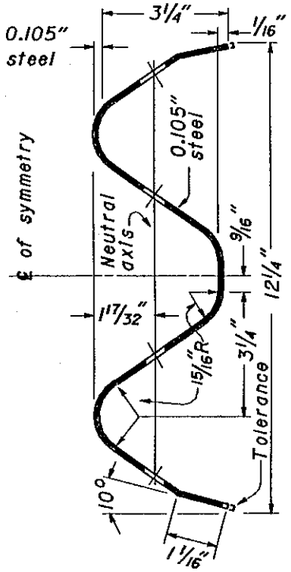
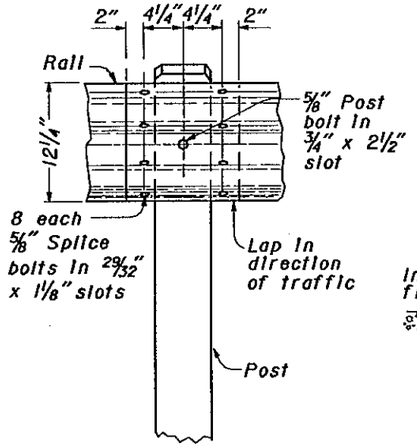
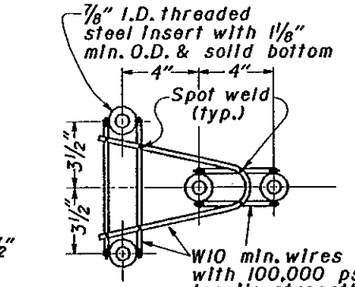


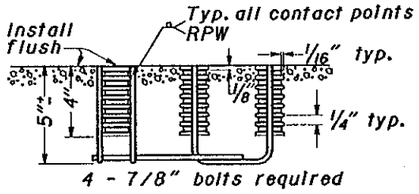
SECTION
W-BEAM RAIL



W-BEAM RAIL SPLICE



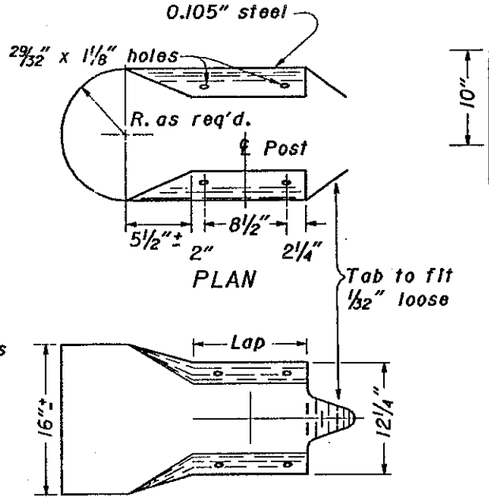
PLAN



4 - 7/8" bolts required

ELEVATION

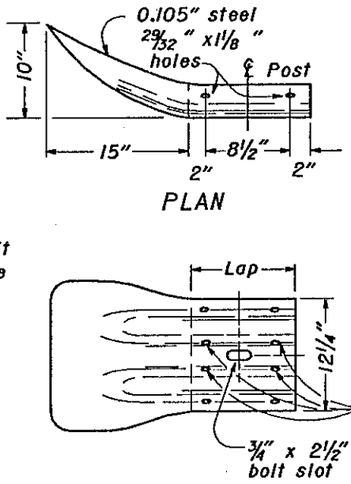
CONCRETE INSERT ANCHOR ASSEMBLY (W-BEAM ONLY)



PLAN

ELEVATION

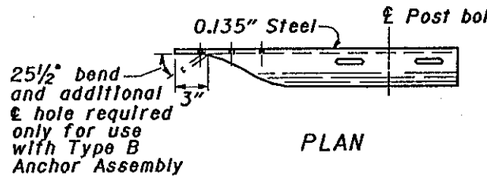
W-BEAM BUFFER END SECTION



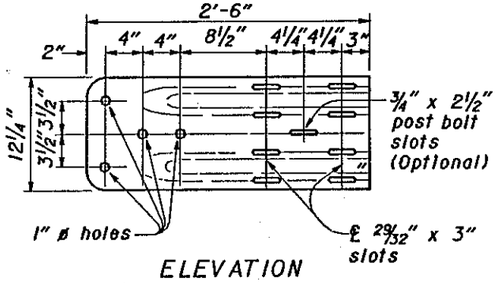
PLAN

ELEVATION

W-BEAM FLARED END SECTION

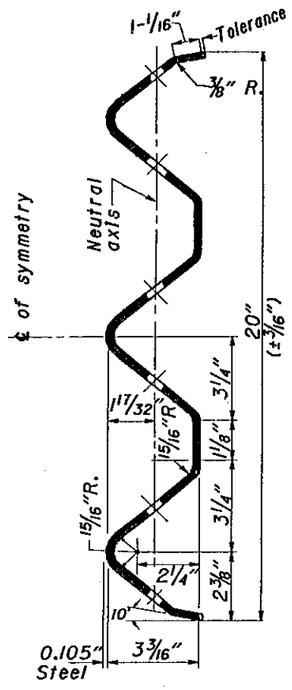


PLAN

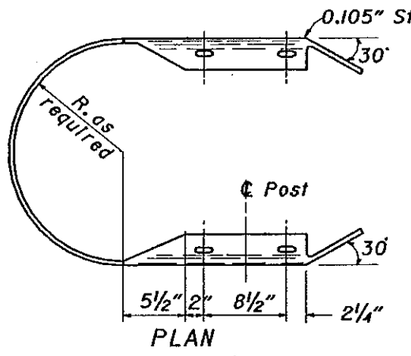


ELEVATION

W-BEAM TERMINAL CONNECTOR



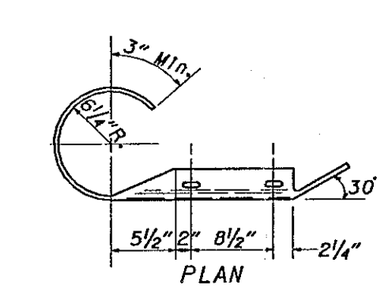
THRIE BEAM RAIL



PLAN

ELEVATION

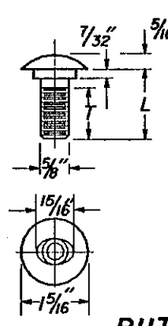
THRIE BEAM BUFFER END SECTION



PLAN

ELEVATION

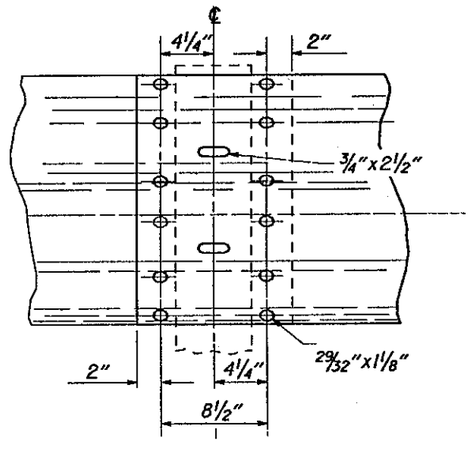
THRIE BEAM ROUNDED END SECTION



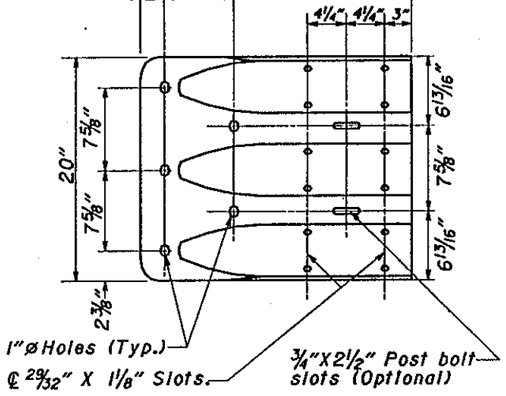
L (In.) Std.	L (In.) Bar.	T (In.) min.	Bolt Use
18	26	3½	Type 5: WP/WB
10		2½	Type 4: WP Type 5: SP/WB
2		1½	Type 4: SP Type 5: SP/SB
1¼		Full	Splice bolt

WP= wood post WB= wood block
SP= steel post SB= steel block
Longer bolt may be needed for round WP larger than 8" dia.

BUTTON HEAD BOLT
(For post and splice bolts)



THRIE BEAM RAIL SPLICE



ELEVATION

THRIE BEAM TERMINAL CONNECTOR

BUREAU OF LOCATION AND DESIGN
OHIO DEPARTMENT OF TRANSPORTATION

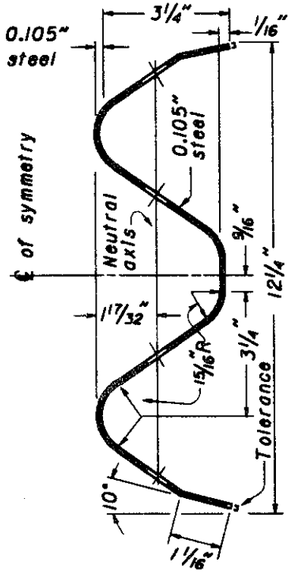
GUARDRAIL DETAILS

STANDARD CONSTRUCTION DRAWING

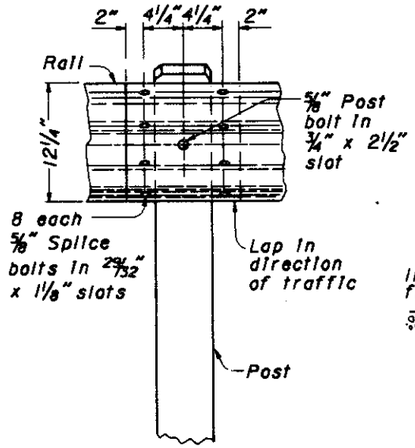
GR-1.1

APPROVED _____ ENGR., L. & D.

