2013  
PLAN DATE

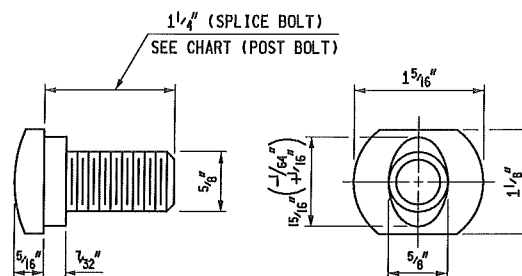
R-60-I

SHEET  
8 OF 10

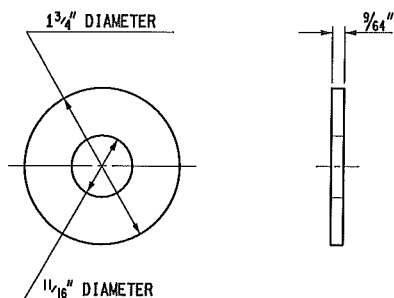


MINIMUM POST BOLT THREAD LENGTH	
BOLT LENGTH	MINIMUM THREAD LENGTH
9 1/2"	1 3/4"
18 "	2 1/2"
26 1/2"	3 "

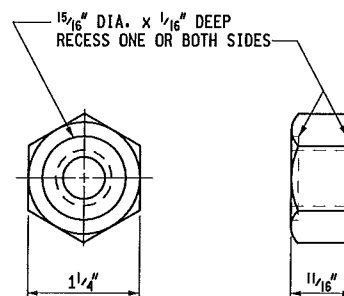
\* EXCEPT AS SPECIFIED ON DETAIL SHOWING TRANSITION FROM GUARDRAIL, TYPE B (OR TYPE T) TO GUARDRAIL, TYPE BD (OR TYPE TD). POST BOLTS SHALL NOT EXTEND MORE THAN  $1\frac{1}{2}$ " BEYOND NUT.



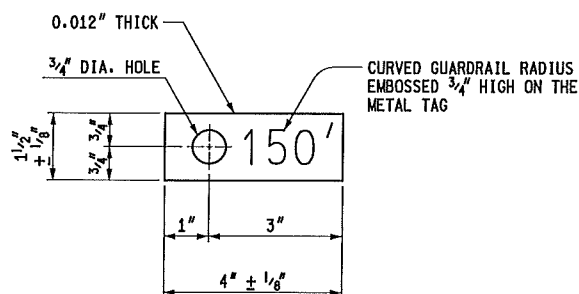
## SPLICE BOLT AND POST BOLT



## ROUND WASHER



NUT



METAL TAG

FOR CURVED GUARDRAIL WITH RADIUS OF 150' OR LESS

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

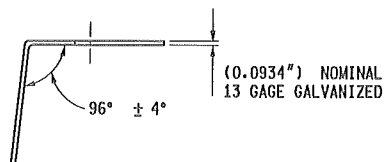
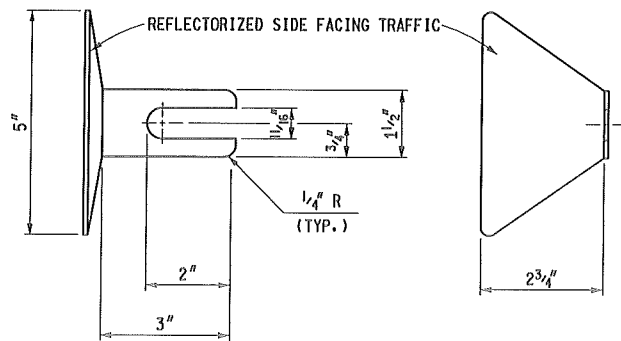
GUARDRAIL,  
TYPES A, B, BD, T, & TD

9-30-2014  
F.H.W.A. APPROVAL

7-5-2013  
PLAN DATE

R-60-I

SHEET  
9 OF 10



### GUARDRAIL REFLECTOR

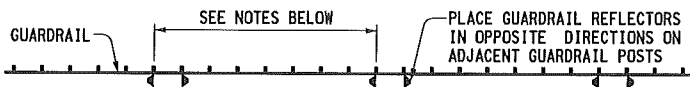


DIRECTION  
OF TRAFFIC →

DIRECTION  
OF TRAFFIC →

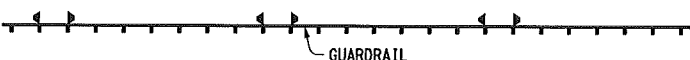


### ONE-WAY TRAFFIC



DIRECTION  
OF TRAFFIC →

DIRECTION  
OF TRAFFIC →

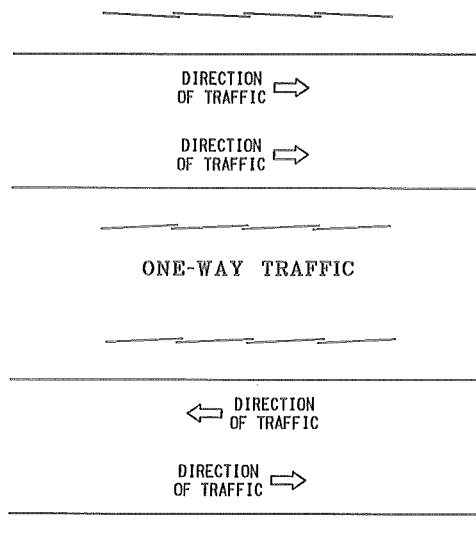


### TWO-WAY TRAFFIC

### PLACEMENT OF GUARDRAIL REFLECTORS

#### NOTES GOVERNING THE USE OF GUARDRAIL REFLECTORS

- GUARDRAIL REFLECTORS SHALL BE USED ON ALL STANDARD GUARDRAIL RUNS, REGARDLESS OF ROADWAY LIGHTING.
- GUARDRAIL REFLECTORS ARE TO BE SPACED AT THE FOLLOWING INTERVALS:
  - 50'-0" ON TANGENT SECTIONS AND CURVES WITH A RADIUS OF 1150' OR MORE.
  - 25'-0" ON CURVES WITH A RADIUS LESS THAN 1150'.
- FOR GUARDRAIL REFLECTOR PLACEMENT ON APPROACH TERMINALS, SEE THE APPROPRIATE GUARDRAIL APPROACH TERMINAL STANDARD PLAN.
- A GUARDRAIL REFLECTOR IS TO BE PLACED ON THE SECOND POST FROM THE GUARDRAIL DEPARTING TERMINAL.
- ON GUARDRAIL, TYPE T AND TYPE TD GUARDRAIL REFLECTORS ARE TO BE PLACED ON THE UPPER POST BOLT.
- 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 JOINT AASHTO - ARBA TECHNICAL BULLETIN NO. 268. "A GUIDE TO STANDARDIZED HIGHWAY BARRIER RAIL 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.

POST BOLT SLOTS AT 6'-3" INTERVALS WILL BE ALLOWED IN BEAM ELEMENTS USED TO CONSTRUCT GUARDRAIL, TYPE A.

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 IS 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.)

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 HIGHWAY DEVELOPMENT STANDARD PLAN FOR

### GUARDRAIL, TYPES A, B, BD, T, & TD

9-30-2014  
F.H.W.A. APPROVAL

7-5-2013  
PLAN DATE

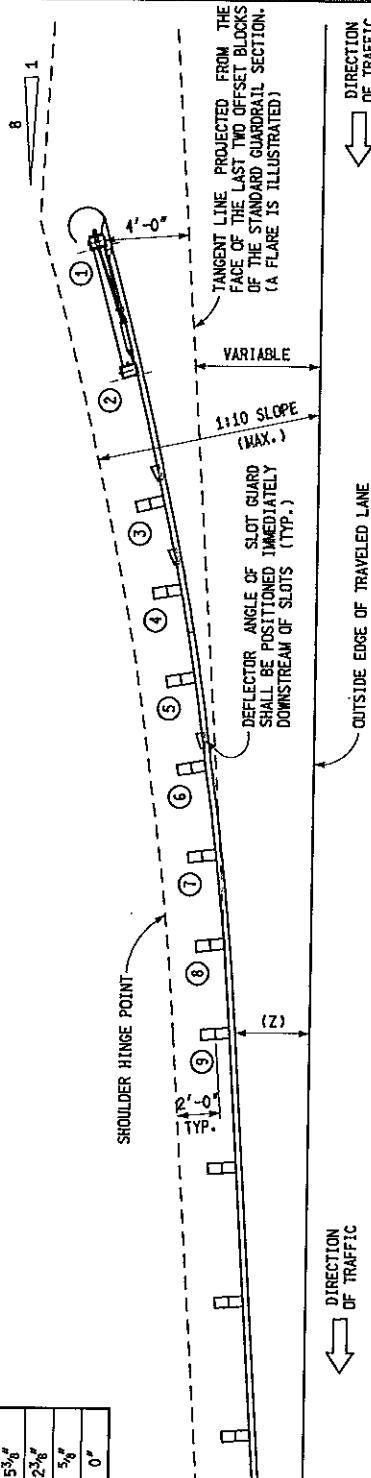
R-60-I

SHEET  
10 OF 10

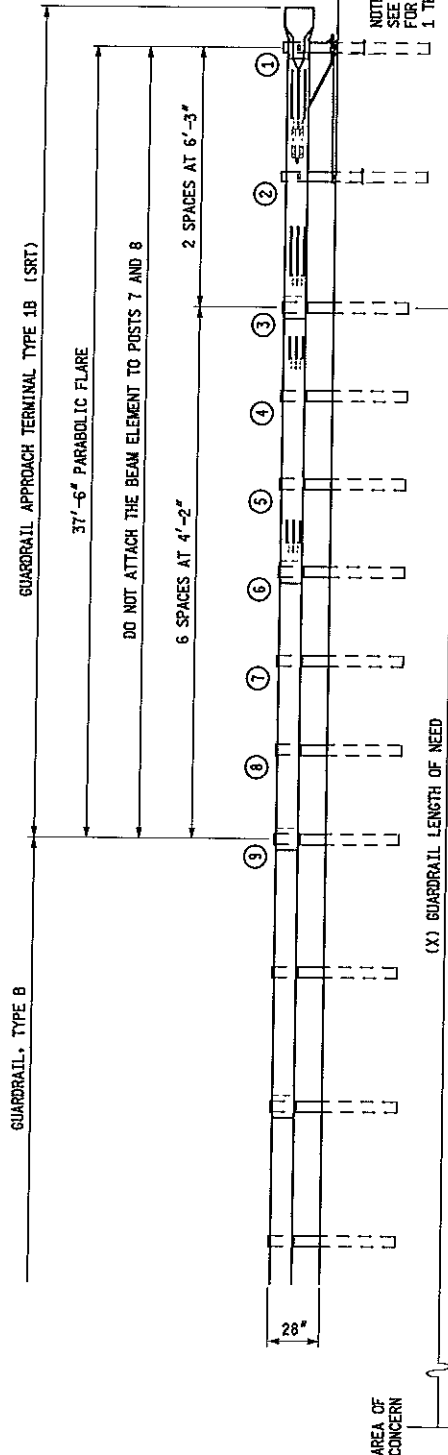
THE POST OFFSET DIMENSIONS ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE WOOD OFFSET BLOCKS, EXCEPT FOR THE FIRST AND SECOND POSTS WHICH ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE POST. OFFSET POINTS ARE TO BE LOCATED BY CHORD MEASUREMENTS AT THE BACK OF THE RAIL EQUAL TO THE NOMINAL POST SPACINGS SPECIFIED. POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.

\* FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 12.

SEE END ANCHORAGE ASSEMBLY, SHEET 3



PLAN VIEW



ELEVATION  
GUARDRAIL APPROACH TERMINAL TYPE 1B  
"SRT"

### OPTION 1

(DETAILED ON SHEETS 1 THROUGH 6)

POST	* POST OFFSET DISTANCE
1	4'-0" 48"
2	2'-8" 33 1/2"
3	1'-8" 21 1/4"
4	1'-2" 14 3/4"
5	0'-8" 9 1/2"
6	0'-45" 5 3/8"
7	0'-2" 2 3/8"
8	0'-05" 5/8"
9	0" 0"



PREPARED BY  
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR  
Kirk T. Stoudie

APPROVED BY:

*John C. Friend*  
ENGINEER OF DELIVERY

APPROVED BY:

*John C. Friend*  
ENGINEER OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

## GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT & FLEAT)

10-21-2008  
F.H.W.A. APPROVAL

9-4-2007  
PLAN DATE

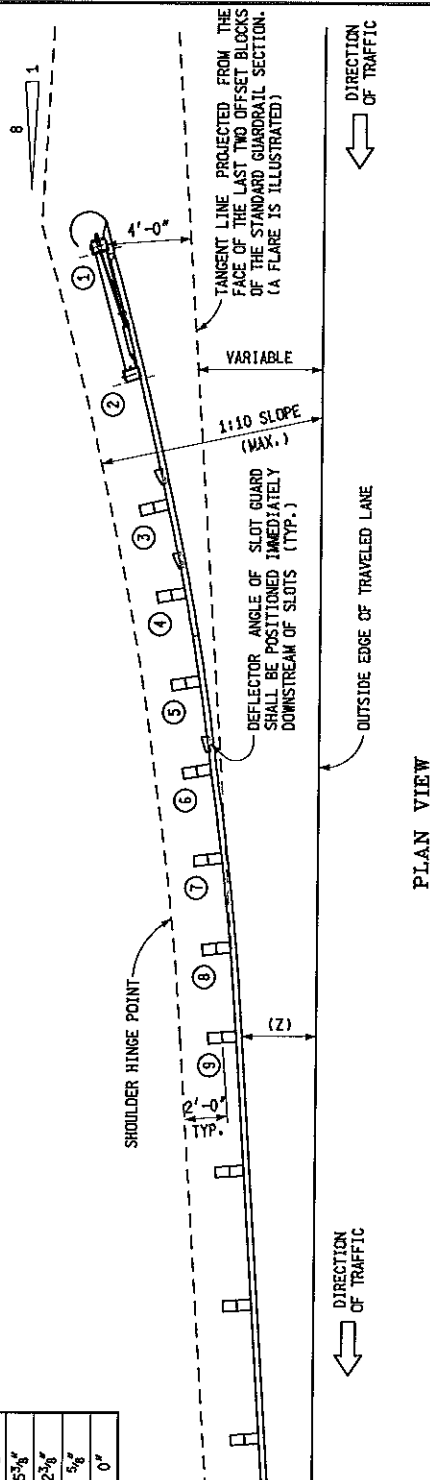
R-61-G

SHEET  
1 OF 14

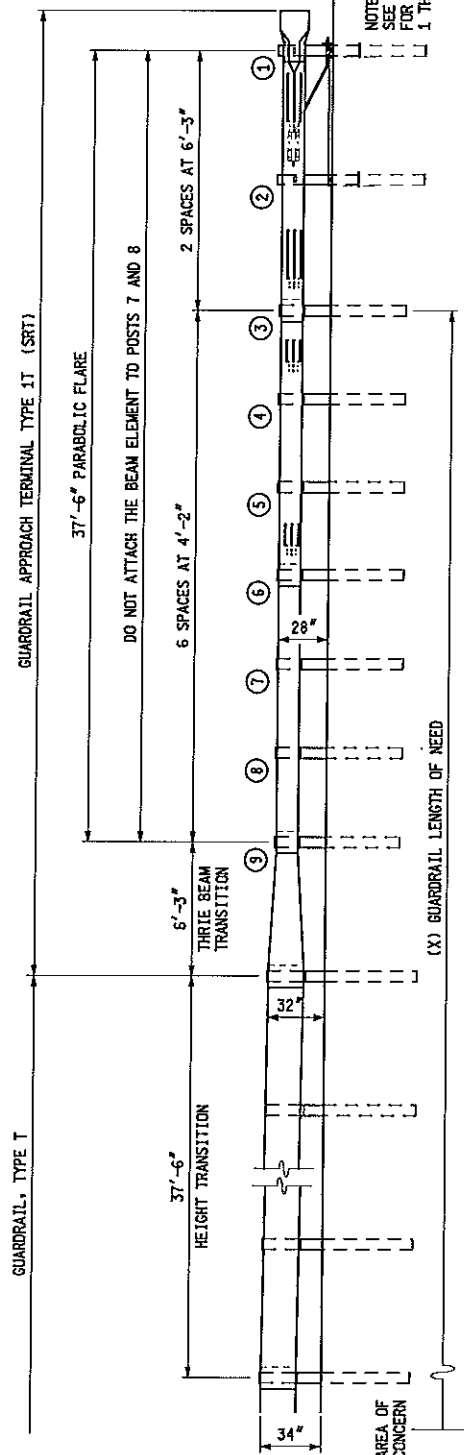
THE POST OFFSET DIMENSIONS ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE WOOD OFFSET BLOCKS. EXCEPT FOR THE FIRST AND SECOND POSTS WHICH ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE POST. OFFSET POINTS ARE TO BE LOCATED BY CHORD MEASUREMENTS AT THE BACK OF THE RAIL EQUAL TO THE NOMINAL POST SPACINGS SPECIFIED. POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.

\* FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 12.

SEE END ANCHORAGE ASSEMBLY, SHEET 3



POST	* POST OFFSET DISTANCE
1	4.0' 48"
2	2.8' 33 1/2"
3	1.8' 21 1/4"
4	1.2' 14 3/4"
5	0.8' 9 1/2"
6	0.45' 5 3/8"
7	0.2' 2 3/8"
8	0.05' 5/8"
9	0' 0"



ELEVATION  
GUARDRAIL APPROACH TERMINAL TYPE 1T  
"SRT"

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

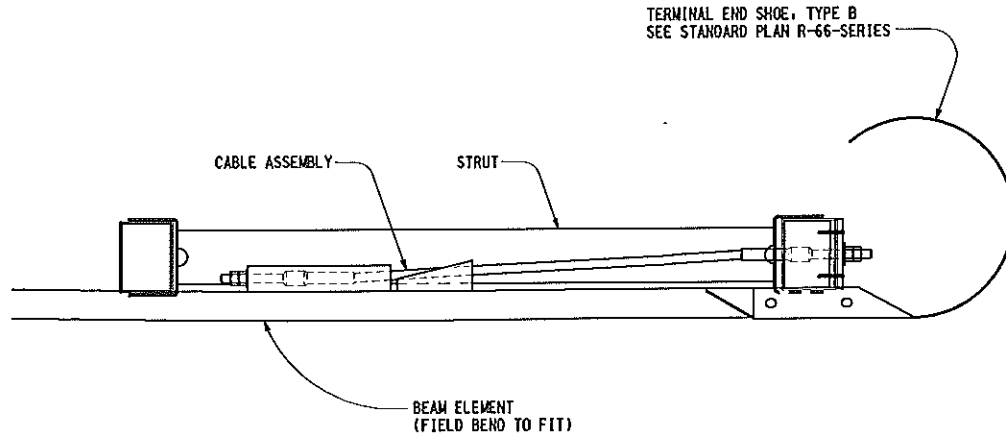
# GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT & FLEAT)