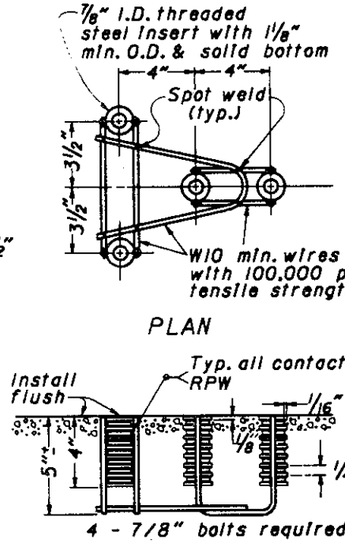
DATE
12-6-76
2-5-82
1-11-85
7-23-87



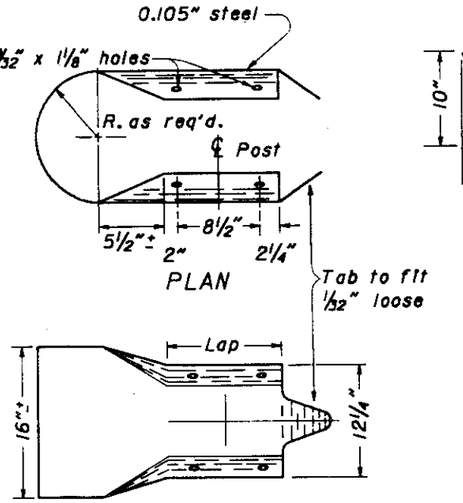
SECTION
W-BEAM RAIL



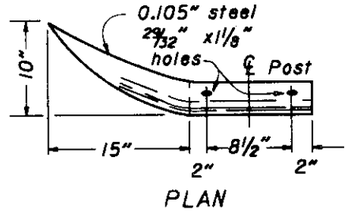
W-BEAM RAIL SPLICE

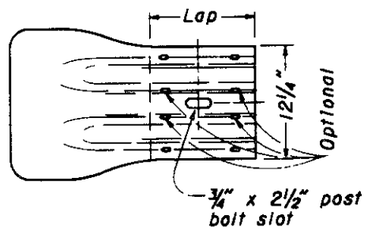


ELEVATION
CONCRETE INSERT ANCHOR ASSEMBLY (W-BEAM ONLY)

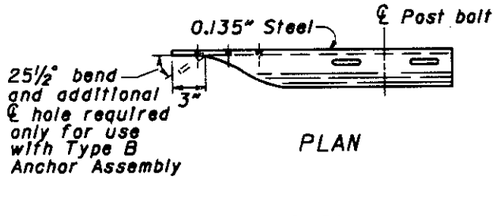


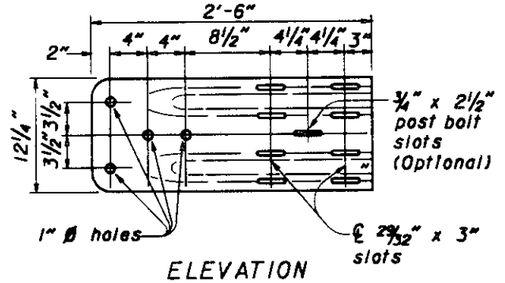
ELEVATION
W-BEAM BUFFER END SECTION



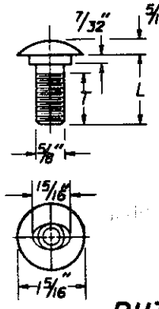


ELEVATION
W-BEAM FLARED END SECTION





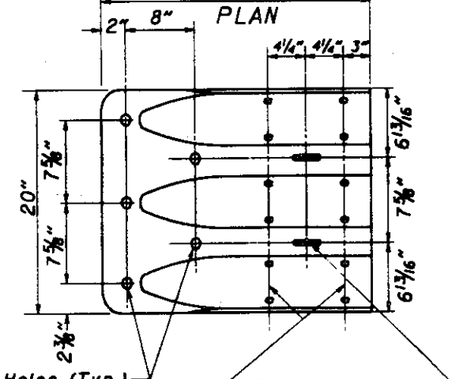
ELEVATION
W-BEAM TERMINAL CONNECTOR



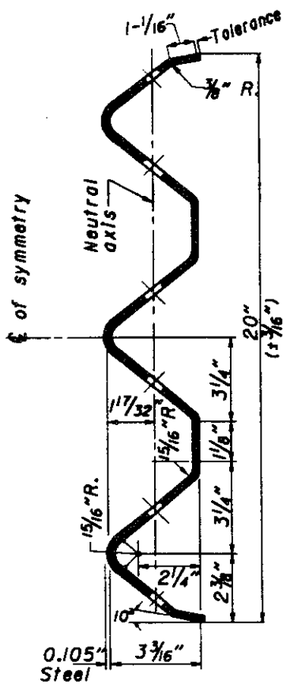
L (In.) Std.	Bar	T (In) min.	Bolt Use
18	26	3½	Type 5: WP/WB
10		2½	Type 4: WP Type 5: SP/WB
2		1½	Type 4: SP Type 5: SP/SB
1¼		Full	Splice bolt

WP= wood post WB= wood block
SP= steel post SB= steel block
Longer bolt may be needed for round WP larger than 8" dia.

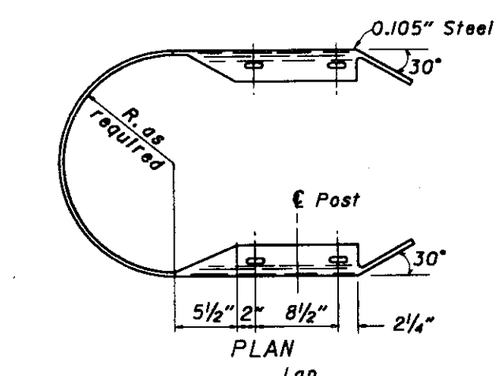
BUTTON HEAD BOLT
(For post and splice bolts)



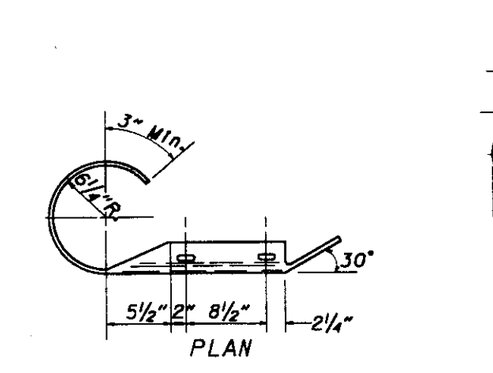
ELEVATION
THRIE BEAM TERMINAL CONNECTOR



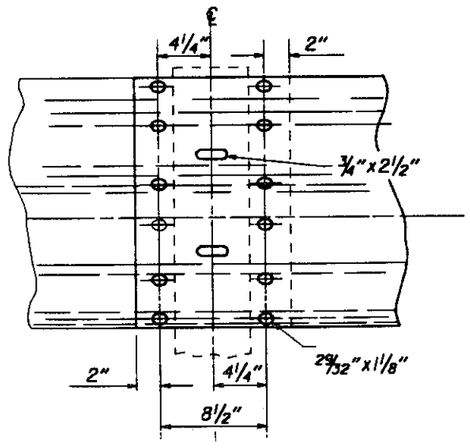
THRIE BEAM RAIL



ELEVATION
THRIE BEAM BUFFER END SECTION



ELEVATION
THRIE BEAM ROUNDED END SECTION



THRIE BEAM RAIL SPLICE

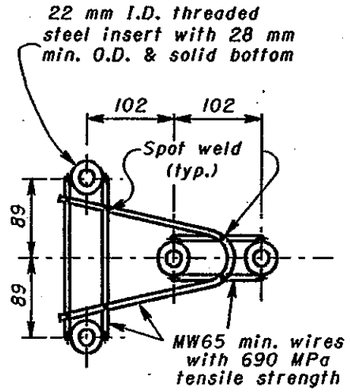
BUREAU OF LOCATION AND DESIGN
OHIO DEPARTMENT OF TRANSPORTATION

GUARDRAIL DETAILS

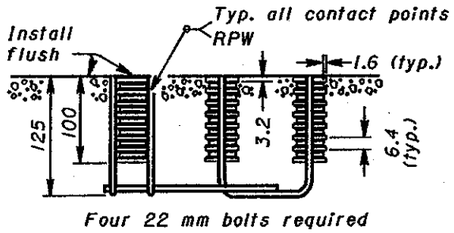
DATE 5-6-91

STANDARD CONSTRUCTION DRAWING **GR-1.1**

APPROVED D.K. Hulman ENGR., L. & D.



PLAN

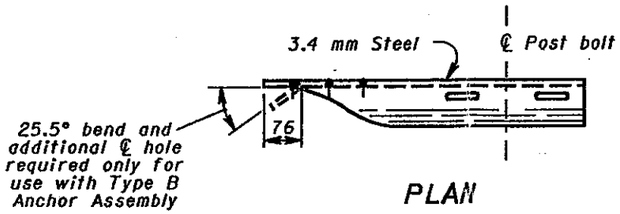


Four 22 mm bolts required

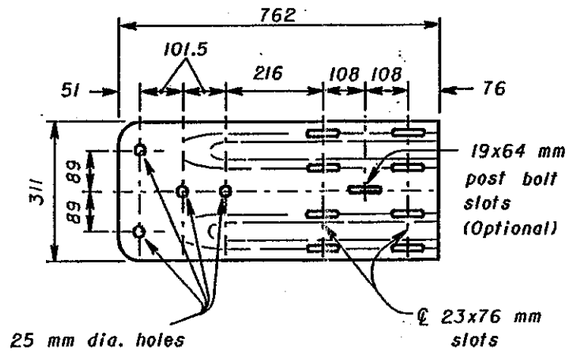
ELEVATION

CONCRETE INSERT ANCHOR ASSEMBLY

(W-BEAM ONLY)

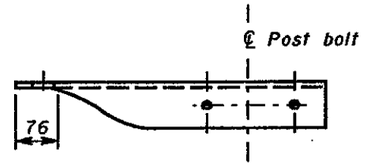


PLAN

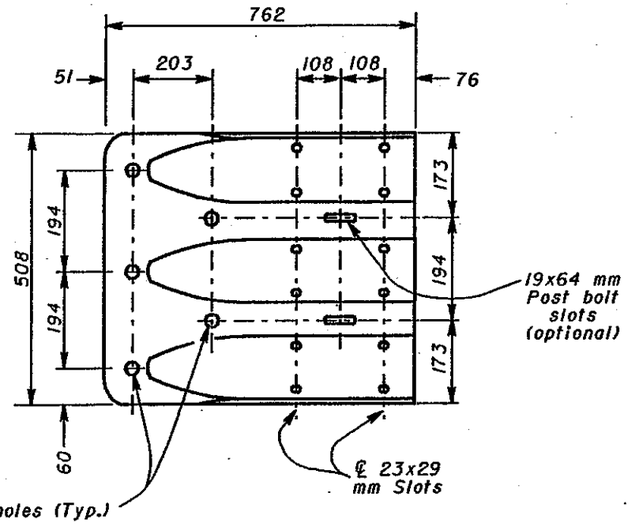


ELEVATION

W-BEAM TERMINAL CONNECTOR

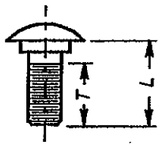


PLAN



ELEVATION

THRIE-BEAM TERMINAL CONNECTOR



L (mm)	T min. (mm)	Bolt Use
455 (Standard rail)	85	Type 5: WP/WB
660 (Barrier rail)		
255	60	Type 4: WP Type 5: SP/WB
50	35	Type 4: SP Type 5: SP/SB
32	Full	Splice bolt

WP= wood post WB= wood block
SP= steel post SB= steel block
Longer bolt may be needed for round WP larger than 200 mm dia.

BUTTON HEAD BOLT

(For post and splice bolts)

NOTE

Refer to AASHTO M 180 for dimensional details of W-Beam and Thrie-Beam rail elements, related buffer and end sections, beam splices, post and splice bolts and nuts, and Type 1 W-Beam to Thrie-Beam Transition section.

All dimensions are in millimeters unless otherwise noted.

metric units

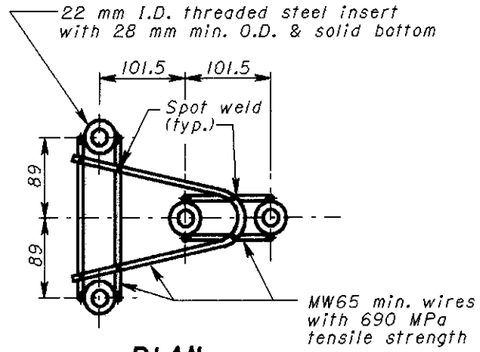
BUREAU OF LOCATION AND DESIGN
OHIO DEPARTMENT OF TRANSPORTATION

GUARDRAIL DETAILS

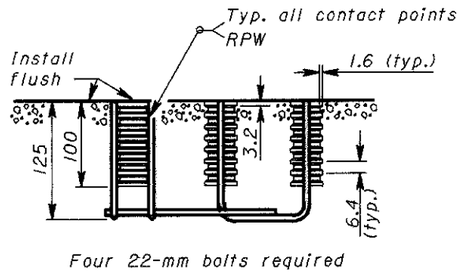
DATE 11-30-94

STANDARD CONSTRUCTION DRAWING **GR-1.1M**

APPROVED D. K. Hukman
ENGR., L & D

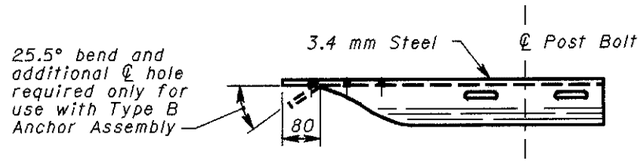


PLAN

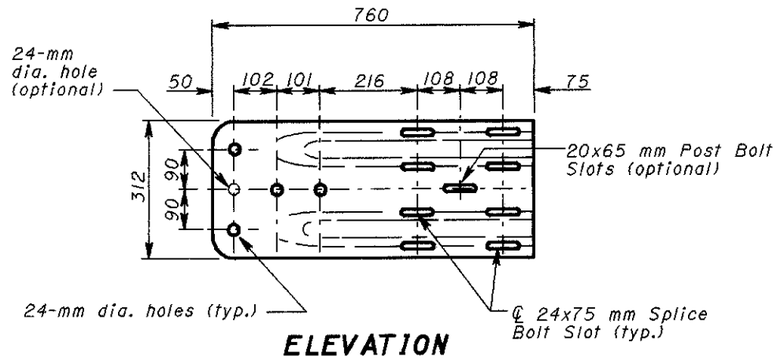


ELEVATION

CONCRETE INSERT ANCHOR ASSEMBLY (W-BEAM ONLY)

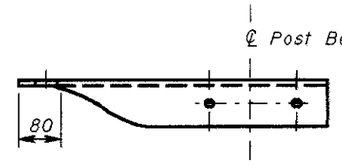


PLAN

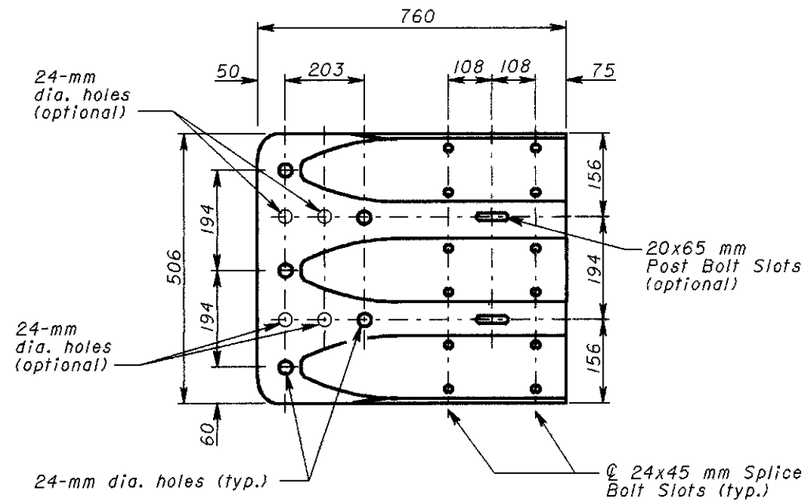


ELEVATION

W-BEAM TERMINAL CONNECTOR

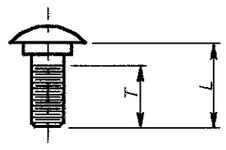


PLAN



ELEVATION

THRIE-BEAM TERMINAL CONNECTOR



L (mm)	T min. (mm)	Bolt Use
455 (Standard Rail)	85	Type 5: WP/WB, PB
660 (Barrier Rail)		
255	60	Type 4: WP Type 5: SP/WB, PB
50	35	Type 4: SP
32	Full	Splice Bolt

WP- wood post WB- wood blockout
SP- steel post PB- plastic blockout
Longer bolt may be needed for round WP larger than 200 mm dia.

BUTTON HEAD BOLT

(For post and splice bolts)

NOTE

Refer to AASHTO M 180 for dimensional details of W-Beam and Thrie-Beam rail elements, related buffer and end sections, beam splices, post and splice bolts and nuts, and Type I W-Beam to Thrie-Beam Transition section.

All dimensions are in millimeters unless otherwise noted.

metric units

OHIO DEPARTMENT OF TRANSPORTATION

GUARDRAIL DETAILS

DATE
11-30-94
10-21-97

STANDARD CONSTRUCTION DRAWING GR-1.1M

APPROVED Larry K. Sutherland

NOTES

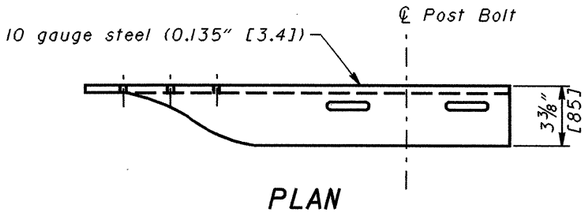
GENERAL: Components shown on this drawing are used in a variety of guardrail systems. See individual guardrail drawing for specific applications.

See CMS 606 for guardrail specifications not covered on these drawings.

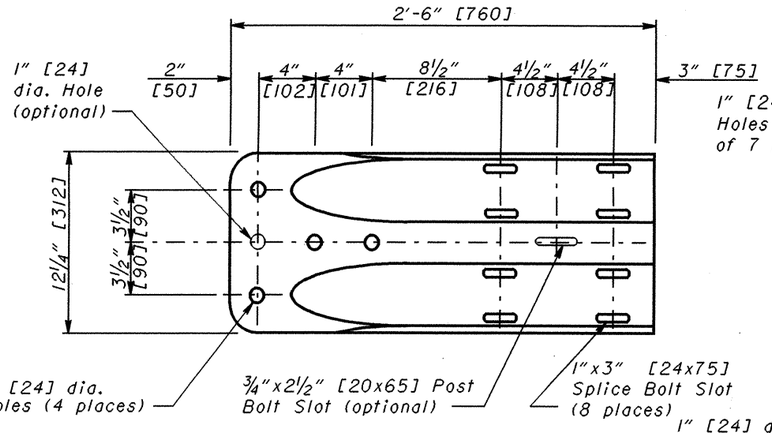
Refer to AASHTO M 180 for dimensional details of W-Beam and Thrie-Beam rail elements, related buffer and end sections, beam splices, post and splice bolts, nuts, and Type 1 W-Beam to Thrie-Beam Transition sections.

RAIL ELEMENTS: W-Beam Rail has an effective length of 12'-6" [3.81 m], unless otherwise specified, with ¾"x2½" [19x64] post bolt slots on 6'-3" [1.905 m] centers regardless of post spacing. Field punch or drill bolt holes or slots for irregularly spaced posts as specified in CMS 606.04.

RAIL SPLICE: Lap splices between two rail elements or between a rail and terminal connector in the direction of traffic. Lap the buffer or flared end sections in the direction of traffic.