10-21-2008  
F.H.W.A. APPROVAL

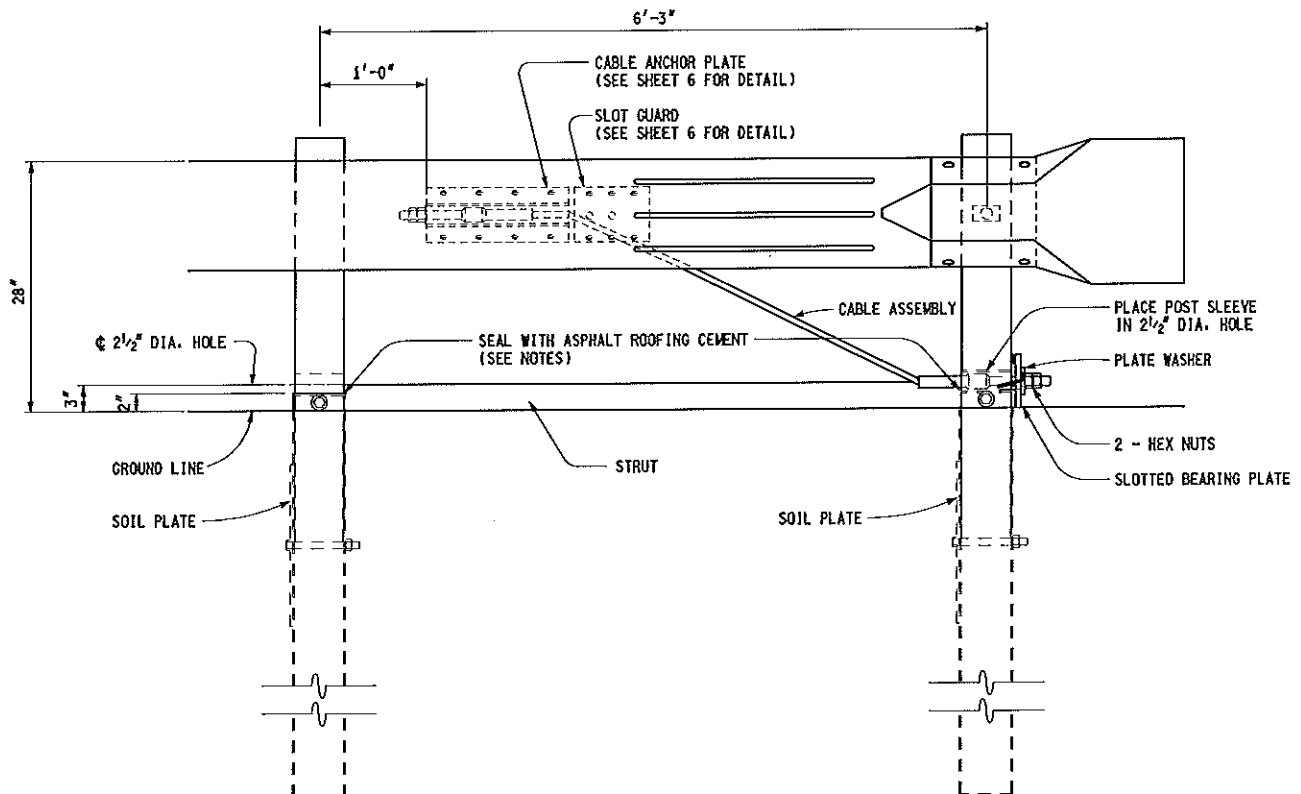
9-4-2007  
PLAN DATE

R-61-G

SHEET  
2 OF 14



PLAN VIEW



ELEVATION

END ANCHORAGE ASSEMBLY  
(SRT)

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT SPECIAL DETAIL FOR

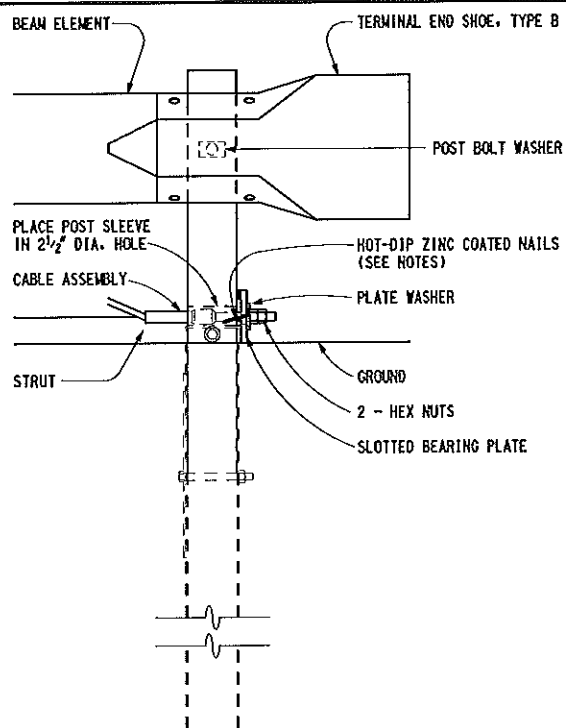
GUARDRAIL APPROACH  
TERMINAL TYPES 1B & 1T  
(SRT & FLEAT)

10-21-2008  
F.H.W.A. APPROVAL

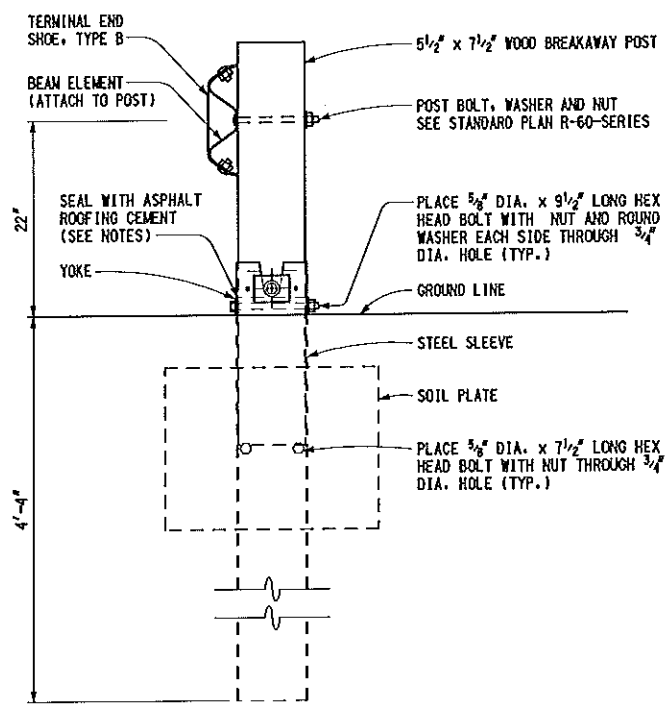
9-4-2007  
PLAN DATE

R-61-G

SHEET  
3 OF 14

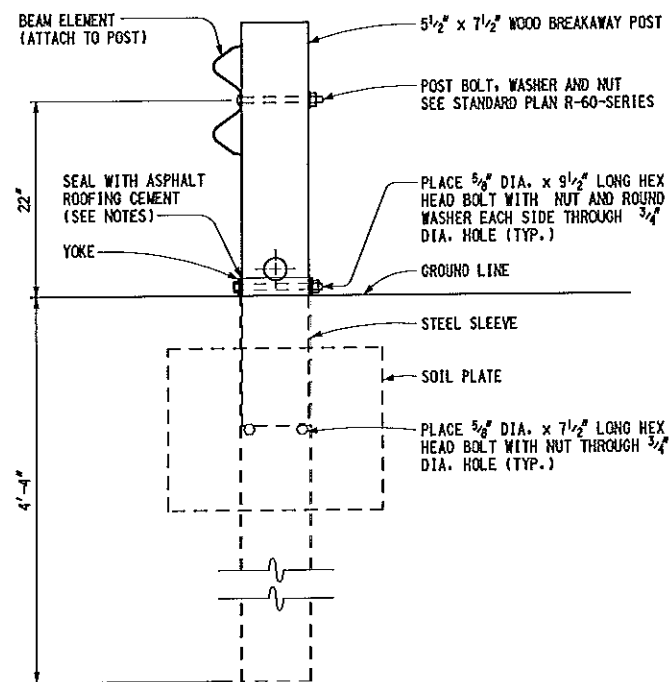


ELEVATION



SIDE

POST 1 DETAIL  
(SRT)



POST 2 DETAIL  
(SRT)

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY-DEVELOPMENT SPECIAL DETAIL FOR  
**GUARDRAIL APPROACH  
TERMINAL TYPES 1B & 1T  
(SRT & FLEAT)**

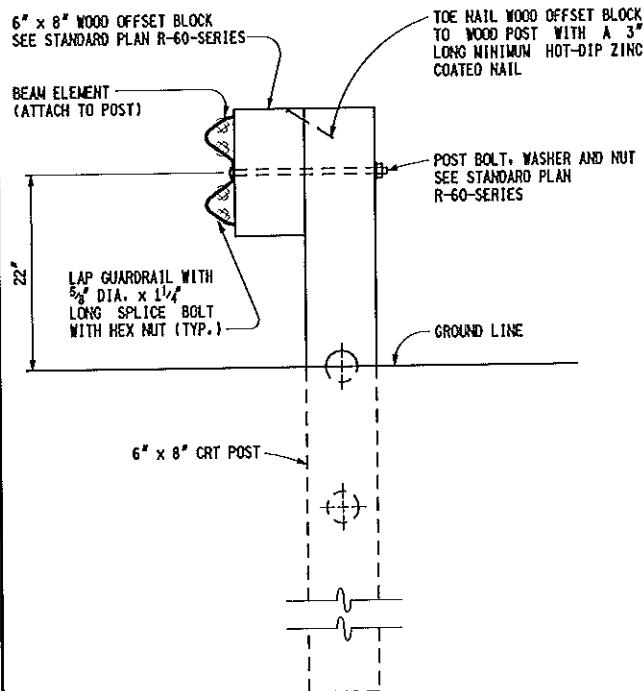
10-21-2008  
F.H.W.A. APPROVAL

9-4-2007  
PLAN DATE

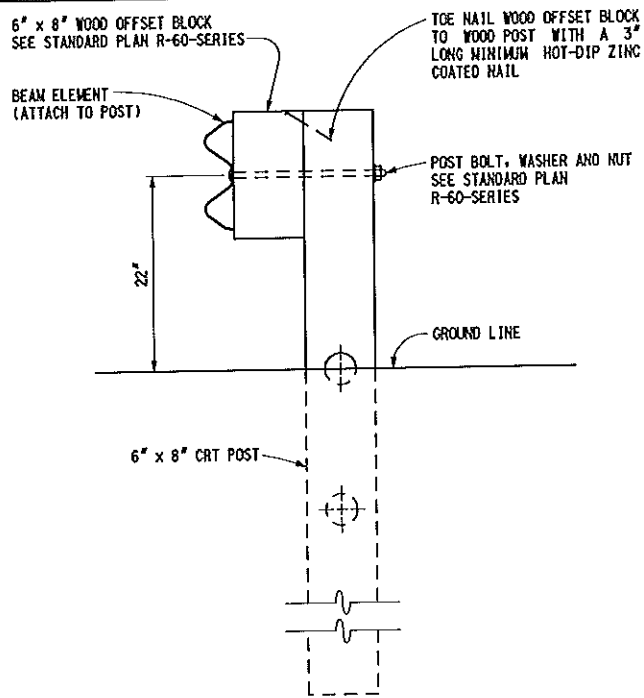
R-61-G

SHEET  
4 OF 14

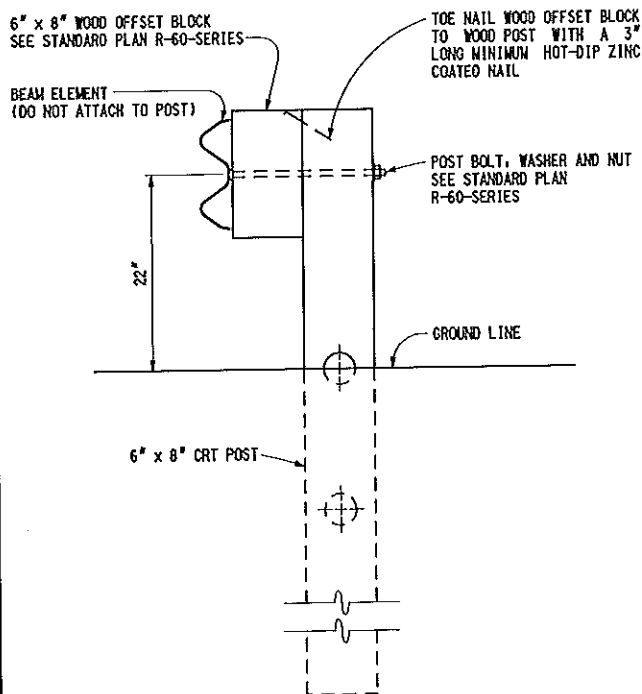




**POST 3 AND 6 DETAIL**  
(SRT)



**POST 4 AND 5 DETAIL**  
(SRT)



**POST 7 AND 8 DETAIL**  
(SRT)

NOTE: POST 9 IS A STANDARD LINE POST

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT SPECIAL DETAIL FOR

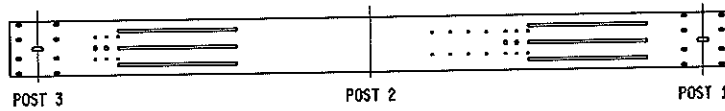
**GUARDRAIL APPROACH  
TERMINAL TYPES 1B & 1T  
(SRT & FLEAT)**

10-21-2008  
F.H.W.A. APPROVAL

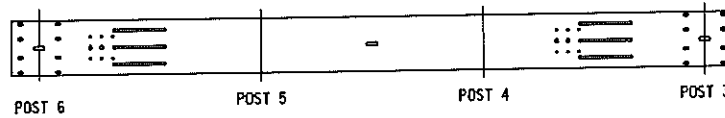
9-4-2007  
PLAN DATE

R-61-G

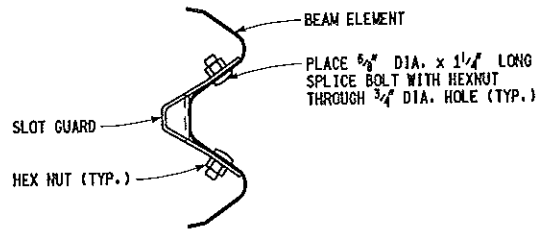
SHEET  
5 OF 14



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



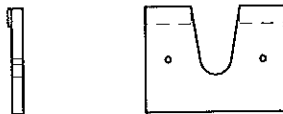
**SLOTTED RAIL BEAM ELEMENT**  
(POST 3 THROUGH 6)



**ASSEMBLY DETAIL**



**SLOT GUARD DETAILS**

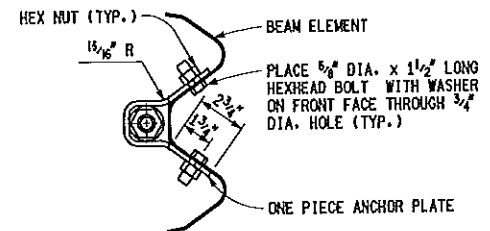
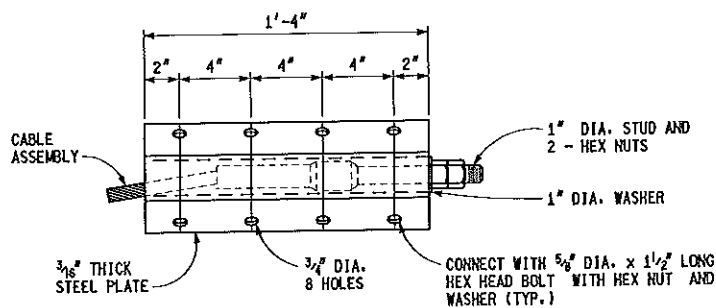


**SLOTTED BEARING PLATE**



**PLATE WASHER**

NOTE: ALL (SRT) ITEMS ILLUSTRATED WITHOUT DIMENSIONS SHALL BE ACCORDING TO THE MANUFACTURERS SPECIFICATION.



**CABLE ANCHOR PLATE DETAILS**  
(SRT)

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT SPECIAL DETAIL FOR  
**GUARDRAIL APPROACH**  
**TERMINAL TYPES 1B & 1T**  
(SRT & FLEAT)

10-21-2008  
F.H.W.A. APPROVAL

9-4-2007  
PLAN DATE

R-61-G

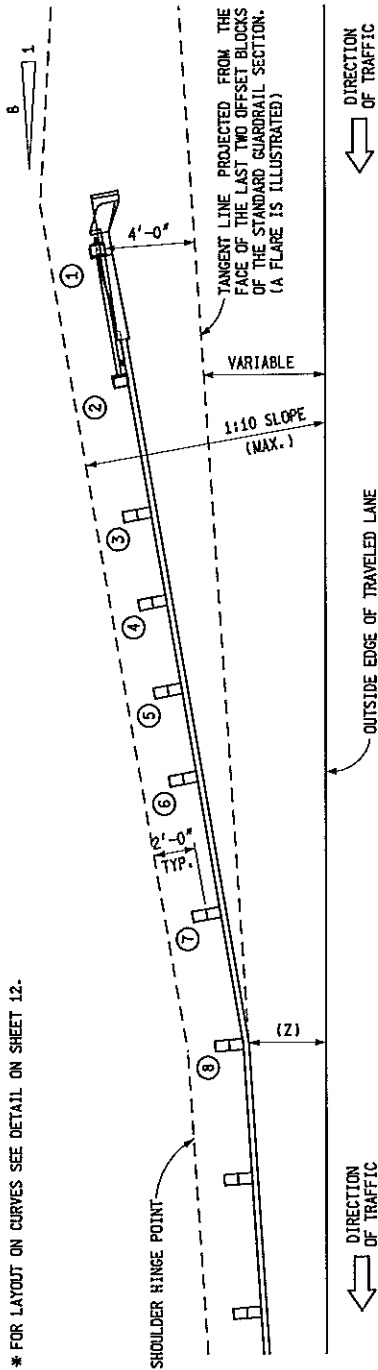
SHEET  
6 OF 14

POST	* POST OFFSET DISTANCE
1	4'-0" 48"
2	3'-33" 40"
3	2'-67" 32"
4	2'-22" 28 1/16"
5	1'-77" 21 5/16"
6	1'-33" 16"
7	0'-67" 8"
8	0' 0"

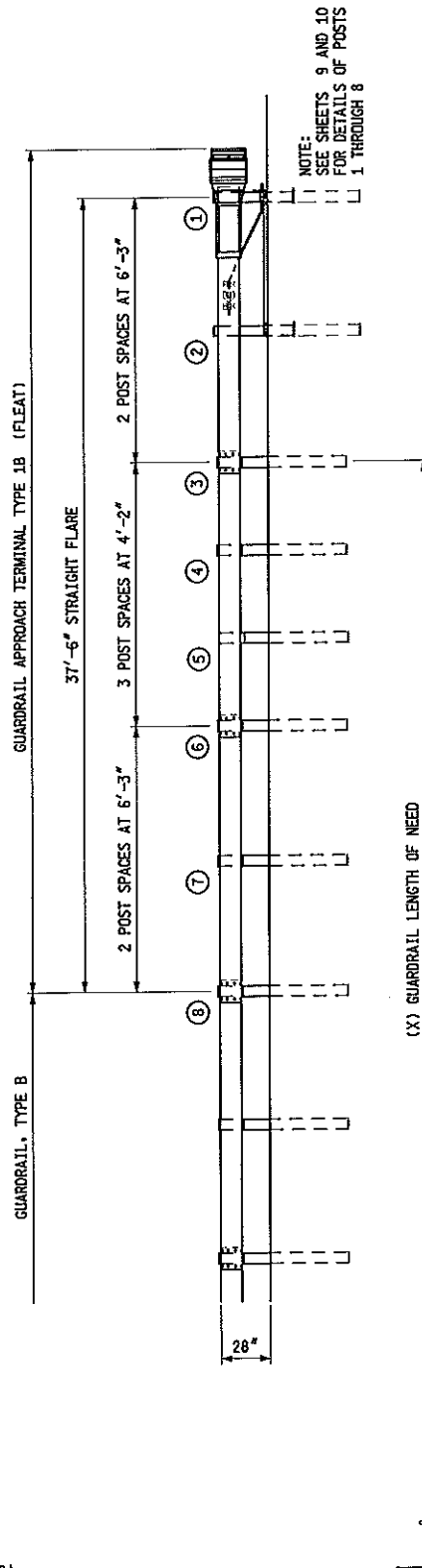
# OPTION 2 (DETAILED ON SHEETS 7 THROUGH 10)

THE POST OFFSET DIMENSIONS ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE WOOD OFFSET BLOCKS. EXCEPT FOR THE FIRST AND SECOND POSTS WHICH ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE POST. OFFSET POINTS ARE TO BE LOCATED BY CHORD MEASUREMENTS AT THE BACK OF THE RAIL EQUAL TO THE NOMINAL POST SPACINGS SPECIFIED. POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.

\* FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 12.



PLAN VIEW



ELEVATION

## GUARDRAIL APPROACH TERMINAL TYPE 1B "FLEAT"

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT SPECIAL DETAIL FOR

## GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT & FLEAT)

10-21-2008  
F.H.W.A. APPROVAL

9-4-2007  
PLAN DATE

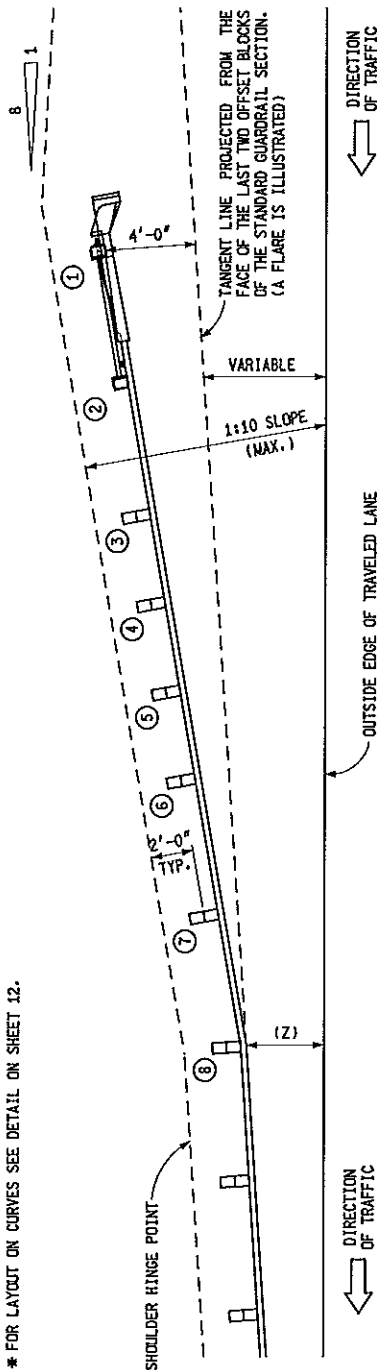
R-61-G

SHEET  
7 OF 14

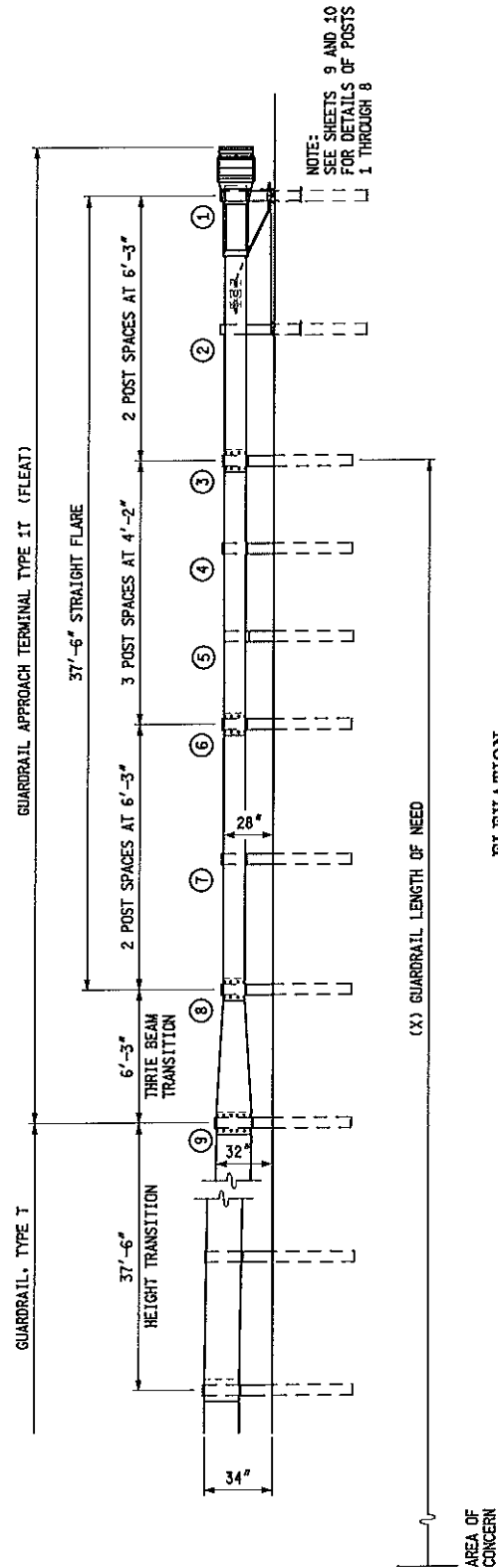
POST	* POST OFFSET DISTANCE
1	4'-0" 48"
2	3'-33" 40"
3	2'-67" 32"
4	2'-22" 26 1/16"
5	1'-77" 21 5/16"
6	1'-33" 16"
7	0'-67" 8"
8	0' 0"

THE POST OFFSET DIMENSIONS ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE WOOD OFFSET BLOCKS, EXCEPT FOR THE FIRST AND SECOND POSTS WHICH ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE POST. OFFSET POINTS ARE TO BE LOCATED BY CHORD MEASUREMENTS AT THE BACK OF THE RAIL EQUAL TO THE NOMINAL POST SPACINGS SPECIFIED. POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.

\* FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 12.



PLAN VIEW



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 1T  
"FLEAT"

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT SPECIAL DETAIL FOR

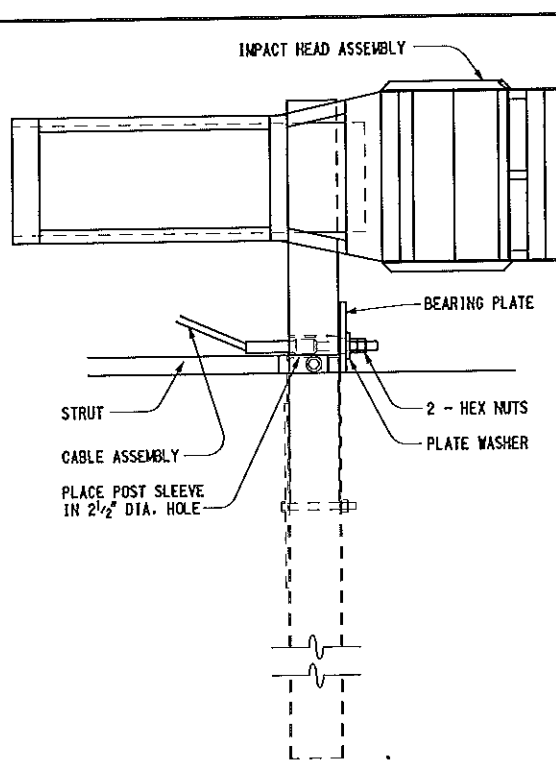
# GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT & FLEAT)

10-21-2008  
F.H.W.A. APPROVAL

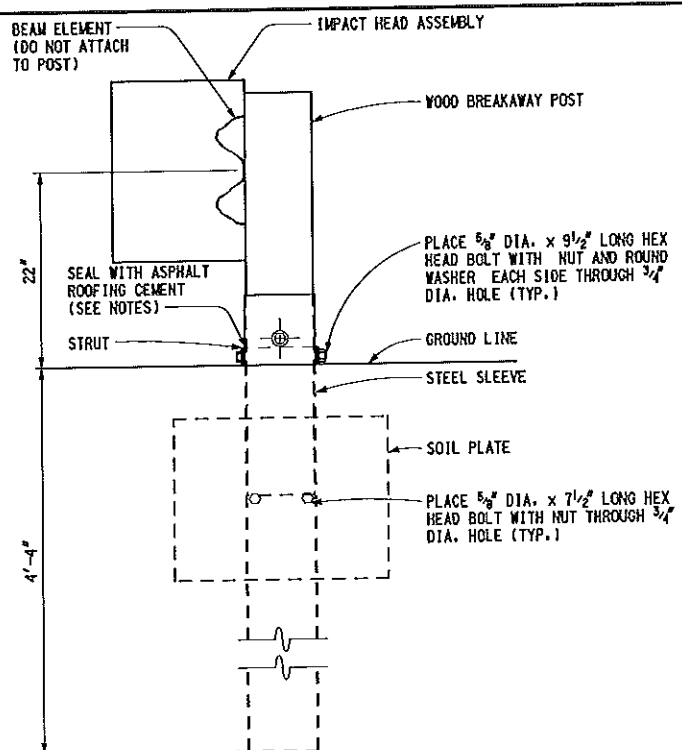
9-4-2007  
PLAN DATE

R-61-G

SHEET  
8 OF 14

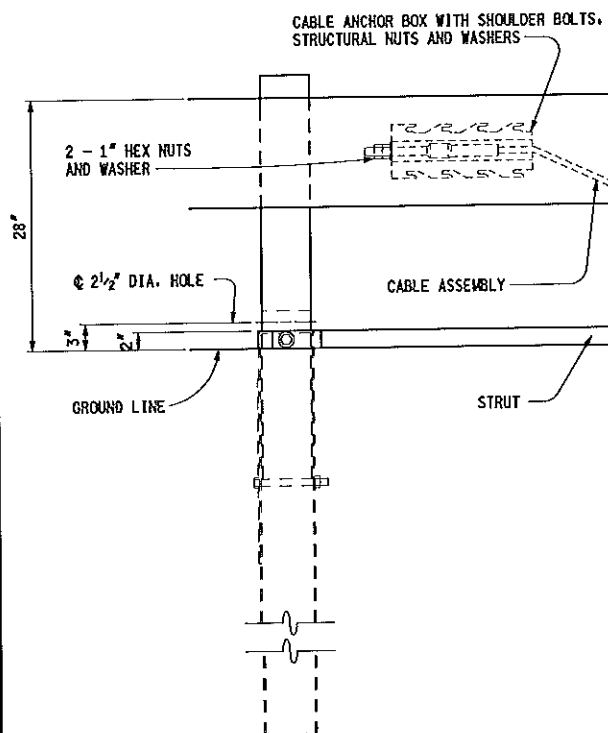


ELEVATION

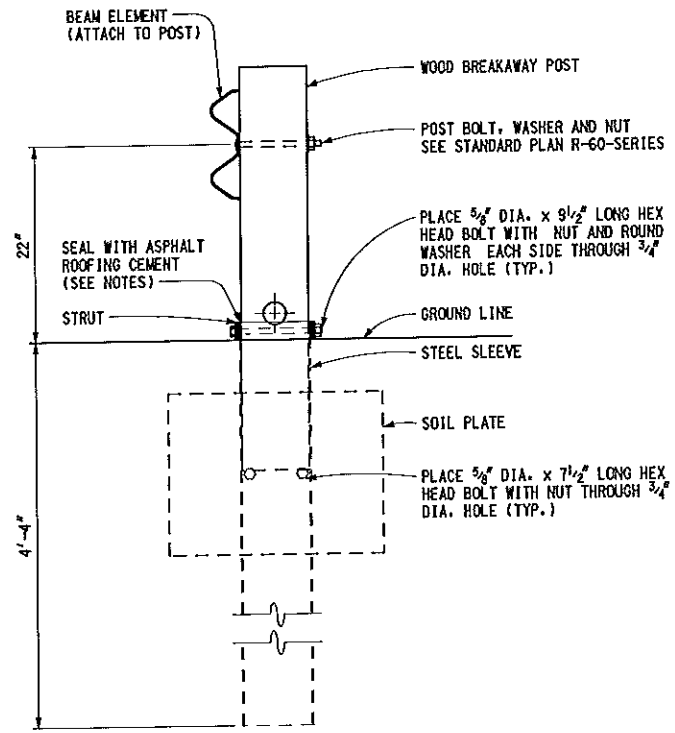


SIDE

POST 1 DETAIL  
(FLEAT)



ELEVATION



SIDE

POST 2 DETAIL  
(FLEAT)

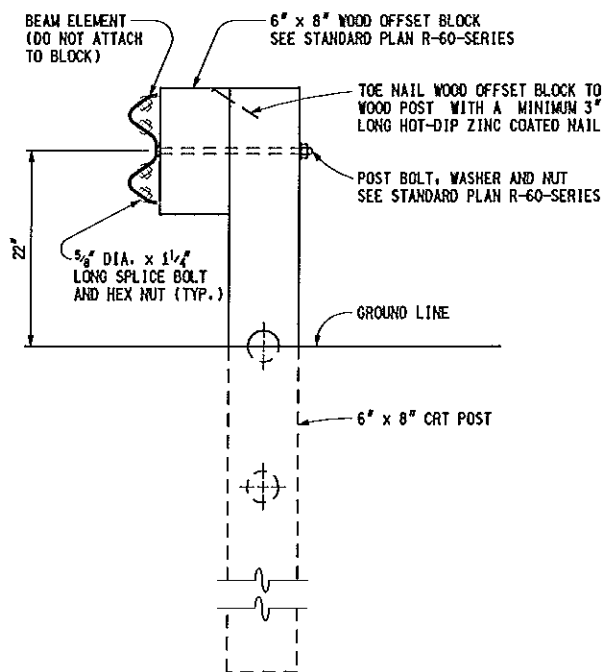
MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT SPECIAL DETAIL FOR  
**GUARDRAIL APPROACH  
TERMINAL TYPES 1B & 1T  
(SRT & FLEAT)**

10-21-2008  
F.H.W.A. APPROVAL

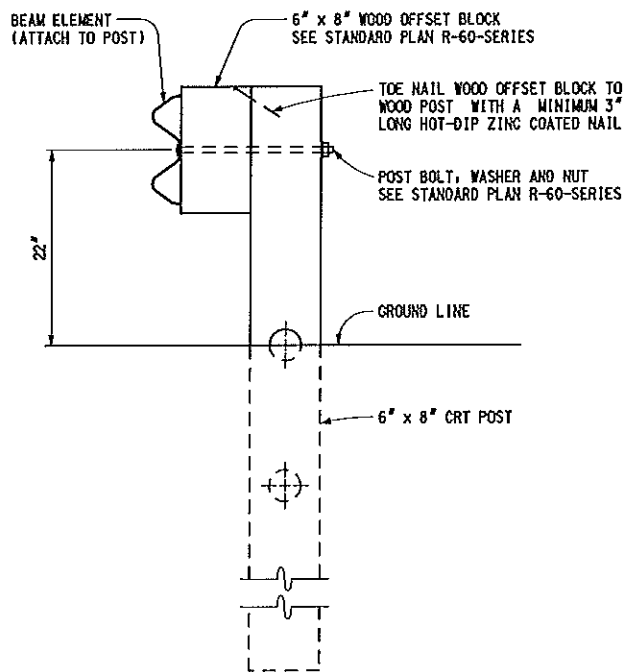
9-4-2007  
PLAN DATE

R-61-G

SHEET  
9 OF 14

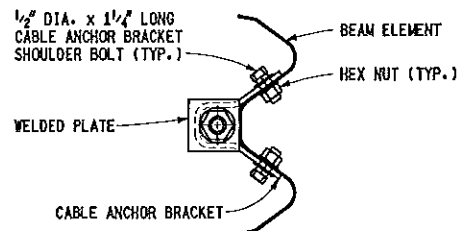
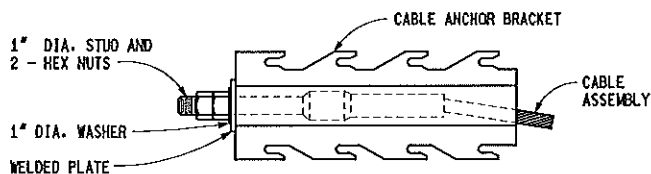


**POST 3 DETAIL**  
(FLEAT)

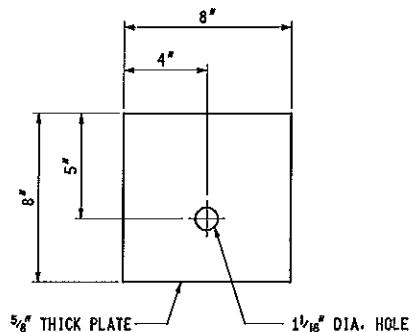


**POST 4 THROUGH 7 DETAIL**  
(FLEAT)

NOTE: POST 8 IS A STANDARD LINE POST



**CABLE ANCHOR BRACKET DETAIL**  
(FLEAT)



**BEARING PLATE**  
(FLEAT)

NOTE: ALL (FLEAT) ITEMS ILLUSTRATED WITHOUT DIMENSIONS SHALL BE ACCORDING TO THE MANUFACTURERS SPECIFICATION.



**W-BEAM GUARDRAIL END SECTION**  
(POST 1 THROUGH 3)

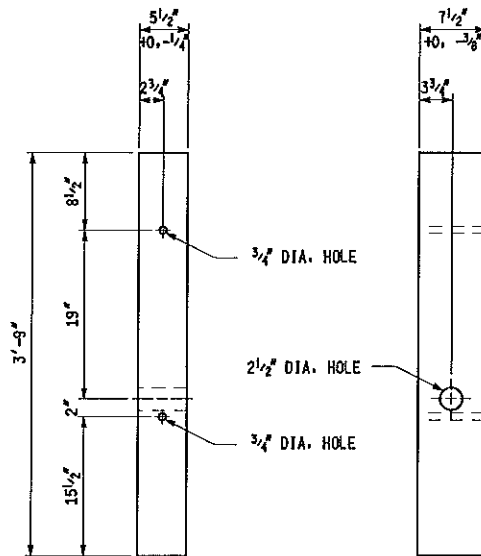
MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT SPECIAL DETAIL FOR  
**GUARDRAIL APPROACH  
TERMINAL TYPES 1B & 1T  
(SRT & FLEAT)**

10-21-2008  
F.H.W.A. APPROVAL

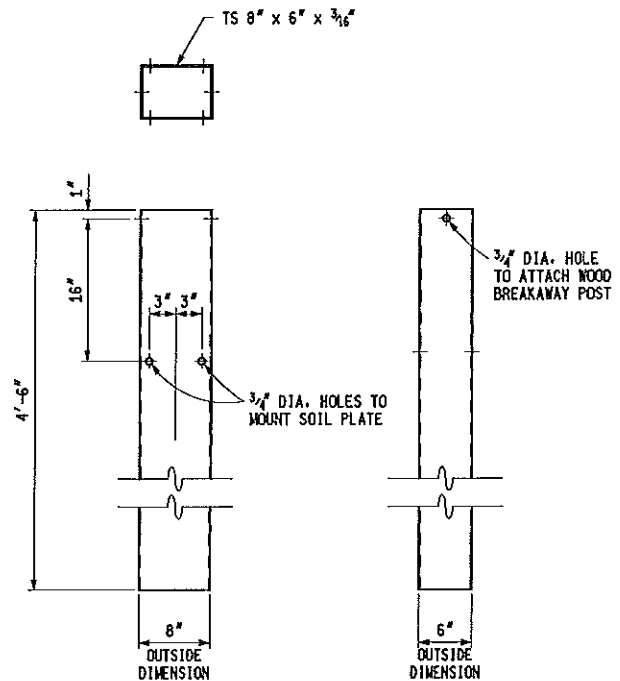
9-4-2007  
PLAN DATE

**R-61-G**

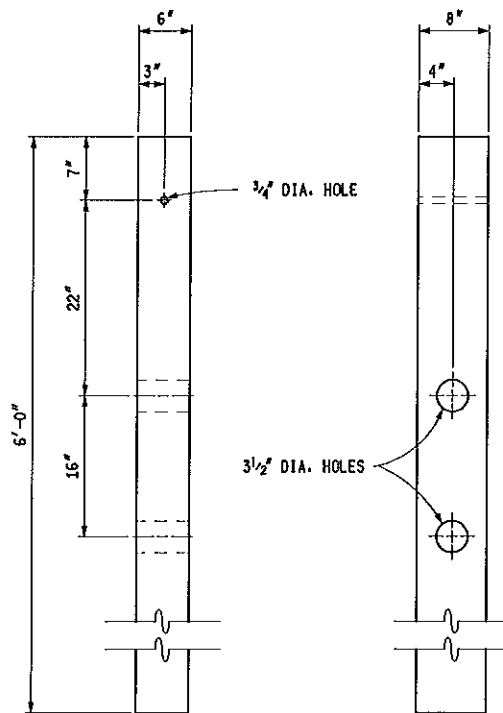
SHEET  
10 OF 14



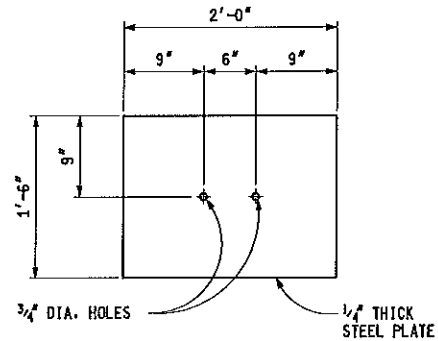
**WOOD BREAKAWAY POST**  
POSTS 1 AND 2 "SRT" AND "FLEAT"