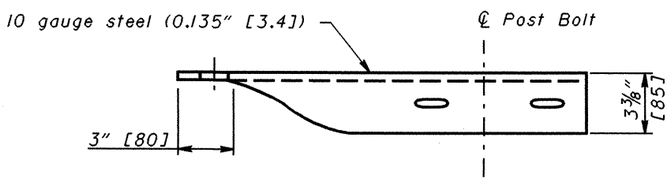


PLAN

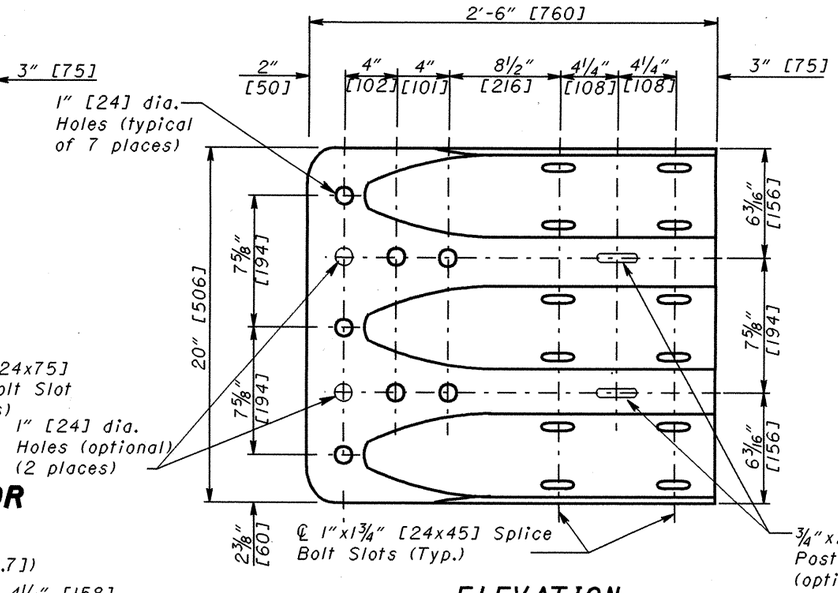


ELEVATION

W-BEAM TERMINAL CONNECTOR

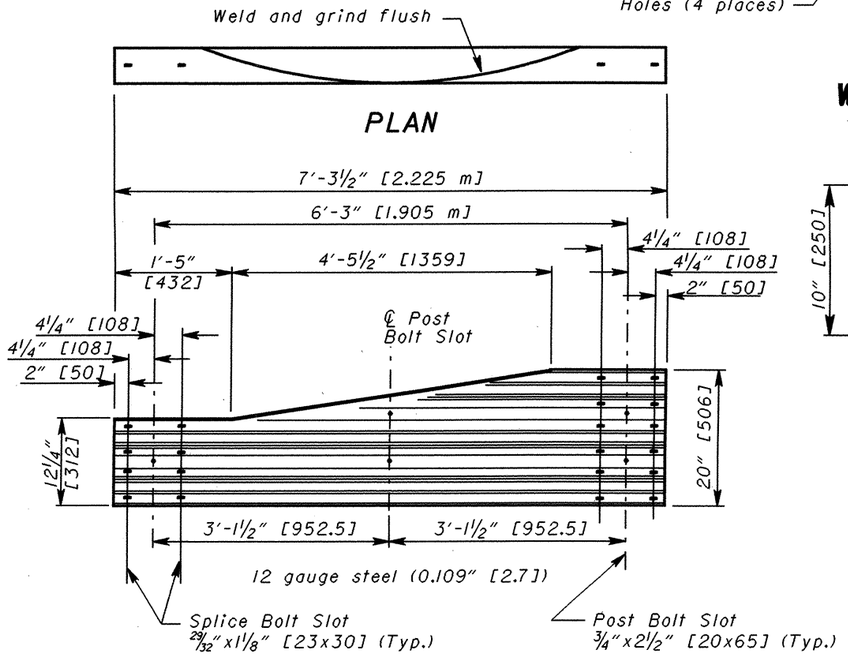


PLAN



ELEVATION

THRIE-BEAM TERMINAL CONNECTOR



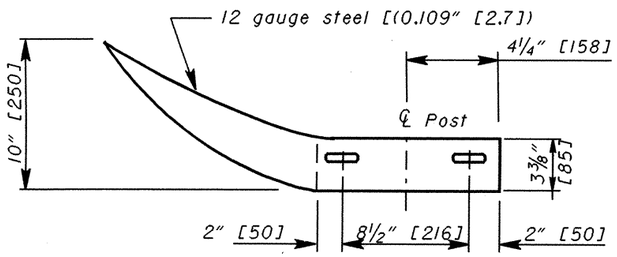
PLAN

ELEVATION

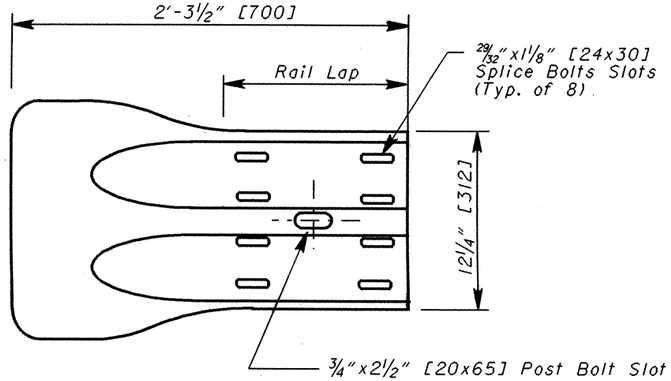
TYPE 2 TRANSITION SECTION

(Asymmetric W to Thrie-Beam)

For details of Type 1 Transition Section (Symmetric), refer to AASHTO M 180, Figure 4.

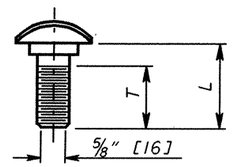


PLAN



ELEVATION

W-BEAM FLARED END SECTION



GUARDRAIL BOLT

(For Post and Splice Bolts)

L	T min.	Bolt Use
18" [460] (Standard Rail)	4" [100]	Type 5: WP/WB, PB
26" [640] (Barrier Rail)		
10" [255]	4" [100]	Type 5: SP/WB, PB
1⅜" [35]	1⅛" [30]	Splice Bolt

WP= Wood Post WB= Wood Blockout
SP= Steel Post PB= Plastic Blockout
Longer Bolt may be needed for round Wood Post larger than 8" [200] dia.

THIS DRAWING REPLACES GR1.1M DATED 10-21-97.

OHIO DEPARTMENT OF TRANSPORTATION
4-18-03 DATE
ROADWAY DESIGN ENGINEER
STDS. ENGR. D. Focke

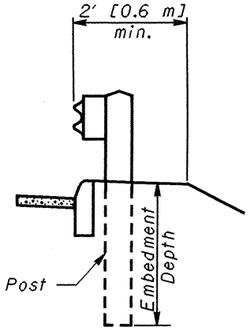
All metric dimensions (in brackets [ ]) are in millimeters unless otherwise noted.

ROADWAY ENGINEERING SERVICES

STANDARD ROADWAY CONSTRUCTION DRAWING
GUARDRAIL DETAILS (Rail Components)

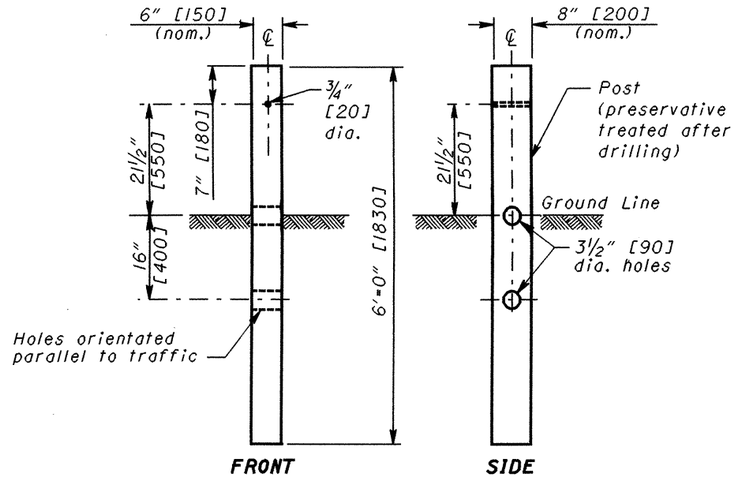
NUMBER GR-1.1

1 / 3

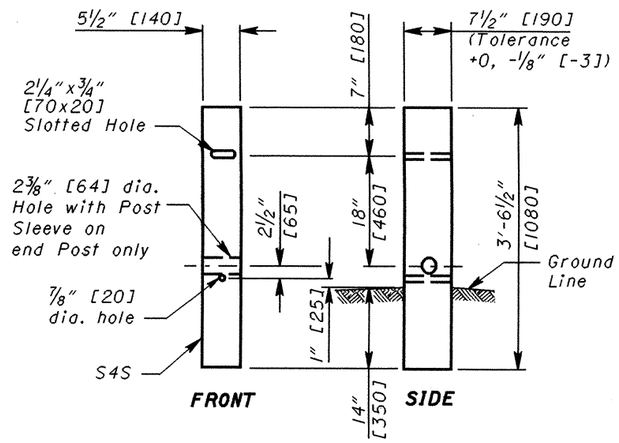


DETAIL A

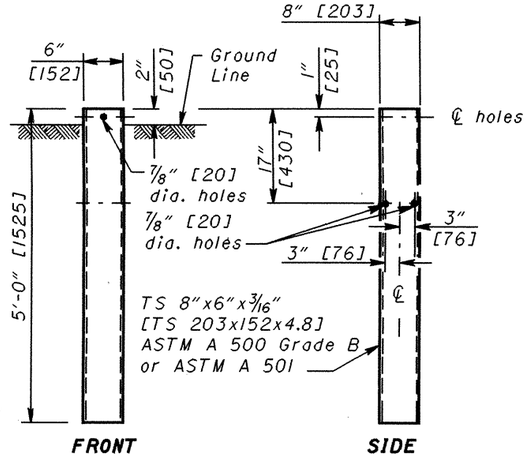
See POST EMBEDMENT DEPTH Note



TYPE 1 BREAKAWAY CRT POST



TYPE 2 BREAKAWAY CRT POST



STEEL GROUND TUBE

NOTES

GUARDRAIL HEIGHT: For initial installation, construct the guardrail within ± 1" [25] of the standard height, h, or 27 3/4" [706] to the top of W-Beam rail. (See MEASURING GUARDRAIL HEIGHT Detail.) When subsequent projects, such as resurfacings, affect the height of existing guardrail, the finished height is to be within ±3" [75] of the standard height.

POST EMBEDMENT DEPTH: Where less than 2' [0.6 m] of graded shoulder shoulder width (10:1 or flatter) exists, measured from from the face of the guardrail (see DETAIL "A"), use longer posts so that a minimum of 5'-5" [1.65 m] embedment depth is provided. Payment for the longer posts will be made at the unit price bid for **Item 606 - Guardrail Post, 9' [2.75 m], Each.**

SPECIAL POST MOUNTINGS: Install posts located over a drainage inlet or structure as shown in the FOOTING ANCHOR Detail, or anchor per the details shown on **SCD GR-2.2.**

Install posts located over a footing with a cover of less than 2'-6" [0.75 m] with a footing anchor as detailed here. (A plate, as detailed on SECTION B-B of **SCD GR-2.2,** may be used as an alternative attachment method.) Where the cover is between 2'-6" [0.75 m] and 3'-5" [1.04 m], the footing anchor may be omitted and the post encased instead with 4" [100] (min.) of concrete.