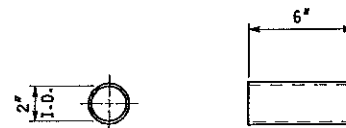
**STEEL SLEEVE**



**CRT POST**  
POSTS 3 THROUGH 9 "SRT"  
POSTS 3 THROUGH 7 "FLEAT"



**SOIL PLATE**



**POST SLEEVE**  
( FOR POST 1 )

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT SPECIAL DETAIL FOR

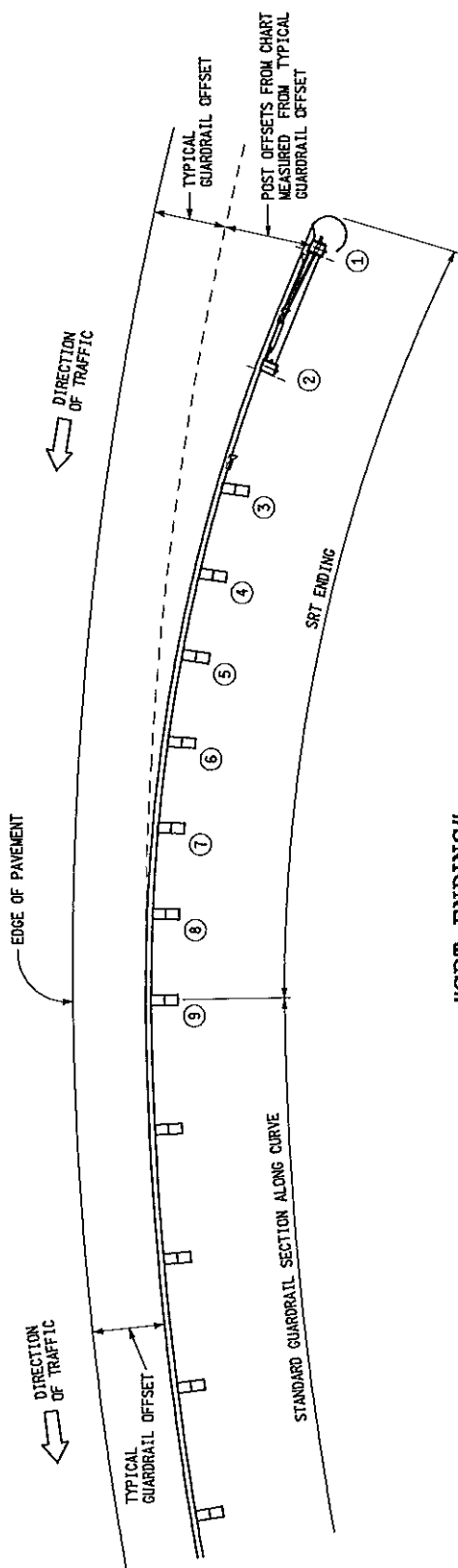
**GUARDRAIL APPROACH  
TERMINAL TYPES 1B & 1T  
(SRT & FLEAT)**

10-21-2008  
F.H.W.A. APPROVAL

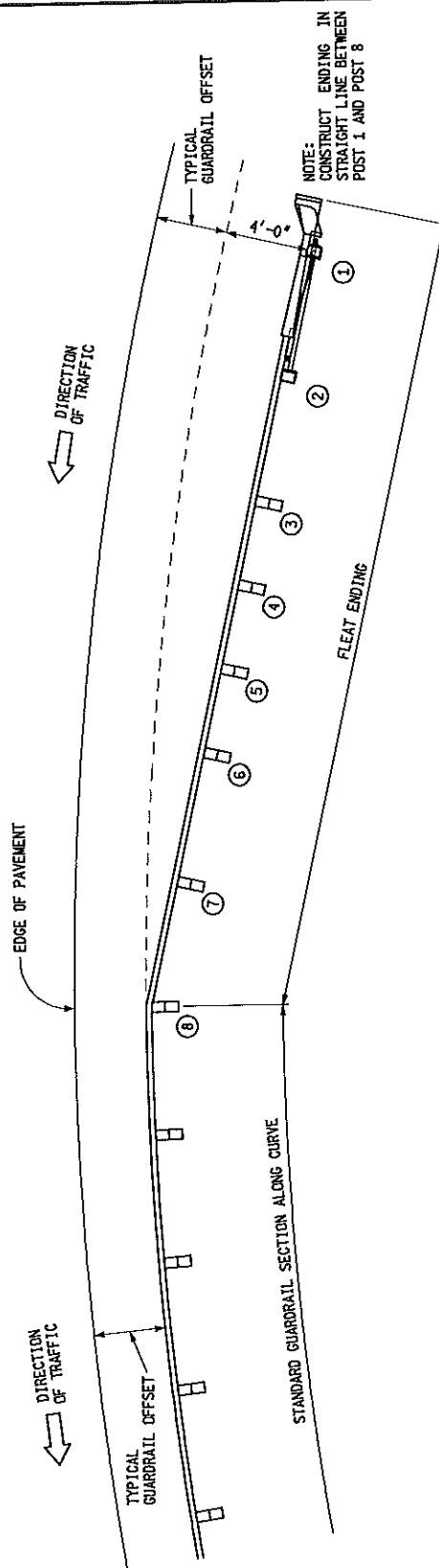
9-4-2007  
PLAN DATE

**R-61-G**

SHEET  
11 OF 14



"SRT ENDING"



"FLEAT ENDING"

LOCATION OF APPROACH GUARDRAIL ON CURVES

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT SPECIAL DETAIL FOR

**GUARDRAIL APPROACH  
TERMINAL TYPES 1B & 1T  
(SRT & FLEAT)**

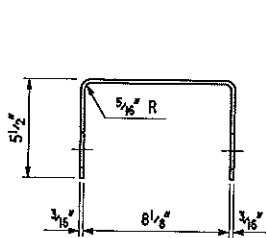
10-21-2008  
F.H.W.A. APPROVAL

9-4-2007  
PLAN DATE

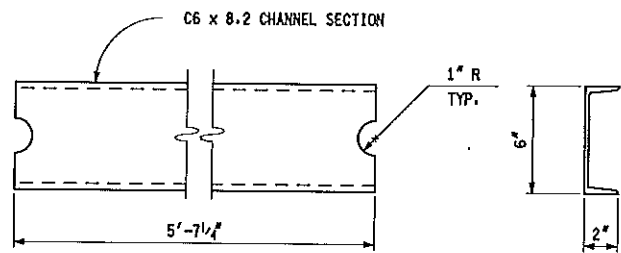
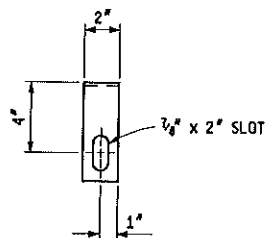
R-61-G

SHEET  
12 OF 14

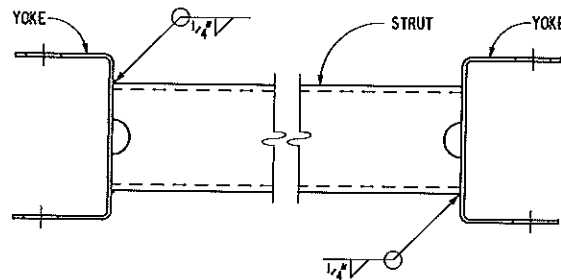




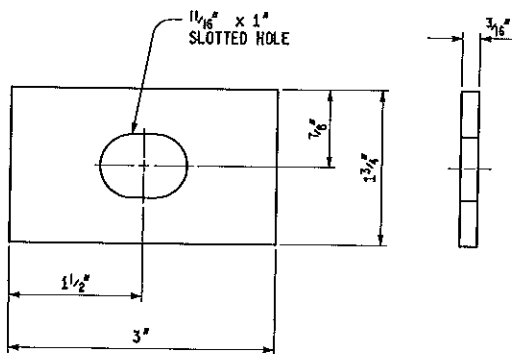
YOKE DETAIL



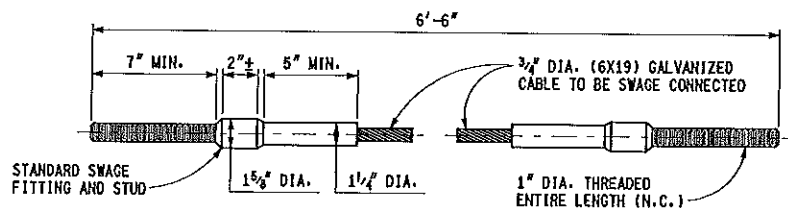
STRUT DETAIL



ASSEMBLY DETAIL  
STRUT AND YOKE ASSEMBLY



POST BOLT WASHER  
(POST 1 ONLY)



CABLE ASSEMBLY

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT SPECIAL DETAIL FOR  
**GUARDRAIL APPROACH  
TERMINAL TYPES 1B & 1T  
(SRT & FLEAT)**

10-21-2008  
F.H.W.A. APPROVAL

9-4-2007  
PLAN DATE

R-61-G

SHEET  
13 OF 14

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.

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

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

GUARDRAIL REFLECTORS ARE NOT TO BE USED ON THE "FLEAT" OR "SRT". PLACE REFLECTORS BEGINNING ON STANDARD RUN OF GUARDRAIL.

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



TRAFFIC PASSING ON  
THE LEFT SIDE



TRAFFIC PASSING ON  
BOTH SIDES



TRAFFIC PASSING ON  
THE RIGHT SIDE

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

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

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

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT SPECIAL DETAIL FOR

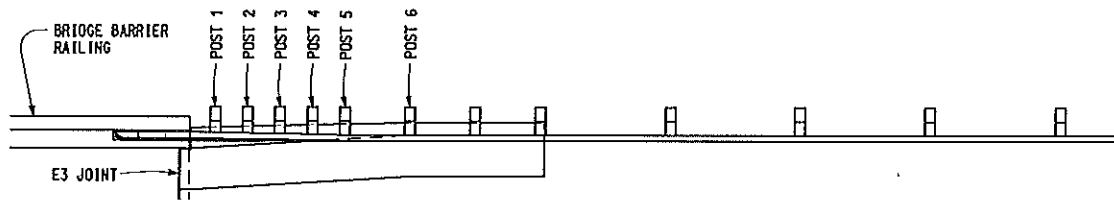
**GUARDRAIL APPROACH  
TERMINAL TYPES 1B & 1T  
(SRT & FLEAT)**

10-21-2008  
F.H.W.A. APPROVAL

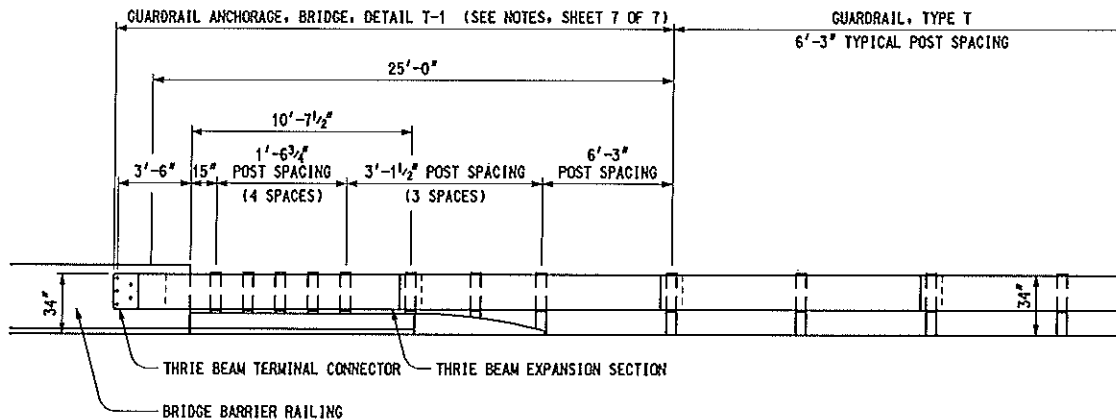
9-4-2007  
PLAN DATE

R-61-G

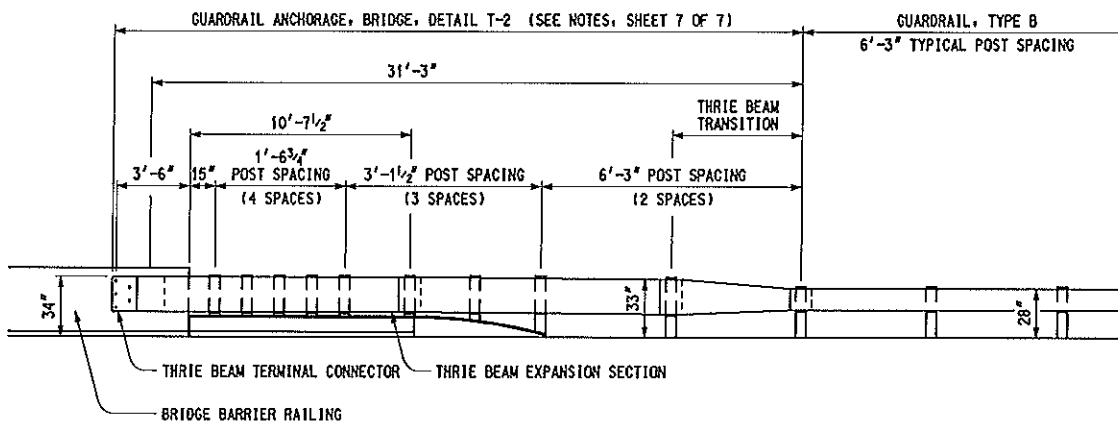
SHEET  
14 OF 14



PLAN VIEW



ELEVATION VIEW  
(TO BE USED WITH GUARDRAIL, TYPE T)



ELEVATION VIEW  
(TO BE USED WITH GUARDRAIL, TYPE B)

**DETAILS FOR CONNECTING GUARDRAIL TO  
BRIDGE BARRIER RAILINGS, TYPE 4, 2-TUBE, 4-TUBE, OR AESTHETIC PARAPET TUBE  
(WITHOUT EXPANSION AT BACKWALL)**



PREPARED BY  
DESIGN  
SUPPORT AREA

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR  
Kirk T. Stouffe

APPROVED BY:

*John C. Fernald*  
ENGINEER OF DELIVERY

APPROVED BY:

*M.S. Pugh*  
ENGINEER OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

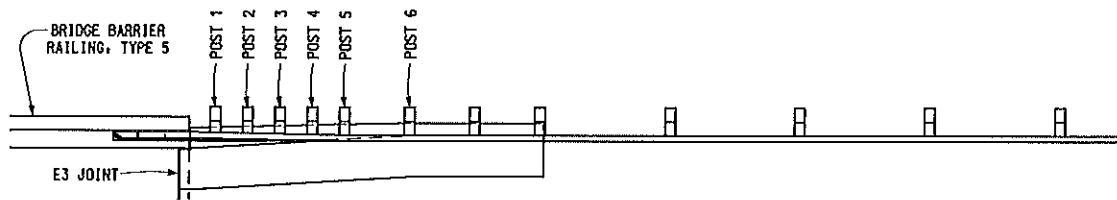
**GUARDRAIL ANCHORAGE,  
BRIDGE, DETAILS**

6-15-2006  
F.H.V.A. APPROVAL

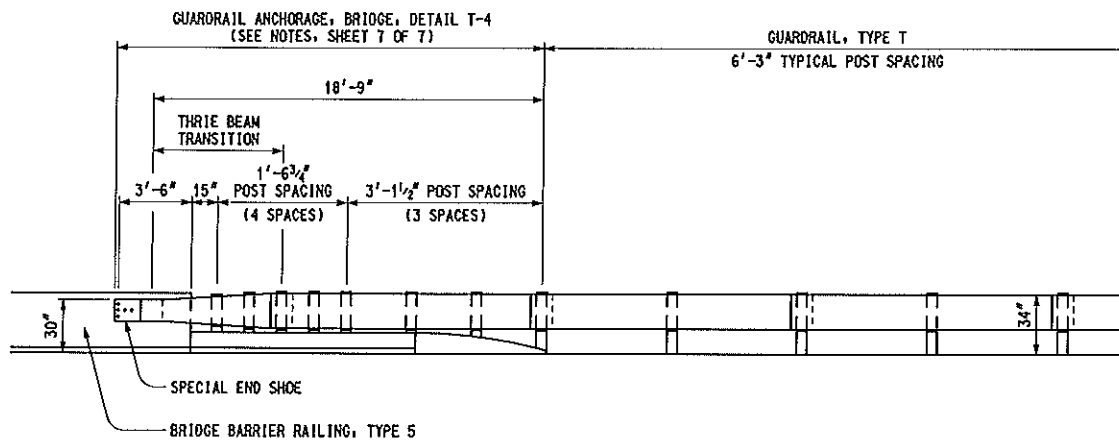
4-24-2006  
PLAN DATE

**R-67-F**

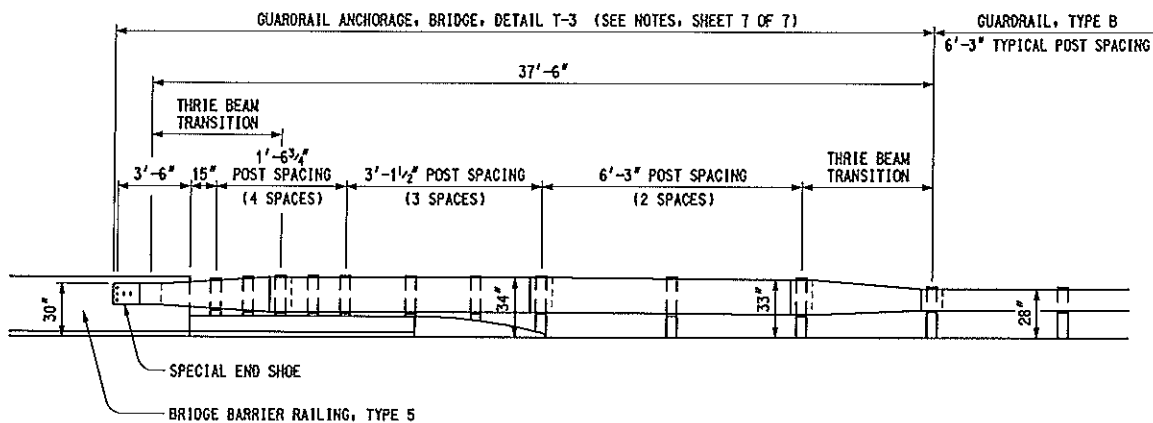
SHEET  
1 OF 1



PLAN VIEW



ELEVATION VIEW  
(TO BE USED WITH GUARDRAIL, TYPE T)



ELEVATION VIEW  
(TO BE USED WITH GUARDRAIL, TYPE B)

**DETAILS FOR CONNECTING GUARDRAIL TO BRIDGE BARRIER RAILINGS, TYPE 5**  
(WITHOUT EXPANSION AT BACKWALL)

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

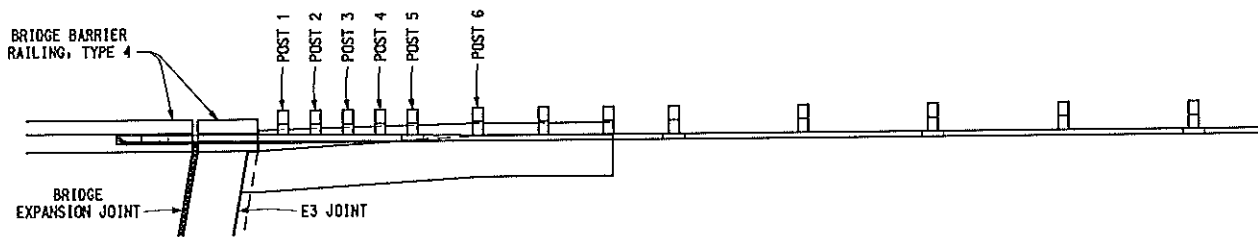
**GUARDRAIL ANCHORAGE,  
BRIDGE, DETAILS**

6-15-2006  
F.H.W.A. APPROVAL

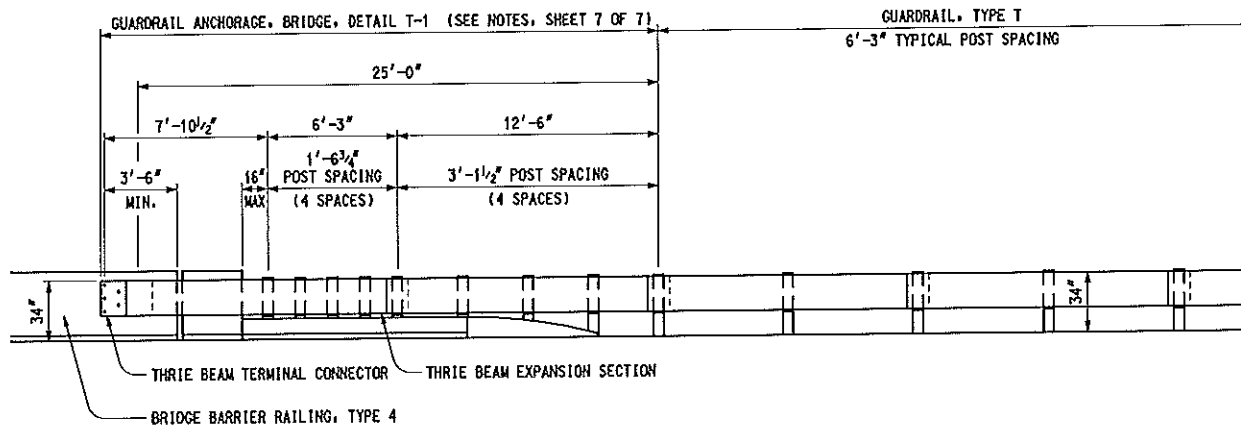
4-24-2006  
PLAN DATE

**R-67-F**

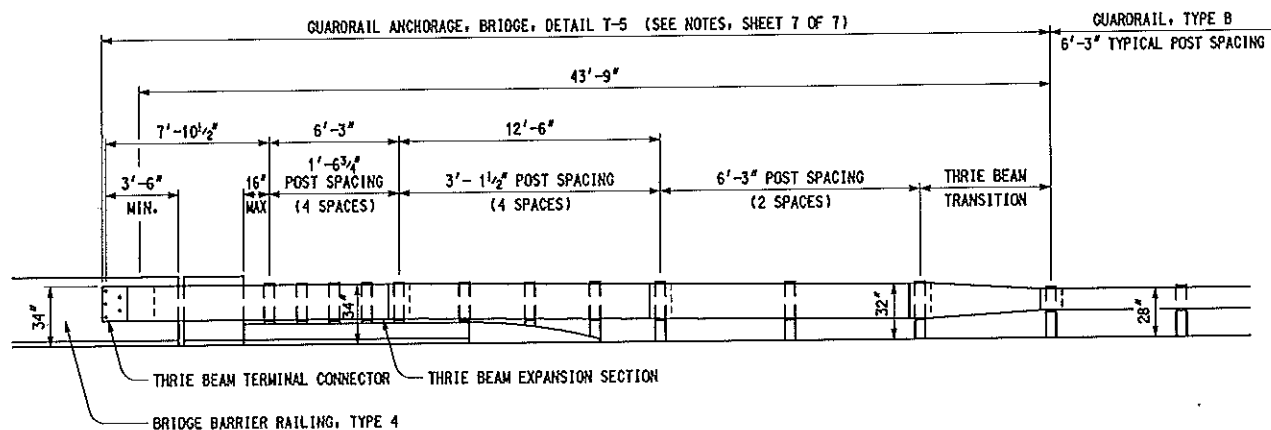
SHEET  
2 OF 7



PLAN VIEW



ELEVATION VIEW  
(TO BE USED WITH GUARDRAIL, TYPE T)



ELEVATION VIEW  
(TO BE USED WITH GUARDRAIL, TYPE B)

DETAILS FOR CONNECTING GUARDRAIL TO  
BRIDGE BARRIER RAILINGS, TYPE 4, 2-TUBE, 4-TUBE, OR AESTHETIC PARAPET TUBE  
(WITH EXPANSION AT BACKWALL)

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

## GUARDRAIL ANCHORAGE, BRIDGE, DETAILS

6-15-2006  
F.H.W.A. APPROVAL

4-24-2006  
PLAN DATE

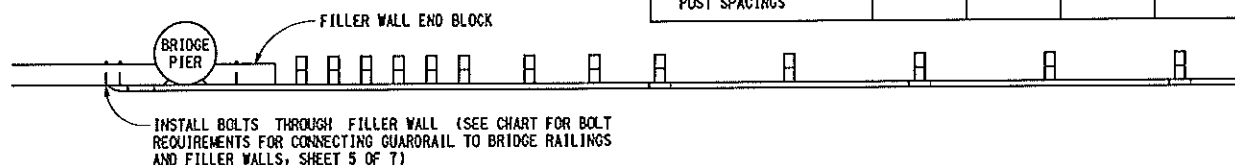
R-67-F

SHEET  
3 OF 7

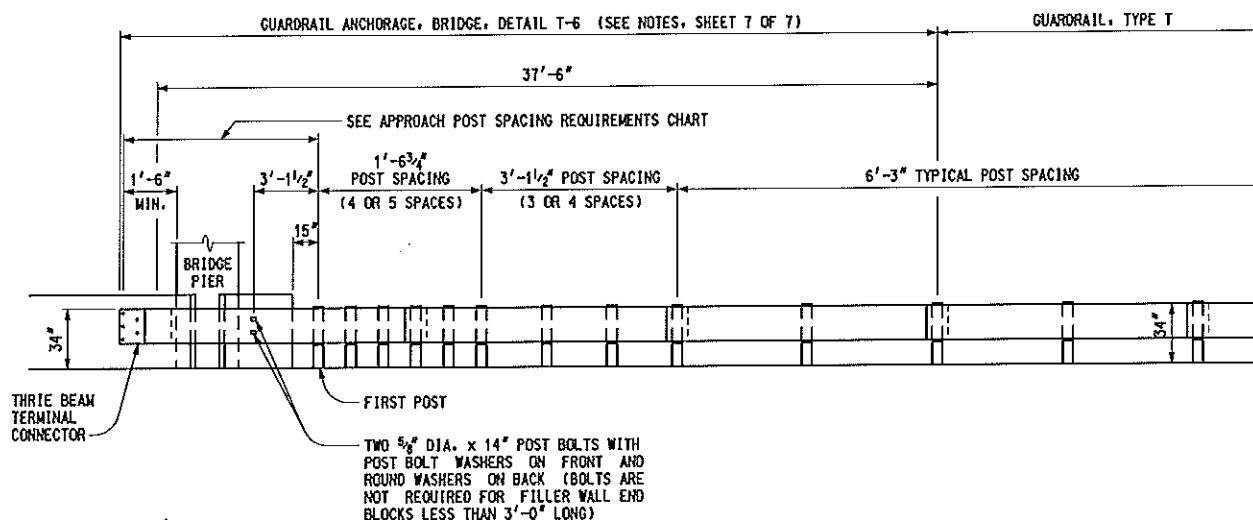
NOTE: FILLER WALL END BLOCK MAY BE OMITTED WHEN FIRST ANCHORAGE POST CAN BE INSTALLED FULL DEPTH 1'-3" FROM BRIDGE PIER.

# APPROACH POST SPACING REQUIREMENTS

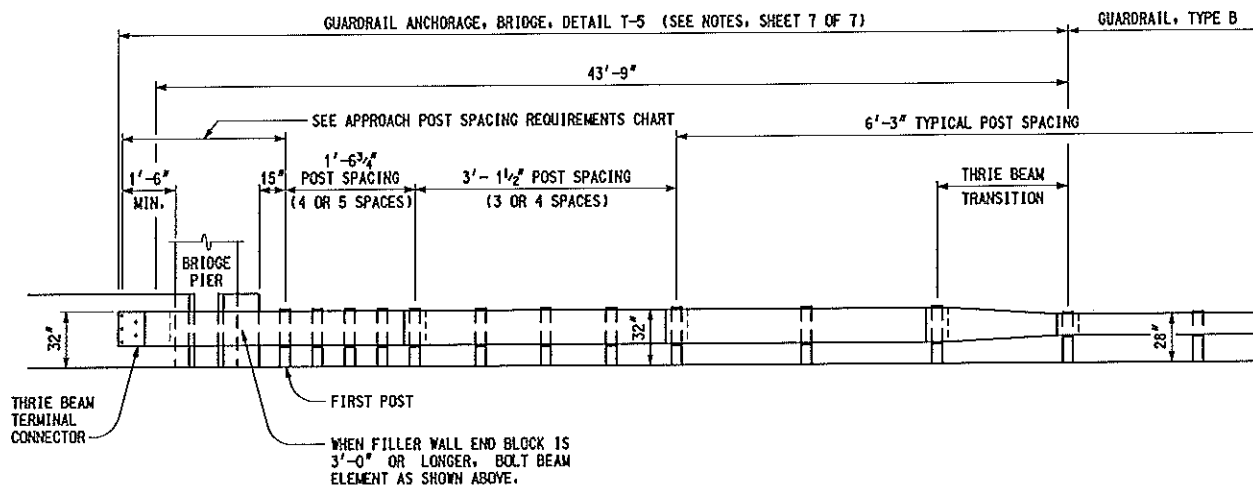
DISTANCE FROM ANCHOR BOLTS TO FIRST POST	7'-11 <sup>3</sup> / <sub>4</sub> "	9'-6 <sup>1</sup> / <sub>2</sub> "	11'-1 <sup>1</sup> / <sub>4</sub> "	12'-8"
NUMBER OF 1'-6 <sup>3</sup> / <sub>4</sub> " POST SPACINGS	4	5	4	5
NUMBER OF 3'-1 <sup>1</sup> / <sub>2</sub> " POST SPACINGS	4	3	3	4



PLAN VIEW



ELEVATION VIEW  
(TO BE USED WITH GUARDRAIL, TYPE T)



ELEVATION VIEW  
(TO BE USED WITH GUARDRAIL, TYPE B)

## DETAILS FOR CONNECTING GUARDRAIL TO FILLER WALLS

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

## GUARDRAIL ANCHORAGE, BRIDGE, DETAILS

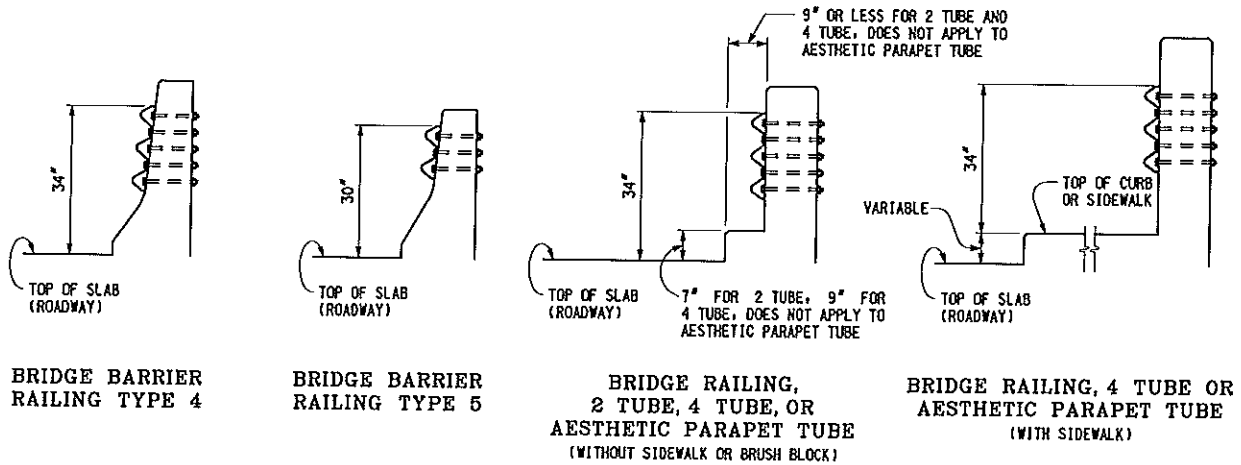
6-15-2006  
F.H.W.A. APPROVAL

4-24-2006  
PLAN DATE

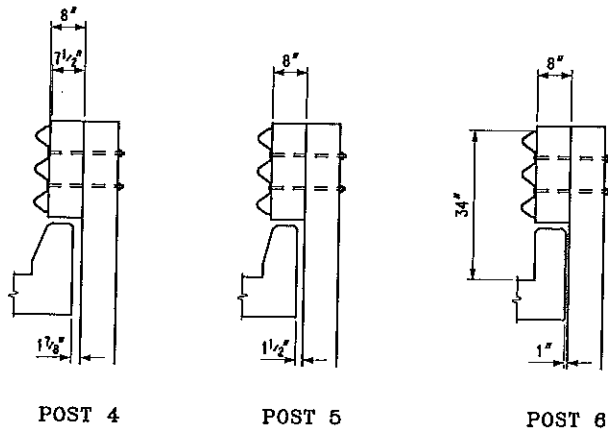
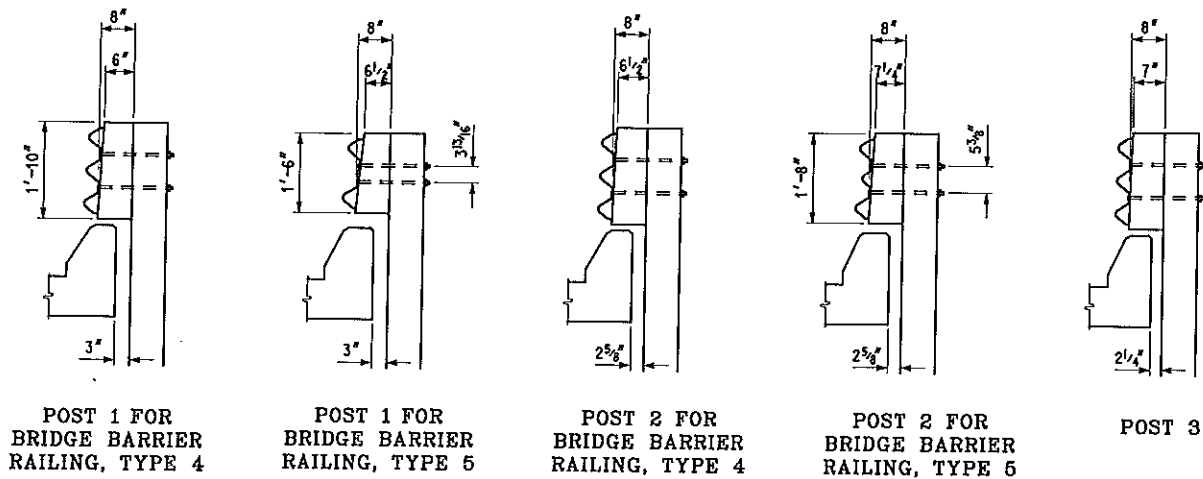
R-67-F

SHEET  
4 OF 7

HIGH STRENGTH  $\frac{7}{8}$ " DIA. HEX HEAD BOLT AND NUTS SHALL BE USED TO CONNECT GUARDRAIL TO BRIDGE RAILINGS WITH ROUND WASHERS ON FRONT AND SQUARE WASHERS ON BACK. (SEE CHART BELOW FOR LENGTHS AND NUMBER REQUIRED.) WASHER DETAILS ARE SHOWN ON SHEET 6 OF 7.



### SECTIONS AT BRIDGE RAILINGS



### BOLT REQUIREMENTS FOR CONNECTING GUARDRAIL TO BRIDGE RAILINGS & FILLER WALLS

BRIDGE RAILING	BOLT LENGTH	MINIMUM THREAD LENGTH	NUMBER REQUIRED
TYPE 4	12 1/2"	4"	5
TYPE 5	11 1/2"	4"	4
2 TUBE	WALL THICKNESS + 2"	2"	5
4 TUBE	WALL THICKNESS + 2"	2"	5
AESTHETIC PARAPET	WALL THICKNESS + 2"	2"	5
** FILLER WALL	WALL THICKNESS + 2"	2"	5

SHORTER BOLT LENGTHS MAY BE USED PROVIDED THE BOLT EXTENDS  $\frac{1}{4}$ " BEYOND THE NUT WHEN TIGHTENED.

\*\* THE USE OF  $\frac{7}{8}$ " DIA. ADHESIVE ANCHORED BOLTS EMBEDDED 8" TO ATTACH GUARDRAIL TO FILLER WALLS WILL BE ALLOWED, INSTEAD OF BOLTING THROUGH THE FILLER WALL, IN THE FOLLOWING LOCATIONS:

1. AT OR NEAR THE JOINT LINE WHEN A FILLER WALL IS A DIFFERENT THICKNESS THAN THE FILLER WALL EXTENSION.
2. IN EXISTING FILLER WALLS THICKER THAN 1'-6".
3. WHEN CONDITIONS PROHIBIT THE USE OF BOLTS.

### GUARDRAIL POST SECTIONS FOR GUARDRAIL ANCHORAGE, BRIDGE

NOTE: ADHESIVE ANCHORS SHALL BE SELECTED FROM THE QUALIFIED PRODUCTS LIST OF THE MATERIALS SAMPLING GUIDE.

#### NOTE:

POST AND BLOCK SECTIONS FOR THE 2 TUBE, 4 TUBE, AND AESTHETIC PARAPET TUBE BRIDGE RAILINGS SHALL BE THE SAME AS THAT SHOWN ON POST 6. POST SPACING SHALL BE AS SHOWN IN ELEVATION VIEWS.

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

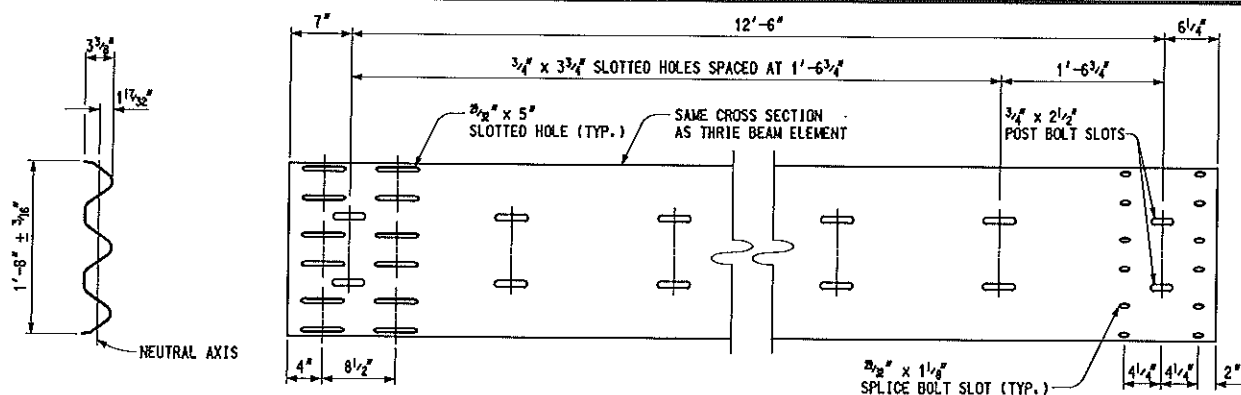
### GUARDRAIL ANCHORAGE, BRIDGE, DETAILS

6-15-2006  
F.H.W.A. APPROVAL

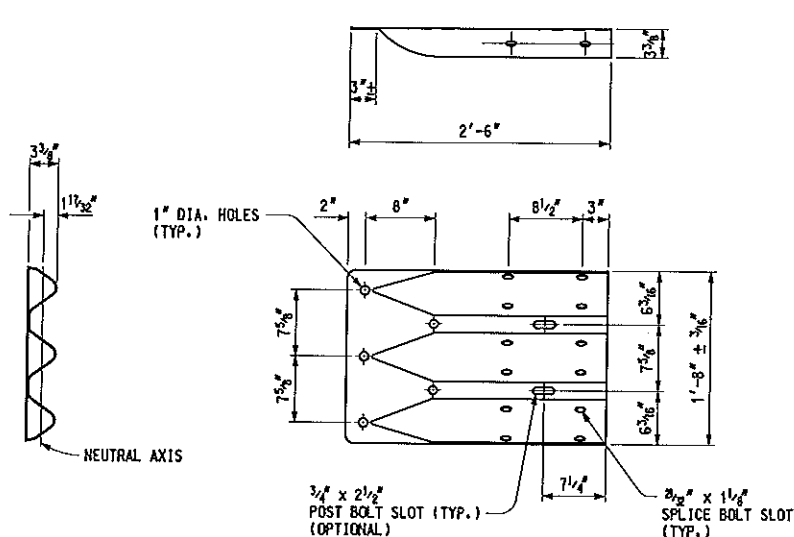
4-24-2006  
PLAN DATE

R-67-F

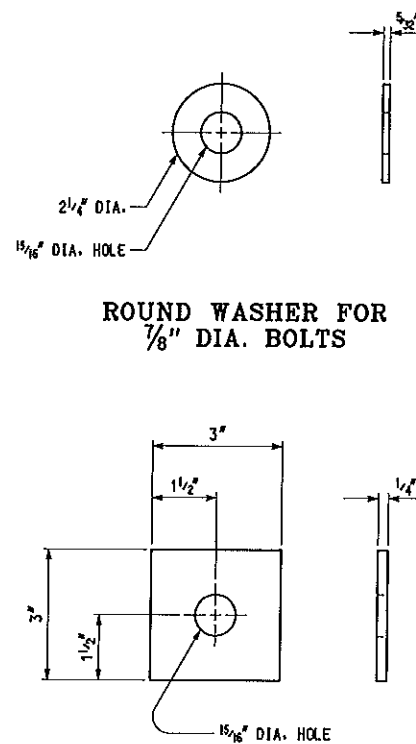
SHEET  
5 OF 7



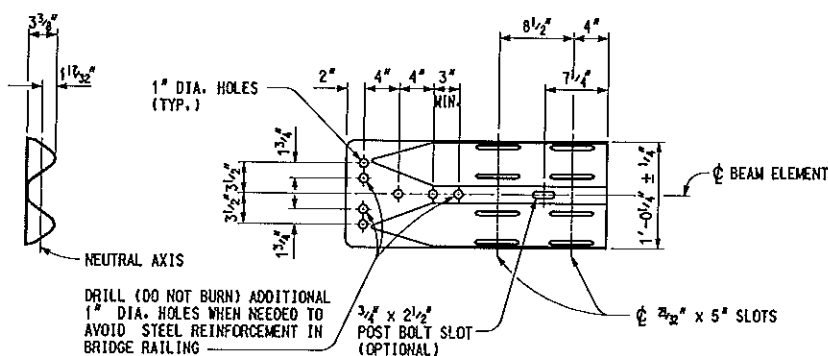
THRIE BEAM EXPANSION SECTION



THRIE BEAM TERMINAL CONNECTOR



SQUARE WASHER FOR 7/8" DIA. BOLTS



SPECIAL END SHOE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

# GUARDRAIL ANCHORAGE, BRIDGE, DETAILS

6-15-2006

F.H.W.A. APPROVAL

4-24-2006

PLAN DATE

R-67-F

SHEET

6 OF 7



NOTES:

ALL POSTS, OFFSET BLOCKS, BEAM ELEMENTS, REFLECTORS, 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 POSTS USED TO CONSTRUCT GUARDRAIL ANCHORAGE, BRIDGE SHALL BE 7'-0" LONG.