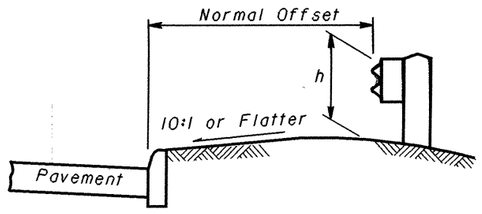
Do not drive posts located over a culvert with less than 4'-3" [1.3 m] of cover; instead set in drilled or dug holes. Where the available post embedment depth is less than 3'-5" [1.04 m], encase the post with a minimum of 4" [100] concrete.

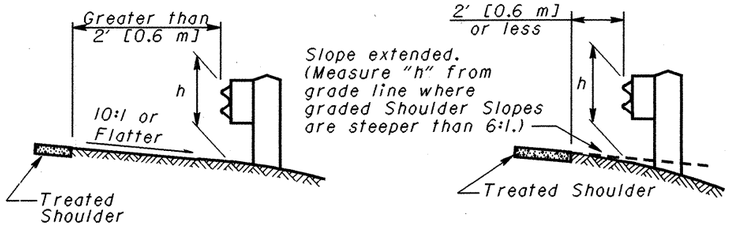
All costs associated with special post mountings are included in the unit price bid for Item 606 Guardrail of the type specified in the plans.

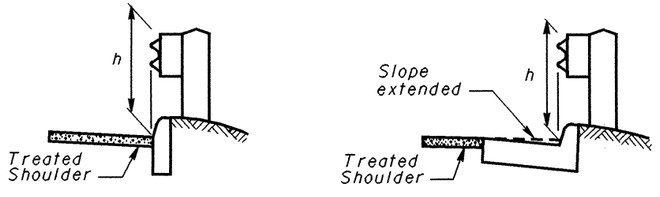
ANCHORS: Holes and grouting shall comply with CMS 510. Use either cement or nonshrink, nonmetallic grout.

Expansion shield anchors as specified in CMS 712.01 may be substituted except where concrete deterioration has occurred, as determined by the Engineer. Where self-drilling anchors are used, drill the holes with the expansion shield (not by a drill bit) and install the shield flush with the concrete surface.

PROTECTIVE COATING: In lieu of the complying with CMS 710.06, coat expansion shields, anchors and concrete insert anchor assemblies embedded in concrete in accordance with ASTM A 153 or be of stainless steel. Any bolts screwed into these devices shall meet CMS 710.06. (See sheet 3 for Concrete Insert Anchor Assembly Detail.)

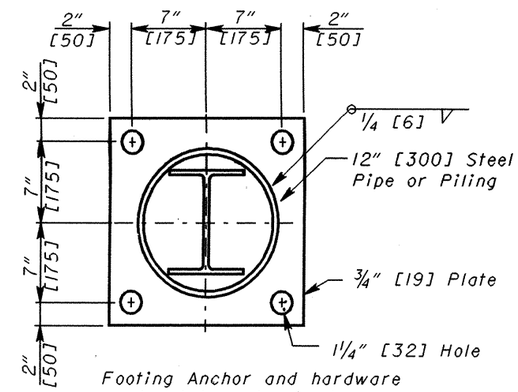






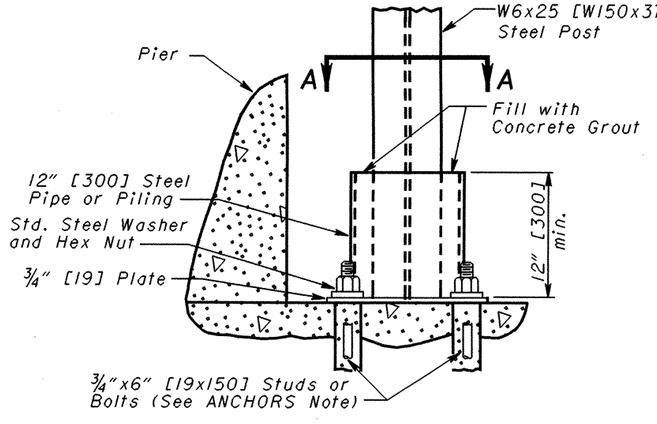
h = Standard Height (See GUARDRAIL HEIGHT Note)

MEASURING GUARDRAIL HEIGHT



Footing Anchor and hardware need not be galvanized

SECTION A-A



ELEVATION

FOOTING ANCHOR

See SPECIAL POST MOUNTINGS Note.

THIS DRAWING REPLACES GR-1.2M DATED 1-3-96.

OHIO DEPARTMENT OF TRANSPORTATION — DATE 4-18-03

ROADWAY DESIGN ENGINEER — Ray Fitzpatrick

STDS. ENGR. — D. Focke

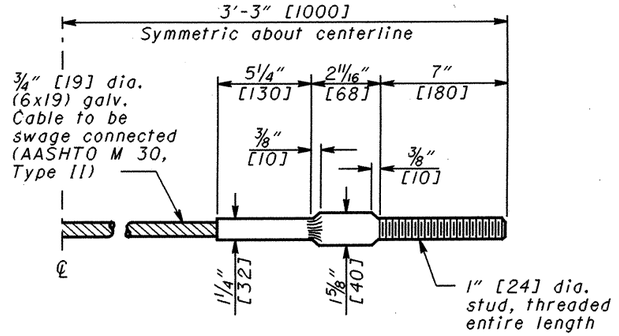
All metric dimensions [in brackets] are in millimeters unless otherwise noted.

ROADWAY ENGINEERING SERVICES

STANDARD ROADWAY CONSTRUCTION DRAWING

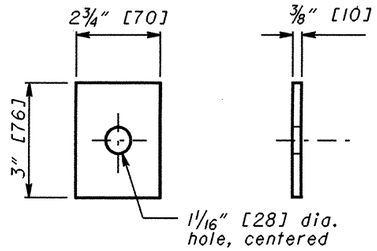
GUARDRAIL DETAILS (Posts)

NUMBER GR-1.1

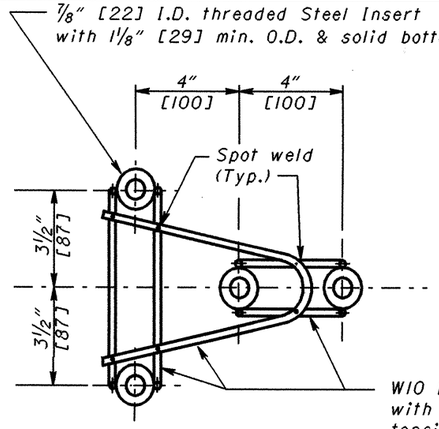


STANDARD SWAGED FITTING AND STUD

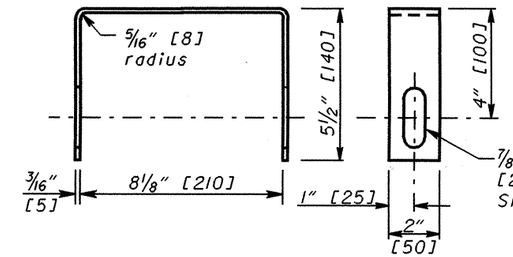
CABLE ANCHOR



END PLATE

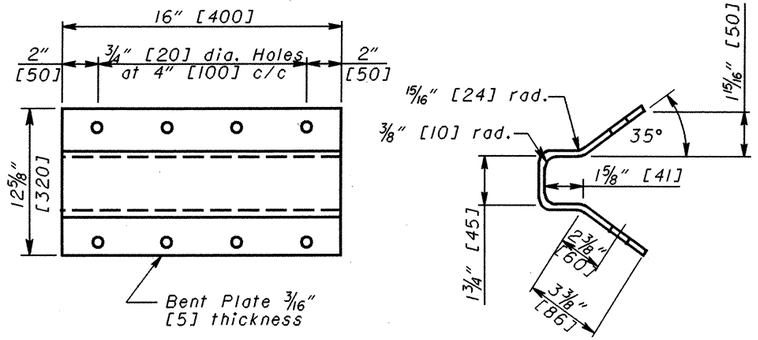


PLAN

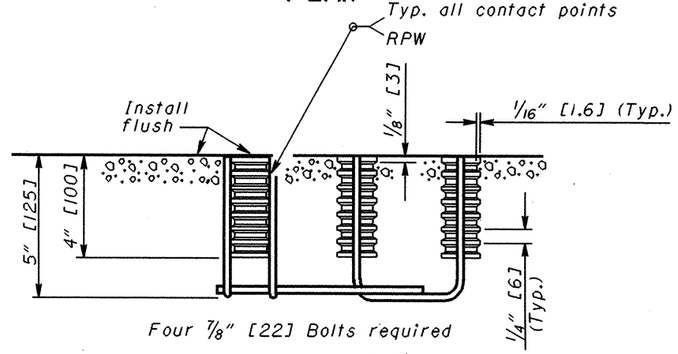


YOKE

Two required in Assembly



ANCHOR BRACKET

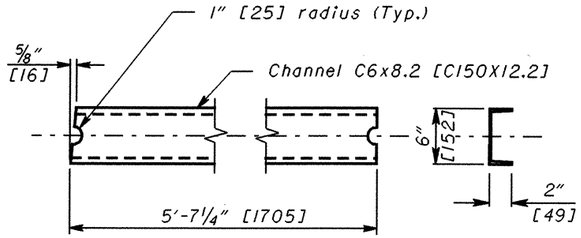


Four 7/8" [22] Bolts required

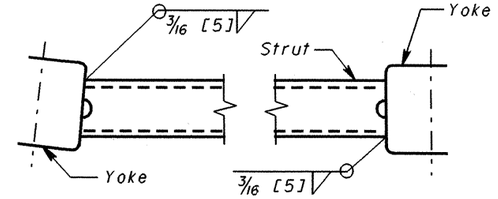
ELEVATION

CONCRETE INSERT ANCHOR ASSEMBLY (W-BEAM ONLY)

See ANCHORS and PROTECTIVE COATINGS Notes on Sheet 2

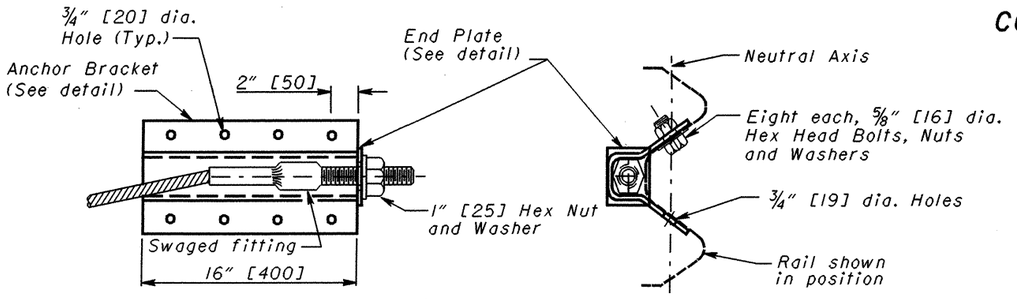


STRUT

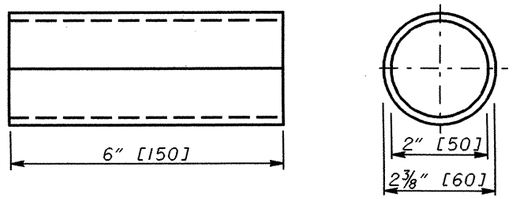


Channel legs shown down. For opposite hand, install Channel legs up.