THE THRIE BEAM TERMINAL CONNECTOR AND SPECIAL END SHOE SHALL BE THE SAME MATERIAL AS ADJACENT RUN OF GUARDRAIL, EXCEPT THAT THEY SHALL NOT BE LIGHTER THAN 10 GAGE (0.138").

SECTIONS OF THE THRIE BEAM ELEMENT REQUIRED TO BE TWISTED FOR USE IN ANCHORAGE SHALL BE FIELD BENT.

GUARDRAIL BEAM ELEMENTS SHALL BE LAPPED IN THE DIRECTION OF TRAFFIC, EXCEPT FOR THE THRIE BEAM TERMINAL CONNECTOR WHICH MAY BE LAPPED IN EITHER DIRECTION.

STANDARD SPLICE BOLTS SHALL BE USED WHEN SPLICING THE THRIE BEAM TERMINAL CONNECTOR TO THE THRIE BEAM EXPANSION SECTION AND WHEN SPLICING THE SPECIAL END SHOE TO THE TRANSITION SECTION. THE SPLICE BOLT NUT SHALL BE INSTALLED FINGER-TIGHT AND SHALL FULLY ENGAGE THE SPLICE BOLT WITH A MINIMUM OF ONE THREAD EXTENDING BEYOND THE NUT. THIS SHALL BE FOLLOWED UP BY UPSETTING THE FIRST THREAD ON THE OUTSIDE OF THE NUT WITH A CENTER PUNCH OR COLD CHISEL, SO THAT IT WILL NOT LOOSEN.

SEE THE CURRENT STANDARD PLAN R-32-SERIES FOR APPROACH CURB AND GUTTER AND DOWNSPOUT HEADER.

GUARDRAIL ANCHORAGE, BRIDGE, DETAILS T-1, T-2, T-5, AND T-6 REQUIRE THAT THE THRIE BEAM TERMINAL CONNECTOR BE ATTACHED TO THE  $\frac{3}{8}$ " x 5" LONG SLOTTED HOLES IN THE THRIE BEAM EXPANSION SECTION.

SEE APPROPRIATE PLANS TO DETERMINE WHETHER GUARDRAIL ANCHORAGE, BRIDGE SPANS A BRIDGE EXPANSION JOINT.

SEE THE CURRENT STANDARD PLAN R-55-SERIES FOR FILLER WALLS AND FILLER WALL END BLOCK.

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

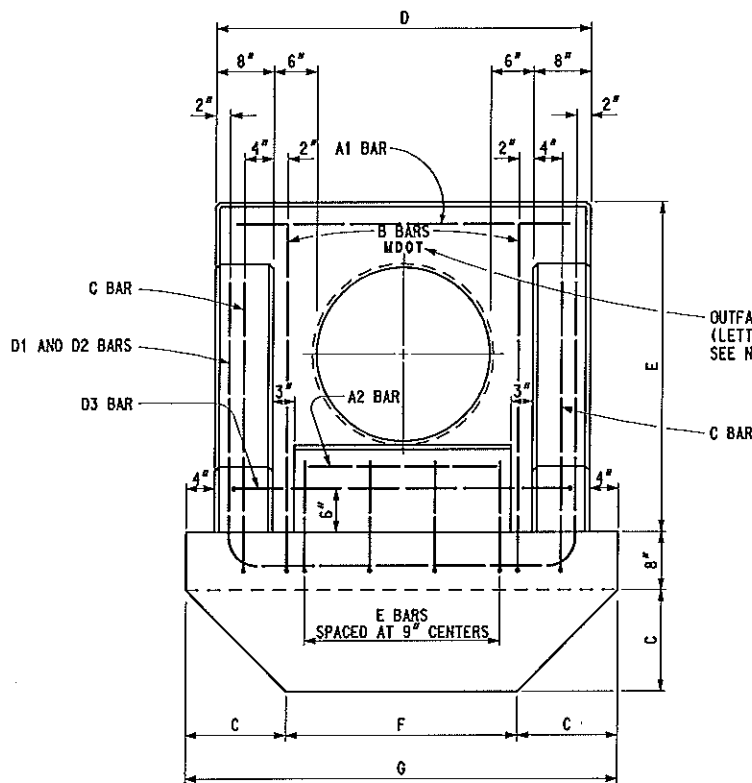
GUARDRAIL ANCHORAGE,  
BRIDGE, DETAILS

6-15-2006  
F.H.W.A. APPROVAL

4-24-2006  
PLAN DATE

R-67-F

SHEET  
7 OF 7



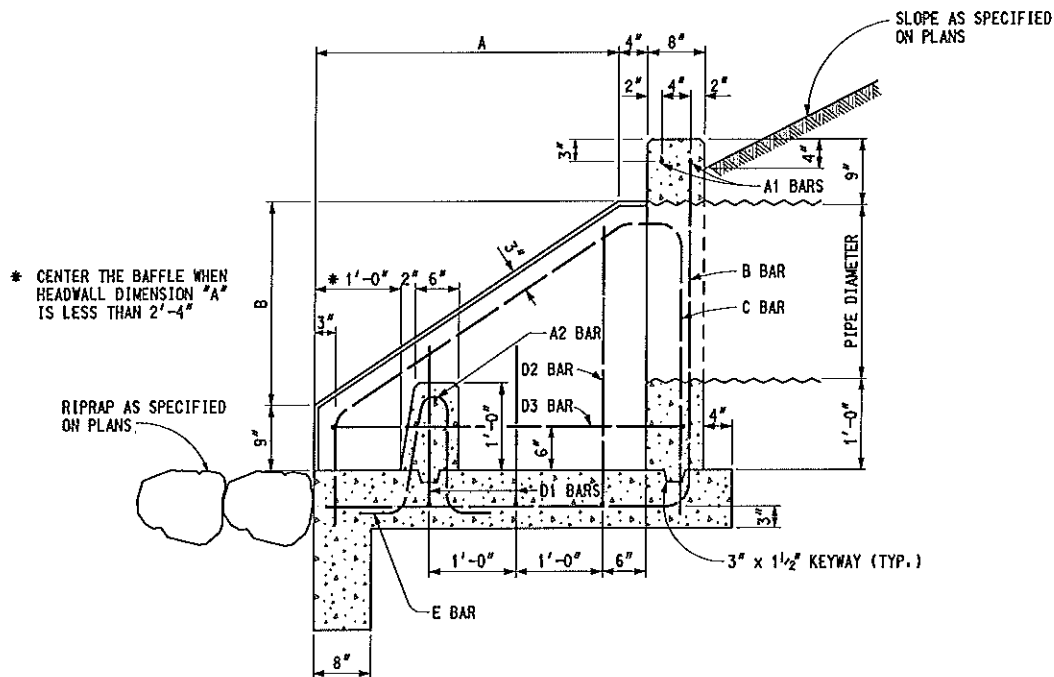
NOTES:

ALL STEEL REINFORCEMENT SHALL BE #4 BARS.

EXPOSED EDGES OF THE HEADWALL SHALL BE CHAMFERED  $\frac{1}{2}$ ".

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

OUTFALL LABEL INSCRIBED INTO CONCRETE (LETTERING:  $1\frac{1}{2}$ " HIGH x 1" WIDE x  $\frac{1}{4}$ " DEEP) SEE NOTES



OUTLET HEADWALL  
(SHOWN WITH BAFFLE)



PREPARED BY  
DESIGN  
SUPPORT AREA

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR  
Gloria J. Jeff

APPROVED BY: John C. Friend  
ENGINEER OF DELIVERY

APPROVED BY: J.L. Polak  
ENGINEER OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

## OUTLET HEADWALLS

11-17-2005

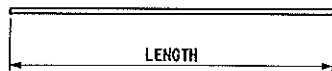
F.H.W.A. APPROVAL

4-21-2005

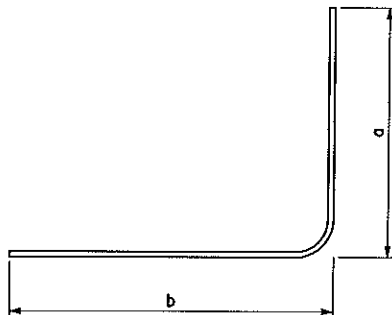
PLAN DATE

R-85-D

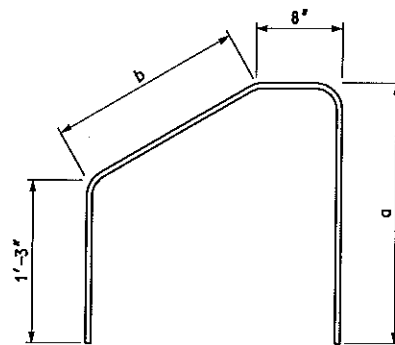
SHEET  
1 OF 2



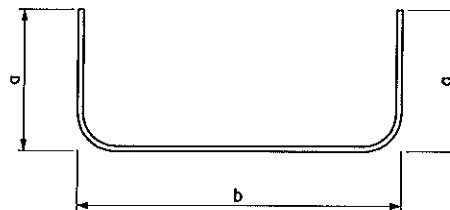
A BAR



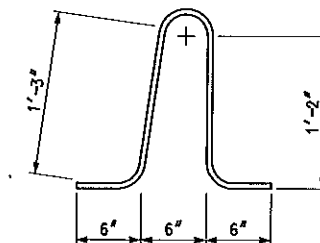
B BAR



C BAR



D BAR



E 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

# 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'-2"	4'-6"	9'-2"	2	3'-8"	4'-6"	1'-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"	1'-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

# MINIMUM MERGING TAPER LENGTH "L" (FEET)

OFFSET	POSTED SPEED LIMIT, MPH (PRIOR TO WORK AREA)										TAPER LENGTH "L" IN FEET
FEET	25	30	35	40	45	50	55	60	65	70	
1	10	15	20	27	45	50	55	60	65	70	
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

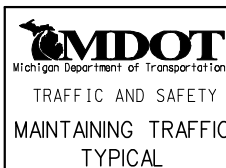
### UPSTREAM TAPERS

MERGING TAPER  
SHIFTING TAPER  
SHOULDER TAPER  
TWO-WAY TRAFFIC TAPER

DOWNSTREAM TAPERS  
(USE IS OPTIONAL)

## TAPER LENGTH

L - MINIMUM  
1/2 L - MINIMUM  
1/3 L - MINIMUM  
100' - MAXIMUM  
100' - MINIMUM  
(PER LANE)



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

DRAWN BY: CON:AE:djf  
CHECKED BY: BMM

JUNE 2006  
PLAN DATE:  
FILE: K:/DGN/TSR/STDS/ENGLISH/MNTTRF/M0020a.dgn

M0020a

SHEET  
1 OF 2

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.



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

DRAWN BY: CON:AE:djf

JUNE 2006

M0020a

SHEET  
2 OF 2

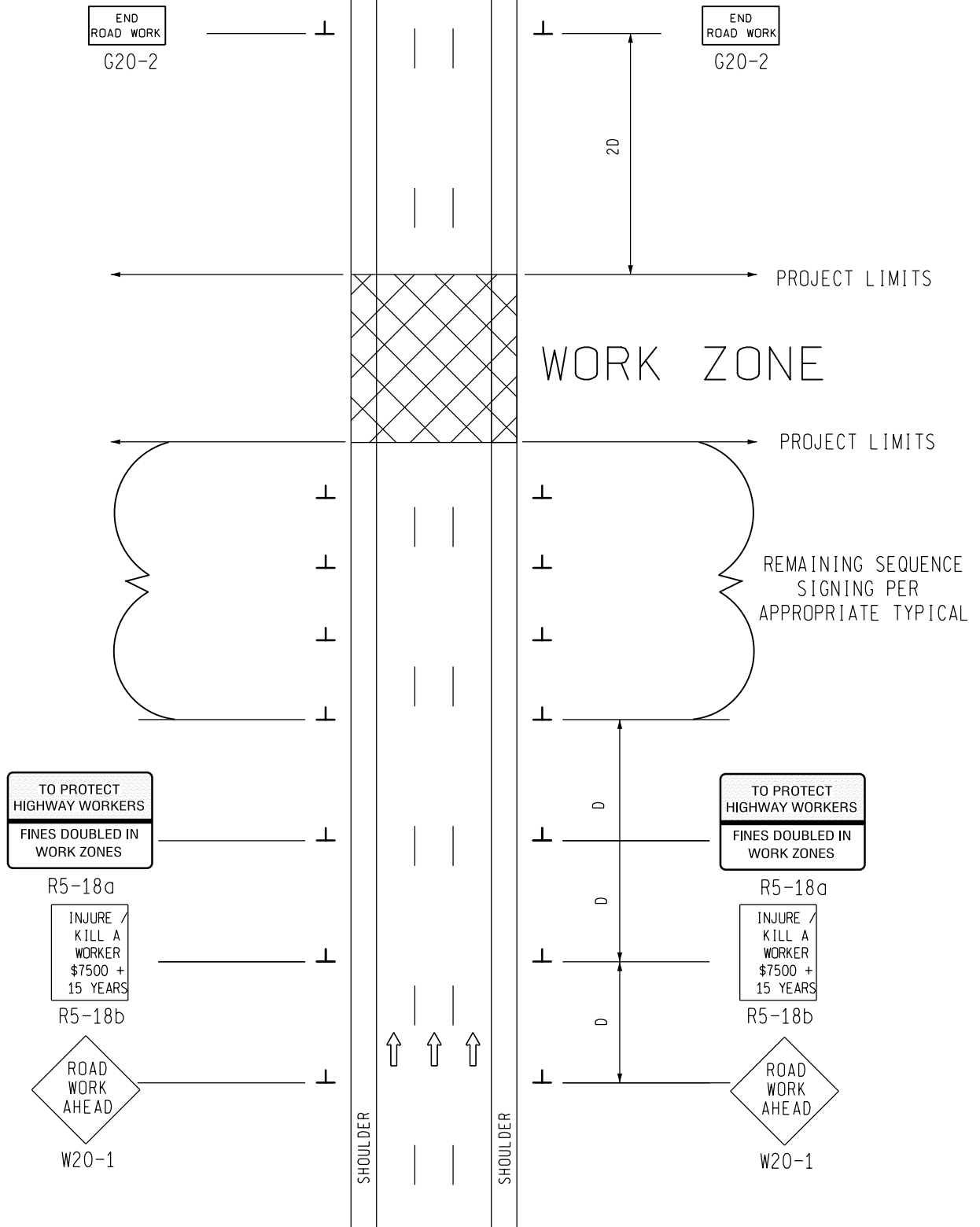
CHECKED BY: BMM

PLAN DATE:

FILE: K:/DGN/TSR/STDS/ENGLISH/MNTTRF/M0020a.dgn

REV. 08/21/2006

SIGN PLACEMENT  
IS THE SAME FOR  
BOTH DIRECTIONS



SIGN = 136 ft±2 - TYPE B  
FOR ONE DIRECTION OF TRAFFIC  
W20-1 QUANTITY INCLUDED WITH  
APPROPRIATE TYPICAL FOR  
SEQUENCE SIGNING

**MDOT**  
Michigan Department of Transportation  
TRAFFIC AND SAFETY  
MAINTAINING TRAFFIC  
TYPICAL

DRAWN BY: CON:AE:djf  
CHECKED BY: BMM:CRB

TYPICAL ADVANCE SIGNING TREATMENT FOR  
LONG, INTERMEDIATE AND SHORT TERM  
STATIONARY WORK ZONE OPERATIONS  
OF LESS THAN TWO MILES IN LENGTH WHERE  
TRAFFIC CONTROL DEVICES MAY REMAIN AT  
END OF WORK DAY ON A DIVIDED ROADWAY.

OCTOBER 2011  
PLAN DATE:

M0070a

SHEET  
1 OF 2

NOT TO SCALE

FILE: PW RD/TS/Typicals/Signs/MT NON FWY/M0070a.dgn REV. 10/13/2011


## NOTES

30. THE APPROPRIATE ADVANCE SIGNING SEQUENCE(S), (M0030a THROUGH M0080a) SHALL BE USED ON ALL PROJECTS.
32. THESE SIGNS SHALL BE LEFT IN PLACE AT THEIR PRESCRIBED LOCATIONS FOR THE DURATION OF THE PROJECT AND UNTIL ALL TEMPORARY TRAFFIC CONTROL HAS BEEN REMOVED.
35. THESE SIGNS ARE INTENDED TO BE USED WITHIN THE LIMITS OF THE TEMPORARY SEQUENCE SIGNING AS IS SHOWN ON 1 OF 2. THESE SIGNS ARE NOT TO BE INTERMINGLED WITH ANY OTHER TEMPORARY SEQUENCE SIGNING EXCEPT AS SHOWN.

## SIGN SIZES

G20-2	-	48" x 24"
R5-18a	-	96" x 60"
R5-18b	-	48" x 60"
W20-1	-	48" x 48"

NOT TO SCALE

 Michigan Department of Transportation TRAFFIC AND SAFETY MAINTAINING TRAFFIC TYPICAL		TYPICAL ADVANCE SIGNING TREATMENT FOR LONG, INTERMEDIATE AND SHORT TERM STATIONARY WORK ZONE OPERATIONS OF LESS THAN TWO MILES IN LENGTH WHERE TRAFFIC CONTROL DEVICES MAY REMAIN AT END OF WORK DAY ON A DIVIDED ROADWAY.	
		DRAWN BY: CON:AE:djf CHECKED BY: BMM:CRB	OCTOBER 2011 PLAN DATE:
FILE: PW RD/TS/Typicals/Signs/MT NON FWY/M0070a.dgn REV. 10/13/2011			

END  
ROAD WORK

PLACE THIS SIGN ALONG WITH THE  
ADVANCE WORK ZONE SIGNING AS  
DEPICTED ON THE APPROPRIATE  
TYPICAL M0030a-M0080a.

END  
ROAD WORK

PLACE THIS SIGN ALONG WITH THE  
ADVANCE WORK ZONE SIGNING AS  
DEPICTED ON THE APPROPRIATE  
TYPICAL M0030a-M0080a.

SPEED  
LIMIT  
X X

R2-1

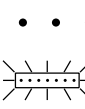
PLACE THROUGHOUT WORK AREA  
AS INDICATED AND AFTER ALL  
ENTRANCE RAMP AND ALL MAJOR  
CROSSROADS IF PERMANENT SIGNS  
ARE NOT IN PLACE.

SPEED  
LIMIT  
X X

R2-1

PLACE THROUGHOUT WORK AREA  
AS INDICATED AND AFTER ALL  
ENTRANCE RAMP AND ALL MAJOR  
CROSSROADS IF PERMANENT SIGNS  
ARE NOT IN PLACE.

### KEY



• • • CHANNELIZING DEVICES



LIGHTED ARROW PANEL  
(CAUTION MODE)



TRAFFIC FLOW



REFLECTS EXISTING  
SPEED LIMIT



USE THE "NEXT -- MILES"  
SIGN WHEN SHOULDER CLOSURE  
EXCEEDS 1 MILE IN LENGTH

SPEED  
LIMIT  
X X

R2-1

WORK  
ZONE  
BEGINS

R5-18c

SPEED  
LIMIT  
X X

R2-1

WORK  
ZONE  
BEGINS

R5-18c

SIGN = 148 ft2 - TYPE B  
PLUS ADDITIONAL R2-1's  
THROUGHOUT WORK AREA



W20-1

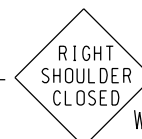
SHOULDER



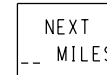
SHOULDER



W21-5b



W21-5a



W20-1a



W20-1

**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  
CHECKED BY: BMM:CRB

OCTOBER 2011  
PLAN DATE:

M0880a

SHEET  
1 OF 2

NOT TO SCALE

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



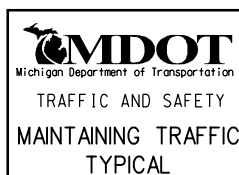
## NOTES

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



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

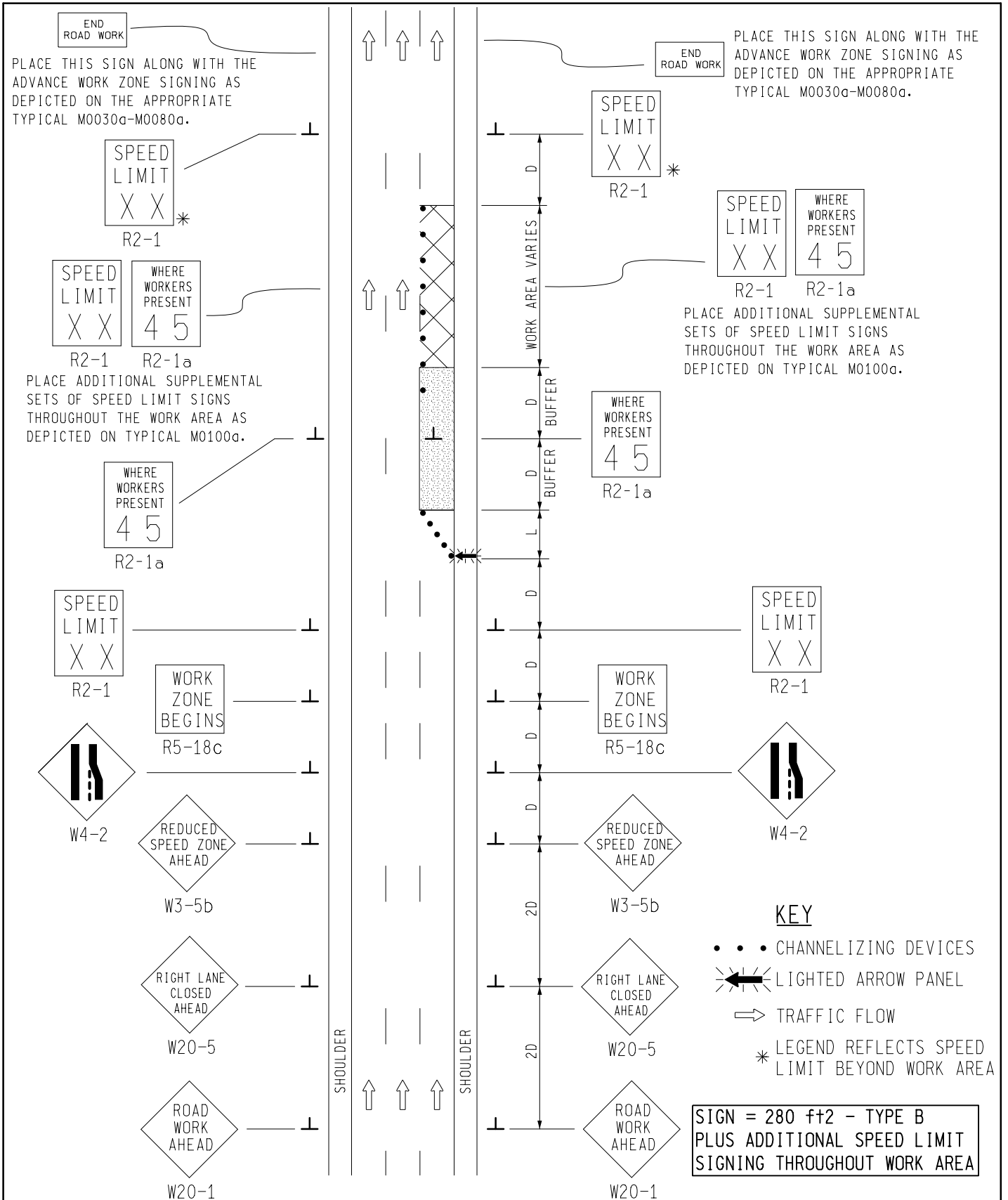
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2 OF 2

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 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 CHECKED BY: BMM:CRB	OCTOBER 2011 PLAN DATE:	M0990a	SHEET 1 OF 2
FILE: K:\-DGN-TSR-STD5-ENGLISH-MNTTRF-M0990a.dgn		REV. 10/27/2011	


## NOTES

11. 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

 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	SHEET 2 OF 2
CHECKED BY: BMM:CRB		PLAN DATE:	
FILE: K:\-DGN-TSR-STD5-ENGLISH-MNTTRF-M0990a.dgn		REV.	M0990a

10/27/2011

## SIGN MATERIAL SELECTION TABLE

SIGN SIZE	SIGN MATERIAL TYPE		
	TYPE I	TYPE II	TYPE III
$\leq 36" \times 36"$		X	X
$> 36" \times 36" \leq 96" \text{ TO WIDE}$		X	
$> 96" \text{ WIDE TO } 144" \text{ WIDE}$	X	X	
$> 144" \text{ WIDE}$	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.  
 HORIZONTAL JOINTS THROUGH SIGN LEGEND OR SYMBOLS ARE NOT PERMITTED.

## POST SIZE REQUIREMENTS TABLE

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

NOT TO SCALE

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PREPARED BY  
 TRAFFIC AND SAFETY  
 SUPPORT AREA

DRAWN BY: CON/ECH

CHECKED BY: AUG

\_\_\_\_\_  
ENGINEER OF DELIVERY

\_\_\_\_\_  
ENGINEER OF DEVELOPMENT

PENDING

\_\_\_\_\_  
FHWA APPROVAL DATE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
 BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR

### GROUND DRIVEN SIGN SUPPORTS FOR TEMP SIGNS

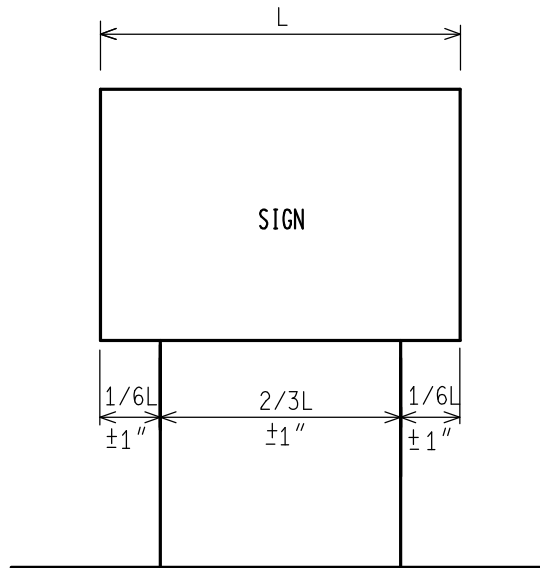
8/2006  
 PLAN DATE

WZD-100-A

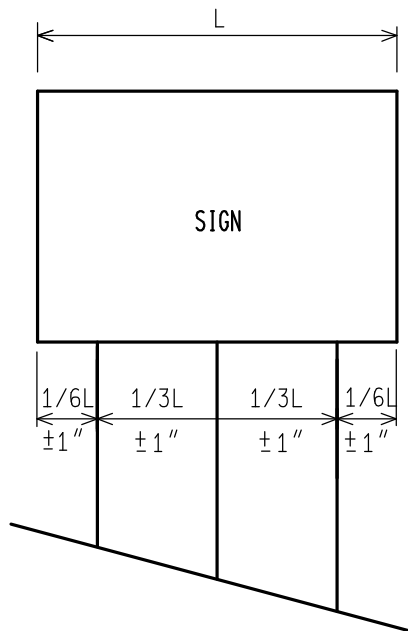
SHEET  
 1 of 11

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## 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

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

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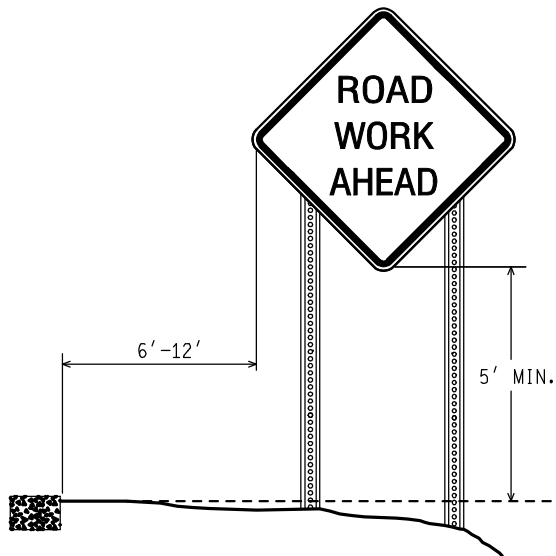
PLAN DATE

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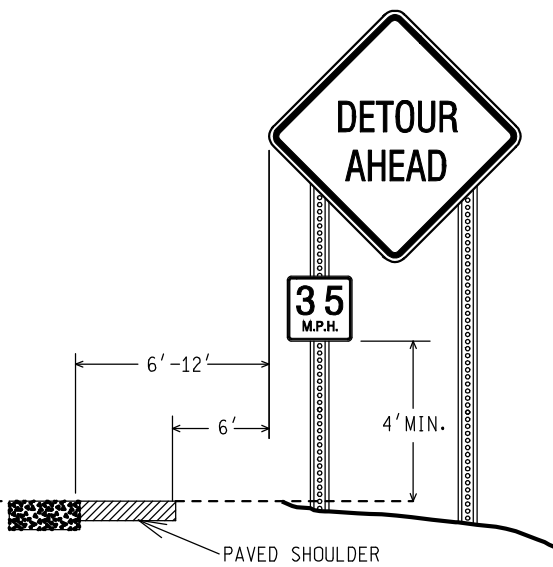
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2 of 11

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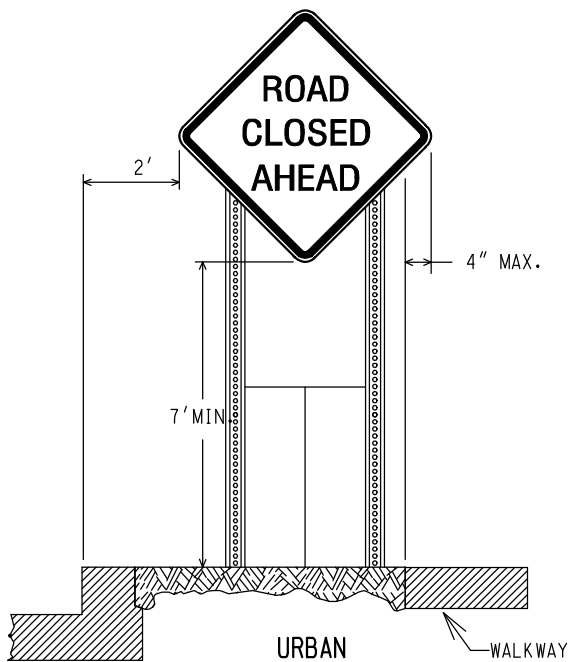
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RURAL

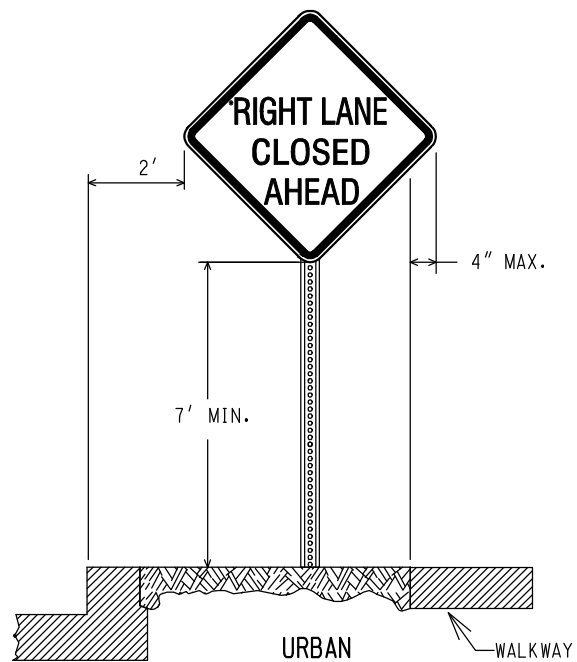


RURAL WITH ADVISORY  
SPEED PLATE



URBAN

(CURBED AREAS OR WHERE  
WALKWAYS ARE PRESENT)



URBAN

(CURBED AREAS OR WHERE  
WALKWAYS ARE PRESENT)

## BOTTOM HEIGHT AND OFFSET

NOT TO SCALE

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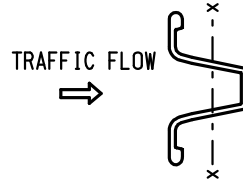
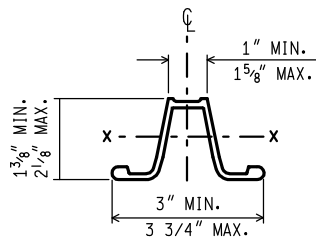
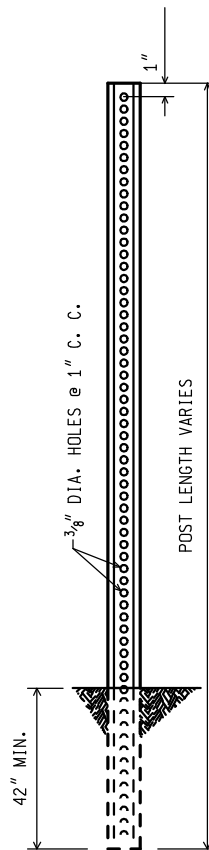
8/2006

PLAN DATE

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3 of 11

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

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

MOUNT SIGN ON OPEN FACE OF  
 U - CHANNEL STEEL POST

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
 BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

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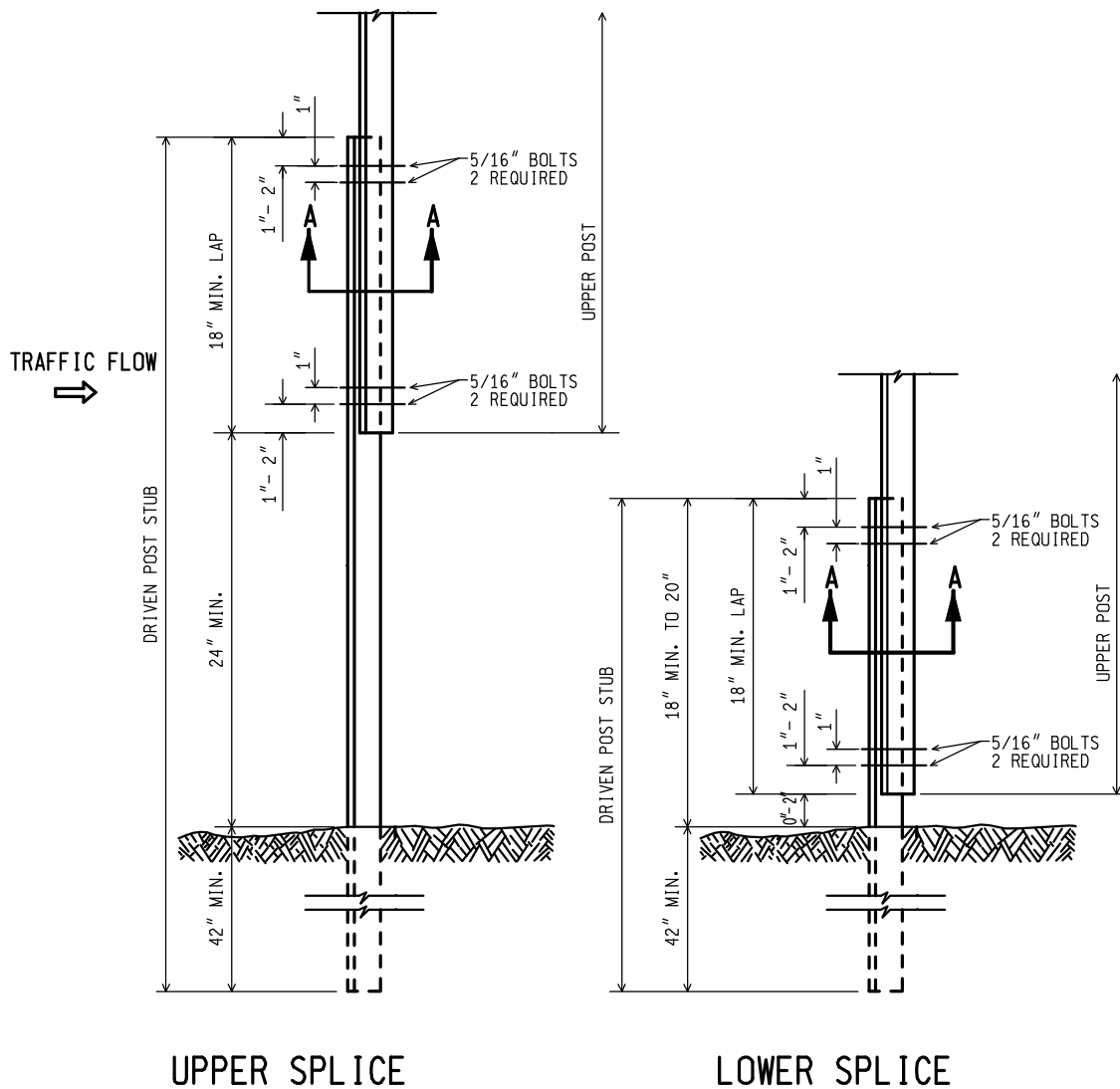
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### 3 lb. U - CHANNEL STEEL POST (WITH SPLICE)

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

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
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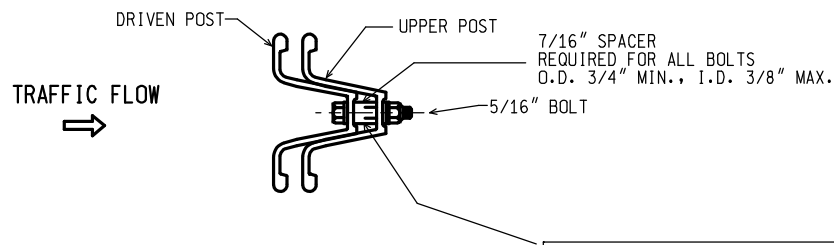
WZD-100-A

SHEET  
5 of 11

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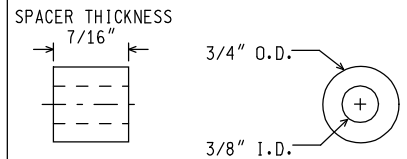
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**SECTION A-A**

**SPACER DETAIL**



**NOTES:**

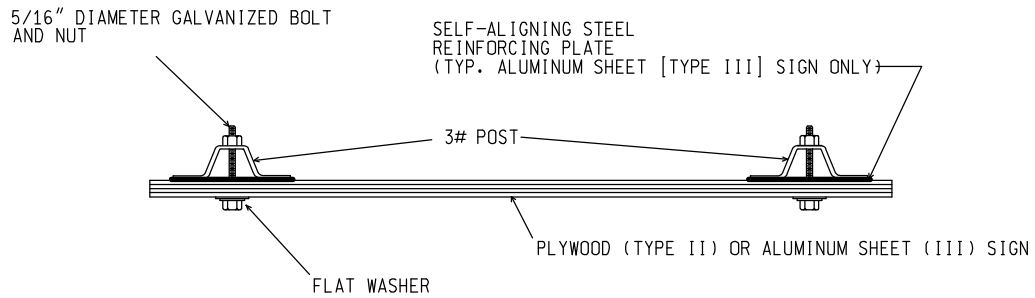
1. THE SPACER THICKNESS SHALL BE 1/16" LESS THAN THE GAP BETWEEN THE POST WHEN POSITIONED IN THE UNBOLTED CONFIGURATION.
2. THE EXTERIOR BOLT (CLOSEST TO LAP), SPACER, WASHER, AND NUT SHALL BE INSTALLED IN A PREPUNCHED HOLE 1" to 2" FROM THE END OF THE LAP.
3. THE INTERIOR BOLT (FARTHEST FROM LAP), SPACER, 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)**