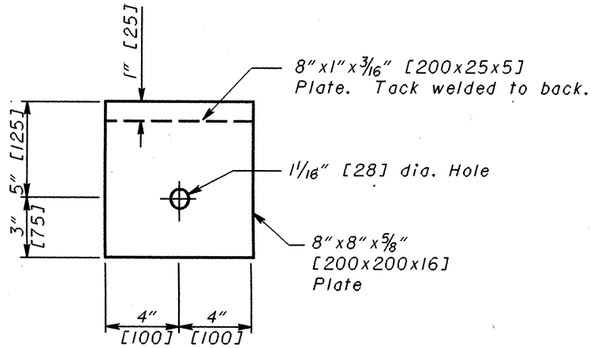
STRUT AND YOKE ASSEMBLY



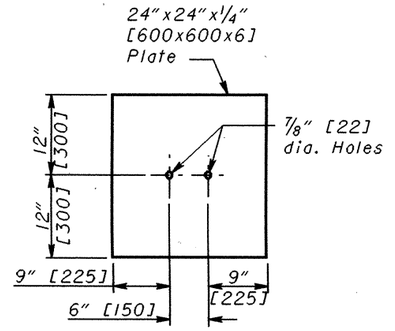
ANCHOR BRACKET ASSEMBLY DETAILS



POST SLEEVE



BEARING PLATE



SOIL PLATE

THIS DRAWING REPLACES GR-1.3M DATED 11-30-94.

OHIO DEPARTMENT OF TRANSPORTATION — 4-18-03 DATE
ROADWAY DESIGN ENGINEER

STDS. ENGR. D. Focke

All metric dimensions (in brackets [ ]) are in millimeters unless otherwise noted.

ROADWAY ENGINEERING SERVICES

STANDARD ROADWAY CONSTRUCTION DRAWING
GUARDRAIL DETAILS (Misc. Components)

NUMBER GR-1.1

NOTES

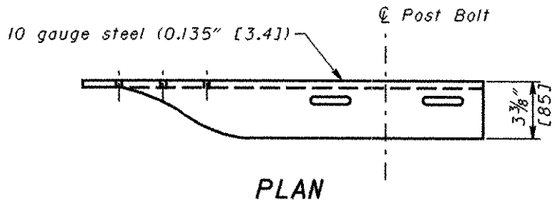
GENERAL: Components shown on this drawing are used in a variety of guardrail systems. See individual guardrail drawing for specific applications.

See CMS 606 for guardrail specifications not covered on these drawings.

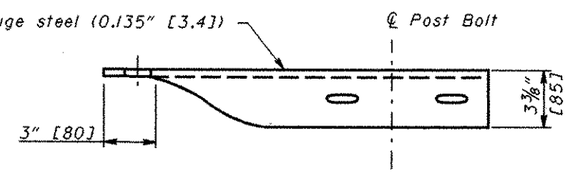
Refer to AASHTO M 180 for dimensional details of W-Beam and Thrie-Beam rail elements, related buffer and end sections, beam splices, post and splice bolts, nuts, and Type 1 W-Beam to Thrie-Beam Transition sections.

RAIL ELEMENTS: W-Beam Rail has an effective length of 12'-6" [3.81 m], unless otherwise specified, with ¾"x2½" [19x64] post bolt slots on 6'-3" [1.905 m] centers regardless of post spacing. Field punch or drill bolt holes or slots for irregularly spaced posts as specified in CMS 606.04.

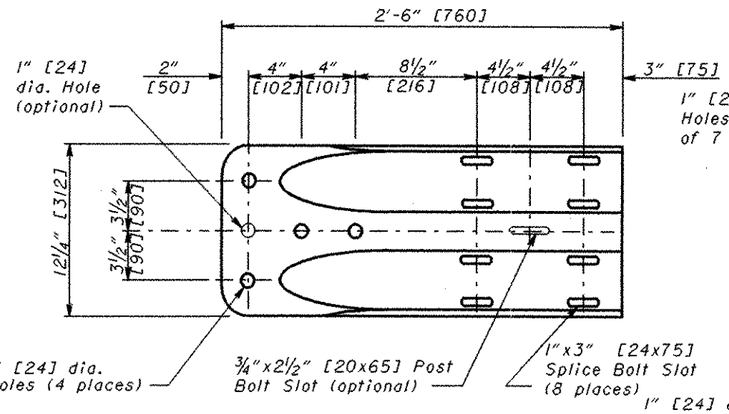
RAIL SPLICE: Lap splices between two rail elements or between a rail and terminal connector in the direction of traffic. Lap the buffer or flared end sections in the direction of traffic.



PLAN

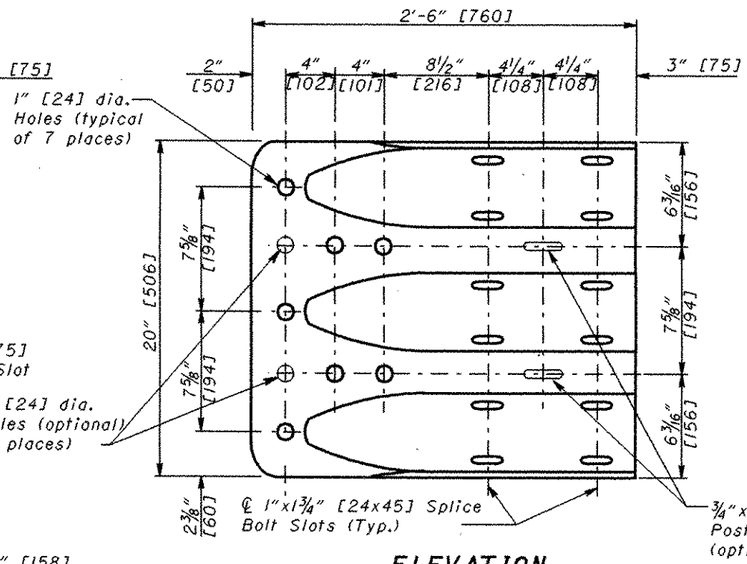


PLAN



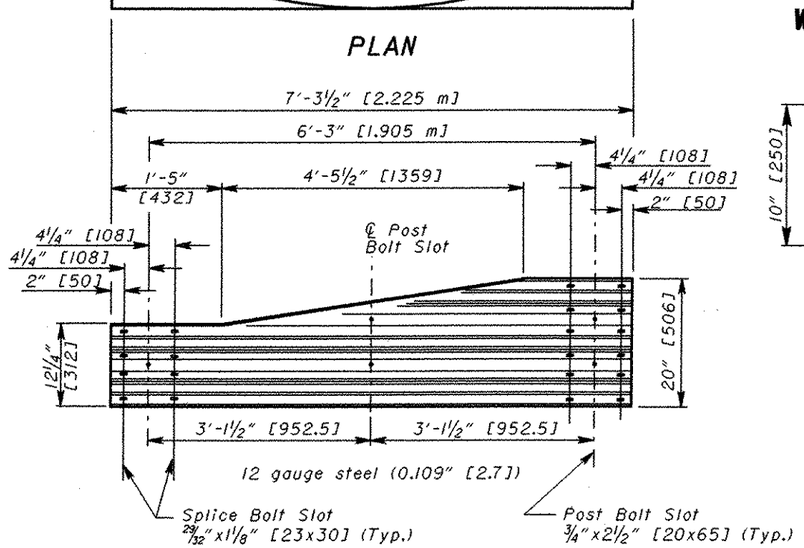
ELEVATION

W-BEAM TERMINAL CONNECTOR



ELEVATION

THRIE-BEAM TERMINAL CONNECTOR

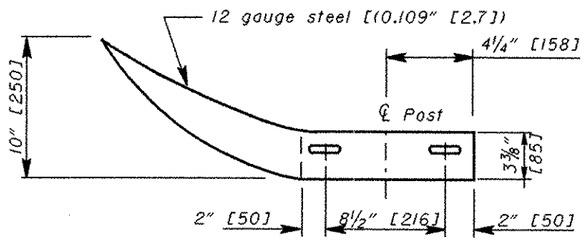


PLAN

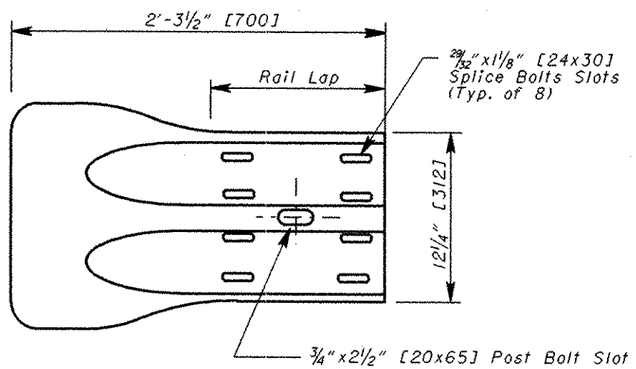
ELEVATION

TYPE 2 TRANSITION SECTION
(Asymmetric W to Thrie-Beam)

For details of Type 1 Transition Section (Symmetric), refer to AASHTO M 180, Figure 4.

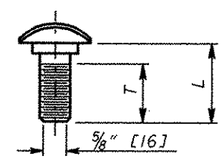


PLAN



ELEVATION

W-BEAM FLARED END SECTION



GUARDRAIL BOLT
(For Post and Splice Bolts)

L	T min.	Bolt Use
18" [460] (Standard Rail)	4" [100]	Type 5: WP/WB, PB
26" [640] (Barrier Rail)		
10" [255]	4" [100]	Type 5: SP/WB, PB
1¼" [35]	1⅛" [30]	Splice Bolt

WP= Wood Post WB= Wood Blockout
SP= Steel Post PB= Plastic Blockout
Longer Bolt may be needed for round Wood Post larger than 8" [200] dia.

THIS DRAWING REPLACES GR-1.1 DATED 4-18-03.

OHIO DEPARTMENT OF TRANSPORTATION
ROADWAY DESIGN ENGINEER
7-16-04
DATE

STDS. ENGR. D. Focke

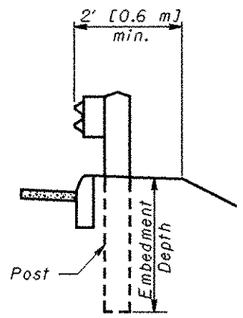
All metric dimensions (in brackets [ ]) are in millimeters unless otherwise noted.

ROADWAY ENGINEERING SERVICES

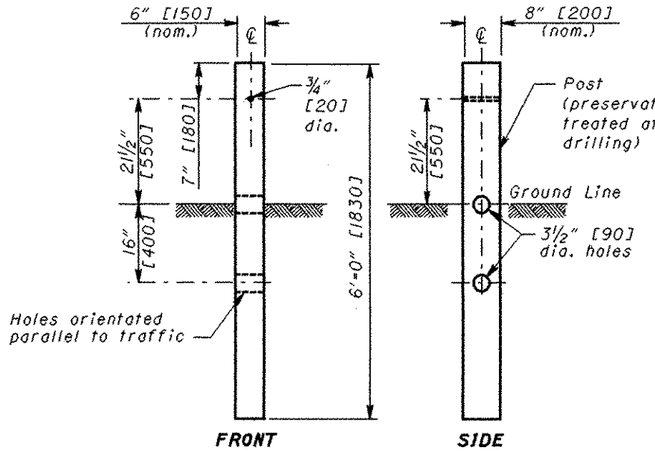
STANDARD ROADWAY CONSTRUCTION DRAWING
GUARDRAIL DETAILS
(Rail Components)

NUMBER GR-1.1

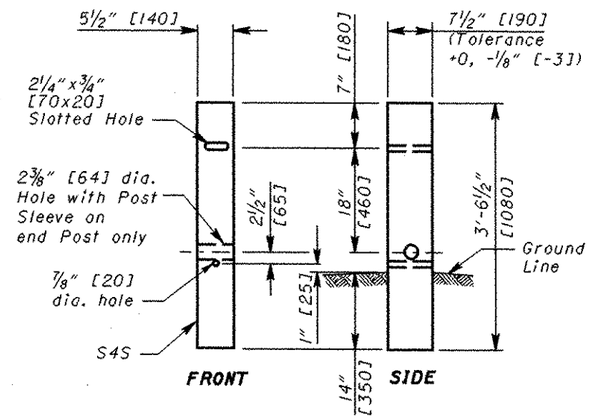
1 / 3



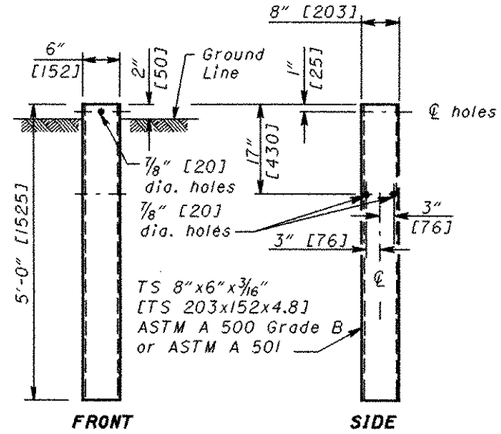
DETAIL A
See POST EMBEDMENT DEPTH Note



TYPE 1 BREAKAWAY CRT POST



TYPE 2 BREAKAWAY CRT POST



STEEL GROUND TUBE

NOTES

GUARDRAIL HEIGHT: For initial installation, construct the guardrail within ± 1" [25] of the standard height, h, or 27¾" [706] to the top of W-Beam rail. (See MEASURING GUARDRAIL HEIGHT Detail.) When subsequent projects, such as resurfacings, affect the height of existing guardrail, the finished height is to be within ±3" [75] of the standard height.

POST EMBEDMENT DEPTH: Where less than 2' [0.6 m] of graded shoulder shoulder width (10:1 or flatter) exists, measured from from the face of the guardrail (see DETAIL "A"), use longer posts so that a minimum of 5'-5" [1.65 m] embedment depth is provided. Payment for the longer posts will be made at the unit price bid for **Item 606 - Guardrail Post, 9' [2.75 m], Each.**

SPECIAL POST MOUNTINGS: Install posts located over a drainage inlet or structure as shown in the FOOTING ANCHOR Detail, or anchor per the details shown on **SCD GR-2.2.**

Install posts located over a footing with a cover of less than 2'-6" [0.75 m] with a footing anchor as detailed here. (A plate, as detailed on SECTION B-B of **SCD GR-2.2,** may be used as an alternative attachment method.) Where the cover is between 2'-6" [0.75 m] and 3'-5" [1.04 m], the footing anchor may be omitted and the post encased instead with 4" [100] (min.) of concrete.

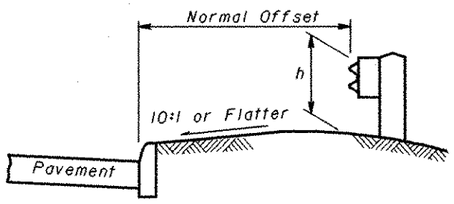
Do not drive posts located over a culvert with less than 4'-3" [1.3 m] of cover; instead set in drilled or dug holes. Where the available post embedment depth is less than 3'-5" [1.04 m], encase the post with a minimum of 4" [100] concrete.

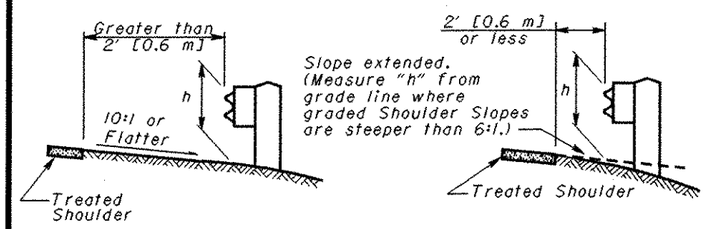
All costs associated with special post mountings are included in the unit price bid for Item 606 Guardrail of the type specified in the plans.

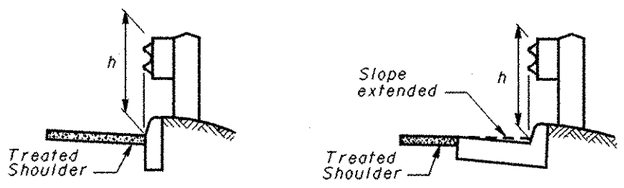
ANCHORS: Holes and grouting shall comply with CMS 510. Use either cement or nonshrink, nonmetallic grout.

Expansion shield anchors as specified in CMS 712.01 may be substituted except where concrete deterioration has occurred, as determined by the Engineer. Where self-drilling anchors are used, drill the holes with the expansion shield (not by a drill bit) and install the shield flush with the concrete surface.

PROTECTIVE COATING: In lieu of the complying with CMS 710.06, coat expansion shields, anchors and concrete insert anchor assemblies embedded in concrete in accordance with ASTM A 153 or be of stainless steel. Any bolts screwed into these devices shall meet CMS 710.06. (See sheet 3 for Concrete Insert Anchor Assembly Detail.)

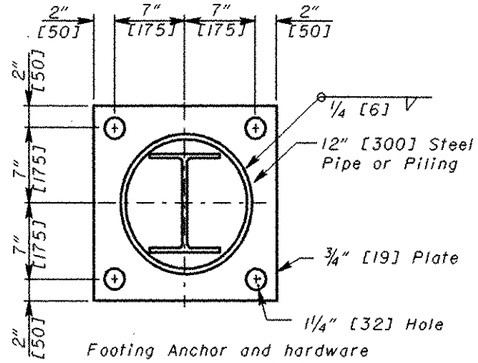






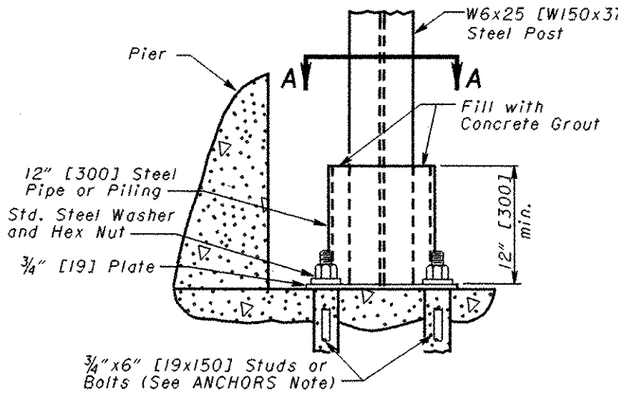
h = Standard Height (See GUARDRAIL HEIGHT Note)

MEASURING GUARDRAIL HEIGHT



Footing Anchor and hardware need not be galvanized

SECTION A-A



ELEVATION
FOOTING ANCHOR
See SPECIAL POST MOUNTINGS Note.

THIS DRAWING REPLACES GR-1.1 DATED 4-18-03.

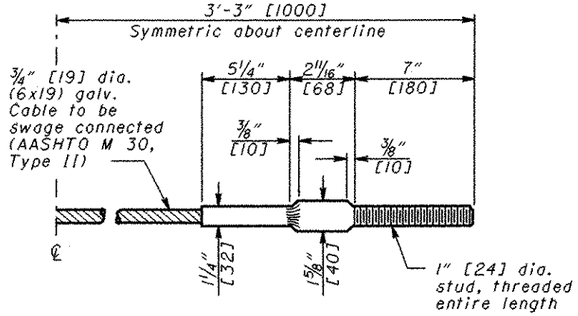
OHIO DEPARTMENT OF TRANSPORTATION — DATE: 7-16-04
ROADWAY DESIGN ENGINEER — Randy Stallard
STDS. ENGR. — D. Focke

All metric dimensions (in brackets [ ]) are in millimeters unless otherwise noted.