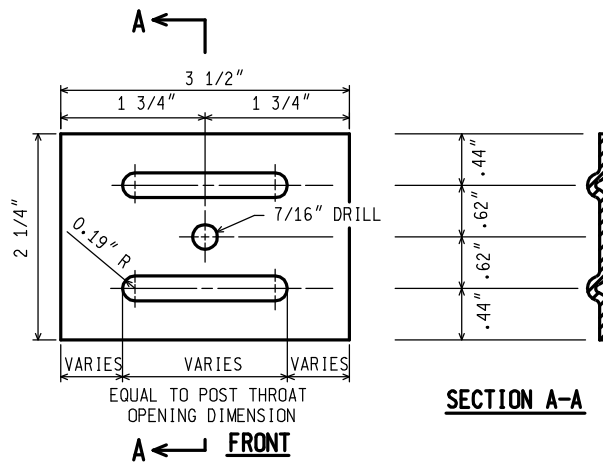
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### SIGN TO 3 Ib. POST CONNECTION



#### NOTES: (FOR STEEL SIGN REINF' PLATE)

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

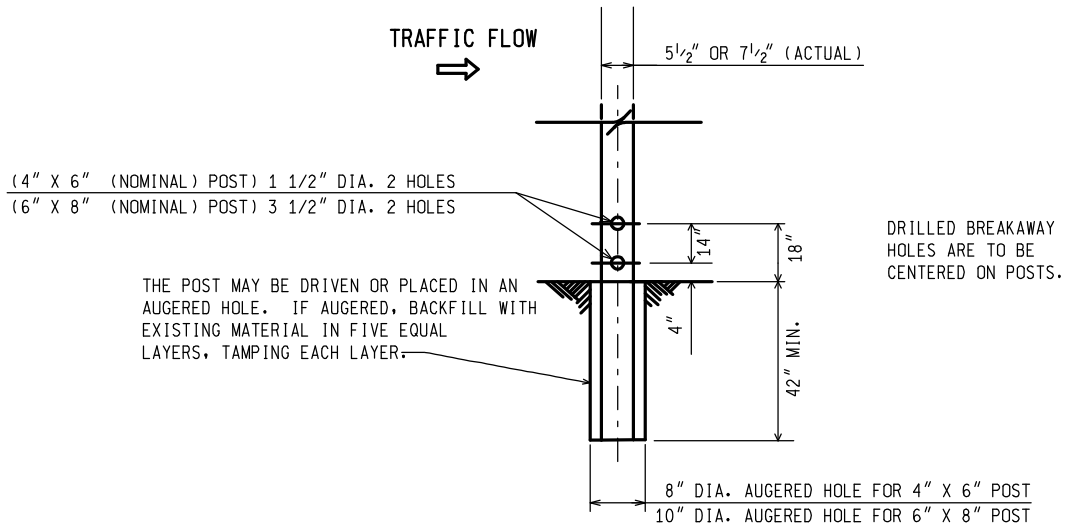
### STEEL SIGN REINFORCING PLATE REQUIRED FOR TYPE III SIGNS ONLY

### 3 Ib. U - CHANNEL STEEL POST SIGN CONNECTION

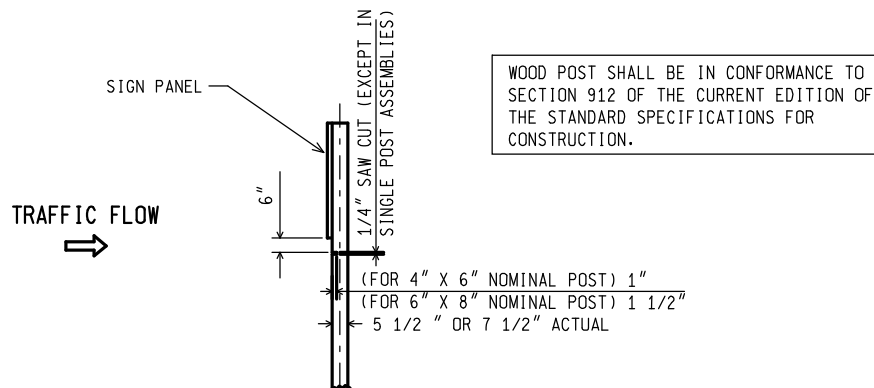
NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	PENDING	8/2006	WZD-100-A	SHEET 7 of 11
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### 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 HIGHWAYS DELIVERY STANDARD PLAN

PENDING  
FHWA APPROVAL DATE

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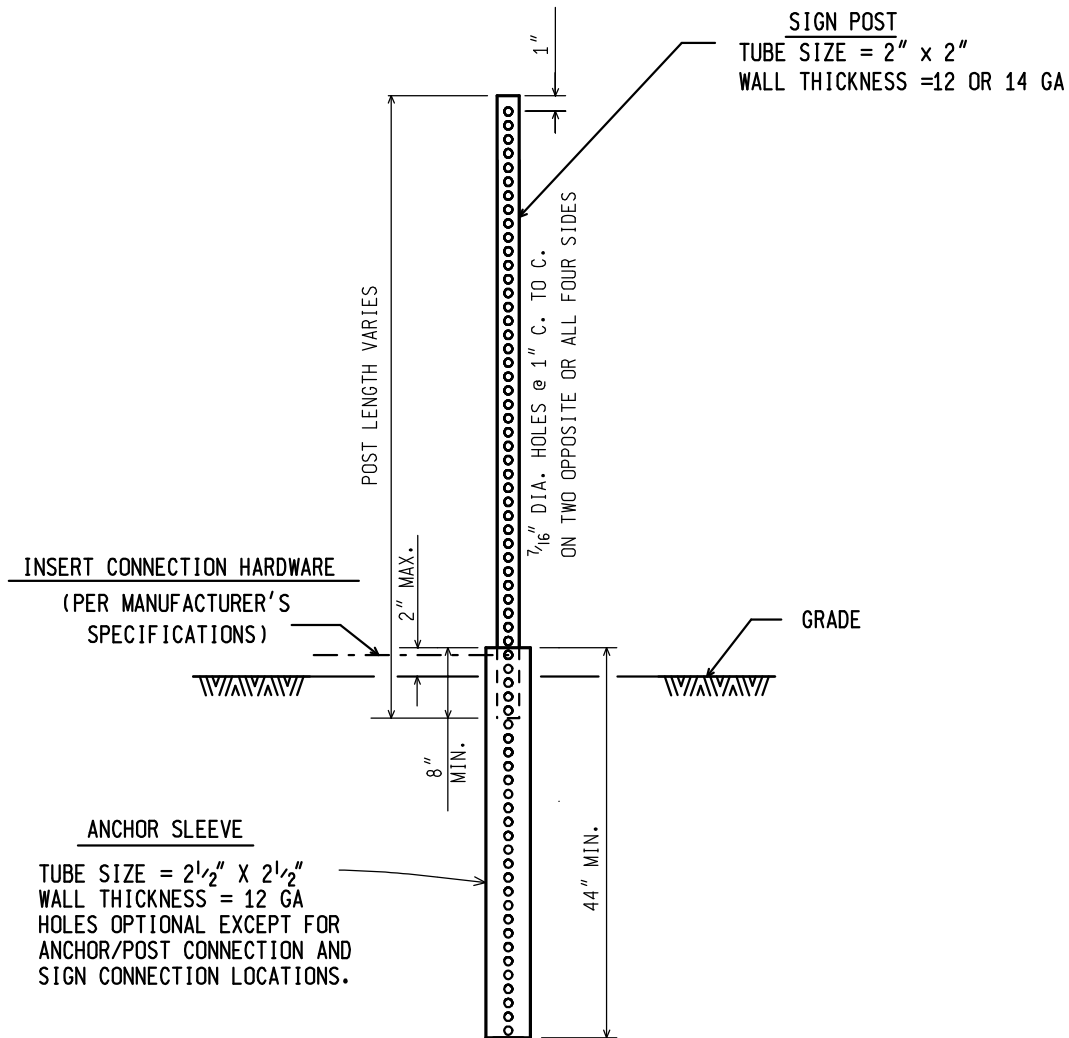
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## WOOD POST CONNECTIONS

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## SQUARE TUBULAR STEEL POST

NOT TO SCALE

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 BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

PENDING  
 FHWA APPROVAL DATE

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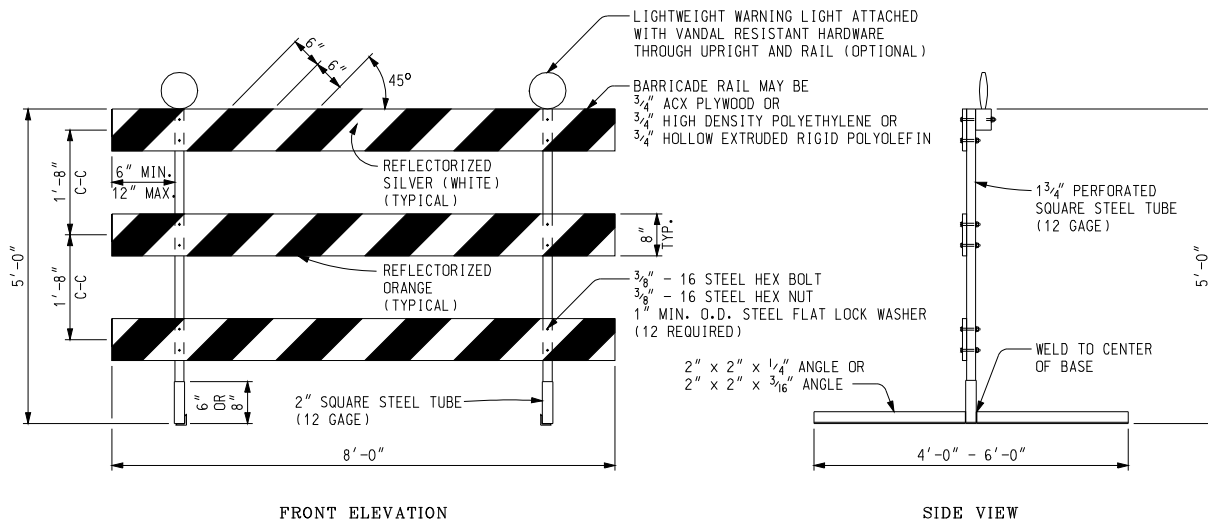
GENERAL NOTES:

1. A MAXIMUM OF TWO POSTS WITHIN A 7 FOOT PATH IS PERMITTED.
2. ALL SIGN POSTS SHALL COMPLY WITH NCHRP 350.
3. ALL POSTS SHALL BE EMBEDDED A MINIMUM OF 42".
4. BRACING OF POST IS NOT PERMITTED.
5. SIGN SHALL BE LEVEL, AND UPRIGHT FOR THE DURATION OF INSTALLATION.
6. ERECT POSTS SO THE SIGN FACE AND SUPPORTS DO NOT VARY FROM PLUMB BY MORE THAN 3/16" IN 3'. PROVIDE A CENTER-TO-CENTER DISTANCE BETWEEN POSTS WITHIN 2 PERCENT OF PLAN DISTANCE.
7. NO MORE THAN ONE SPLICE PER POST, AS SHOWN, WILL BE PERMITTED.
8. POST TYPES SHALL NOT BE MIXED WITHIN A SIGN SUPPORT INSTALLATION.
9. NO VERTICAL JOINTS ARE PERMITTED IN SIGN. NO HORIZONTAL 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, COVER, 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.

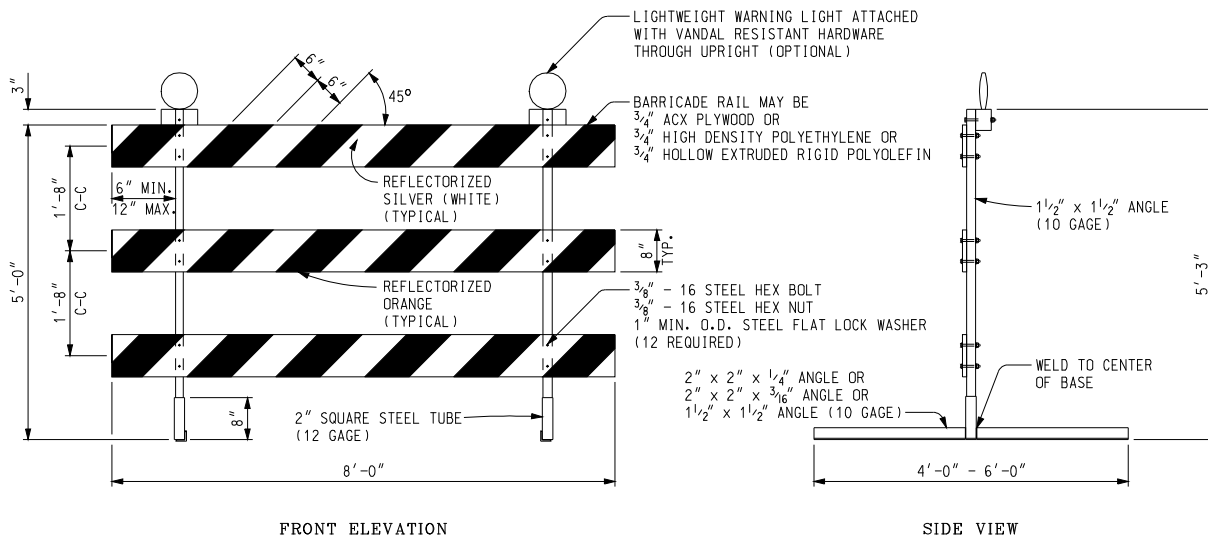
NOT TO SCALE

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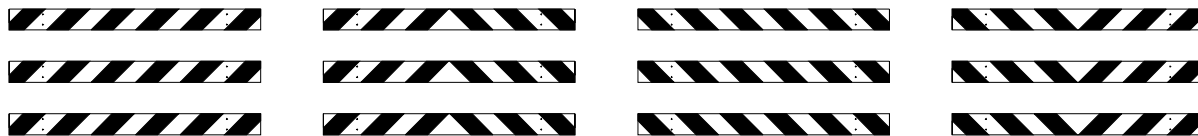
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PERFORATED SQUARE STEEL TUBE OPTION



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](http://safety.fhwa.dot.gov/roadway_dept/road_hardware/wzd.htm)

NOT TO SCALE

File: T&S/Typ/Signs/WorkZones/wzd 125 d

Rev. 09/22/09 PJ



PREPARED BY  
TRAFFIC AND SAFETY

DRAWN BY: ECH

CHECKED BY: MWB

ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT

(SPECIAL DETAIL)

FHWA APPROVAL DATE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR

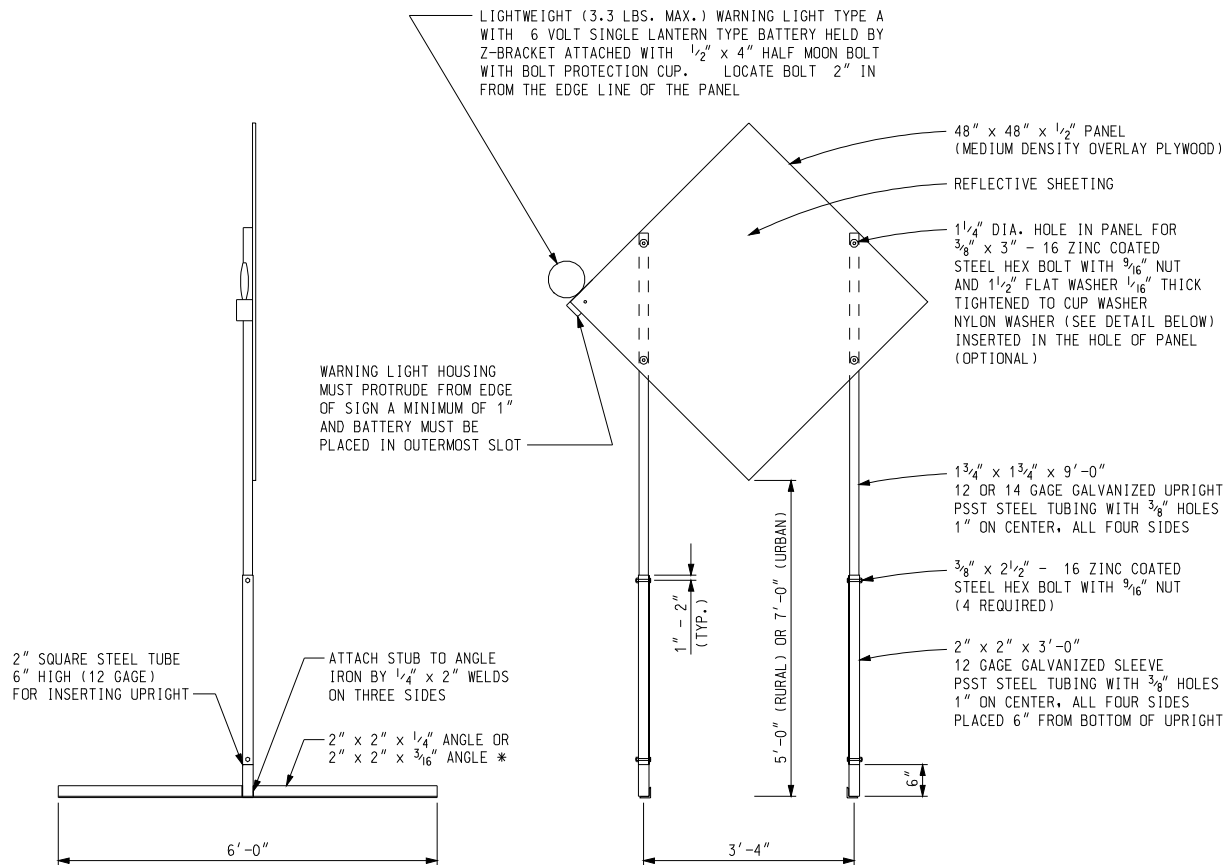
Temporary  
Traffic Control Devices

9/22/09  
PLAN DATE

WZD-125-E

SHEET  
1 of 3

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



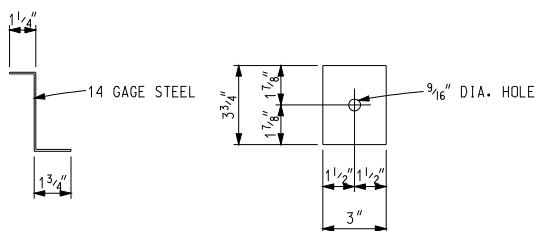
SIDE VIEW

FRONT ELEVATION

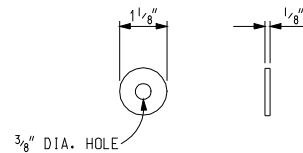
### TEMPORARY SIGN SUPPORT

(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](http://safety.fhwa.dot.gov/roadway_dept/road_hardware/wzd.htm)

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

(SPECIAL DETAIL)  
FHWA APPROVAL DATE

9/22/09  
PLAN DATE

WZD-125-E

SHEET  
2 of 3

File: T&S/Typ/Signs/WorkZones/wzd 125 d

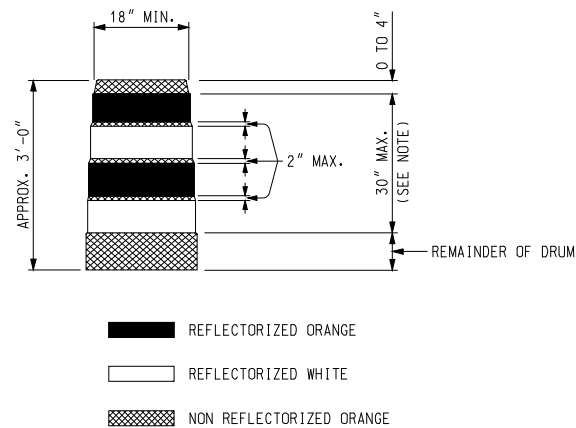
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- PLASTIC DRUM
- ▲ ▲ ▲ PROPOSED TYPE III BARRICADE
- △ △ △ EXISTING TYPE III BARRICADE

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 BARRICADE.
- WARNING LIGHTS SHALL BE PLACED ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS FOR CONSTRUCTION AND ALL OTHER PROVISIONS IN THE CONTRACT WHEN THEY ARE USED 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 TEMPORARY 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 HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE	9/22/09	WZD-125-E	SHEET 3 of 3
File: T&S/Typ/Signs/WorkZones/wzd 125 d	Rev. 09/22/09 PJ	PLAN DATE		

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