ROADWAY ENGINEERING SERVICES

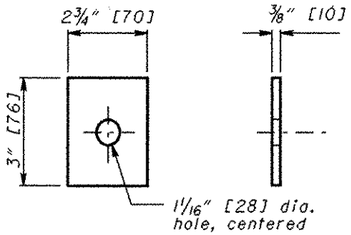
STANDARD ROADWAY CONSTRUCTION DRAWING
GUARDRAIL DETAILS (Post s)

NUMBER **GR-1.1**

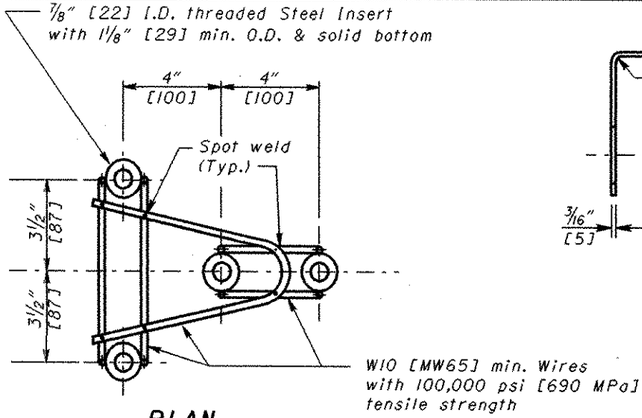


STANDARD SWAGED FITTING AND STUD

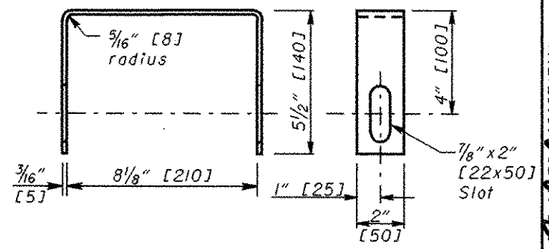
CABLE ANCHOR



END PLATE

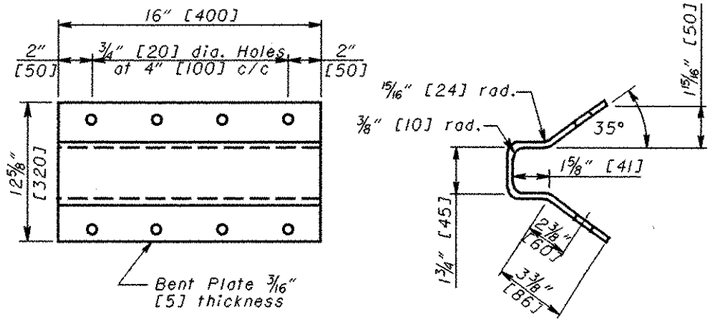


PLAN

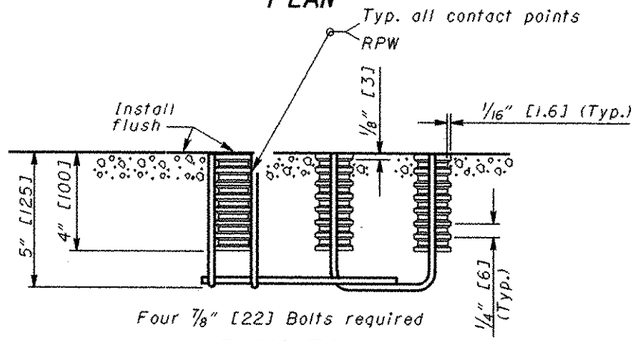


YOKE

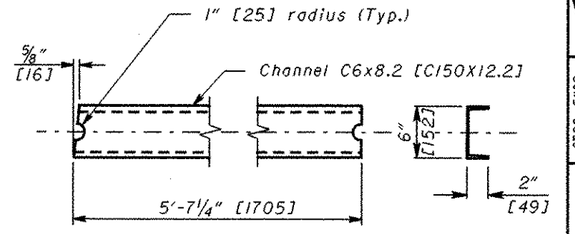
Two required in Assembly



ANCHOR BRACKET



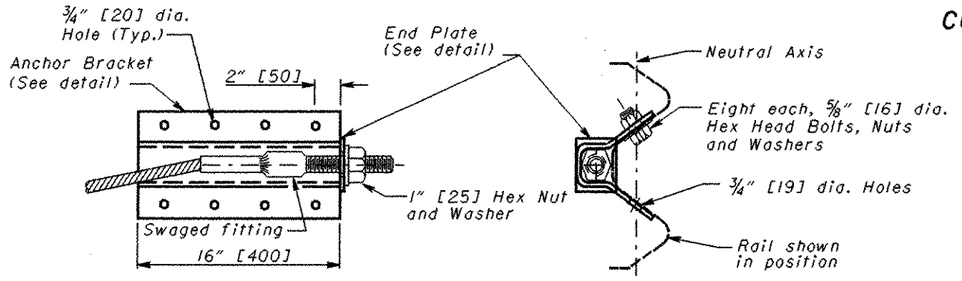
ELEVATION



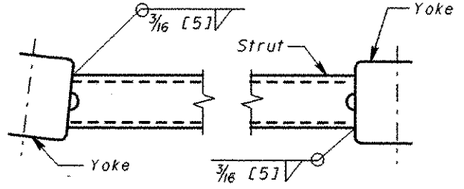
STRUT

CONCRETE INSERT ANCHOR ASSEMBLY (W-BEAM ONLY)

See ANCHORS and PROTECTIVE COATINGS Notes on Sheet 2

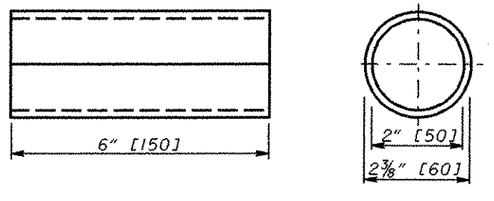


ANCHOR BRACKET ASSEMBLY DETAILS

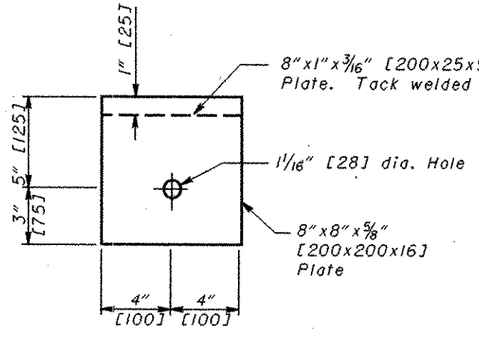


Channel legs shown down. For opposite hand, install Channel legs up.

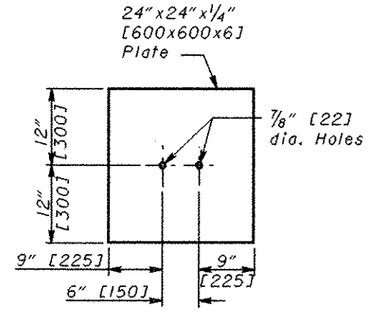
STRUT AND YOKE ASSEMBLY



POST SLEEVE



BEARING PLATE



SOIL PLATE

THIS DRAWING REPLACES GR-1.1 DATED 4-18-03.

OHIO DEPARTMENT OF TRANSPORTATION	7-16-04 DATE
ROADWAY DESIGN ENGINEER	Randy E. Stinchcomb
STDS. ENGR.	D. Focke
All metric dimensions (in brackets [ ]) are in millimeters unless otherwise noted.	
ROADWAY ENGINEERING SERVICES	
STANDARD ROADWAY CONSTRUCTION DRAWING	GUARDRAIL DETAILS (Misc. Components)
NUMBER	GR-1.1
	3 / 3

NOTES

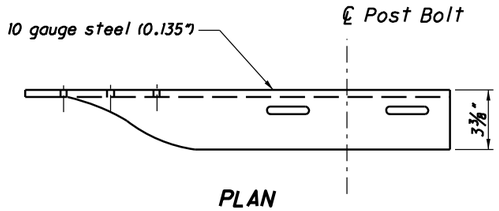
GENERAL: Components shown on this drawing are used in a variety of guardrail systems. See individual guardrail drawing for specific applications.

See CMS 606 for guardrail specifications not covered on these drawings.

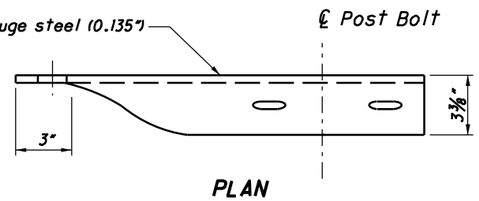
Refer to AASHTO M 180 for dimensional details of W-Beam and Thrie-Beam rail elements, related buffer and end sections, beam splices, post and splice bolts, nuts, and Type 1 W-Beam to Thrie-Beam Transition sections.

RAIL ELEMENTS: W-Beam Rail has an effective length of 12'-6" unless otherwise specified, with ¾" x 2½" post bolt slots on 6'-3" centers regardless of post spacing. Field punch or drill bolt holes or slots for irregularly spaced posts as specified in CMS 606.04.

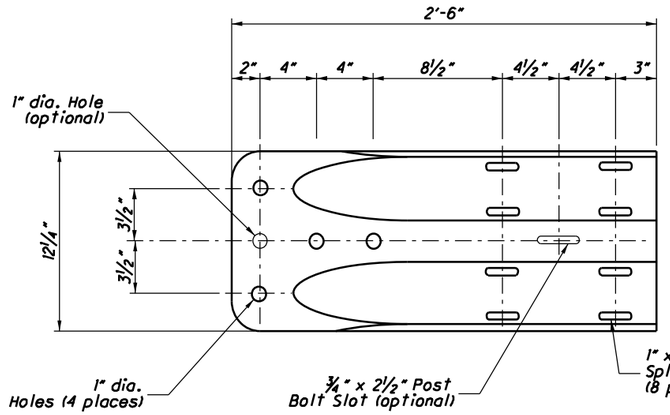
RAIL SPLICES: Lap splices between two rail elements or between a rail and terminal connector in the direction of traffic. Lap the buffer or flared end sections in the direction of traffic.



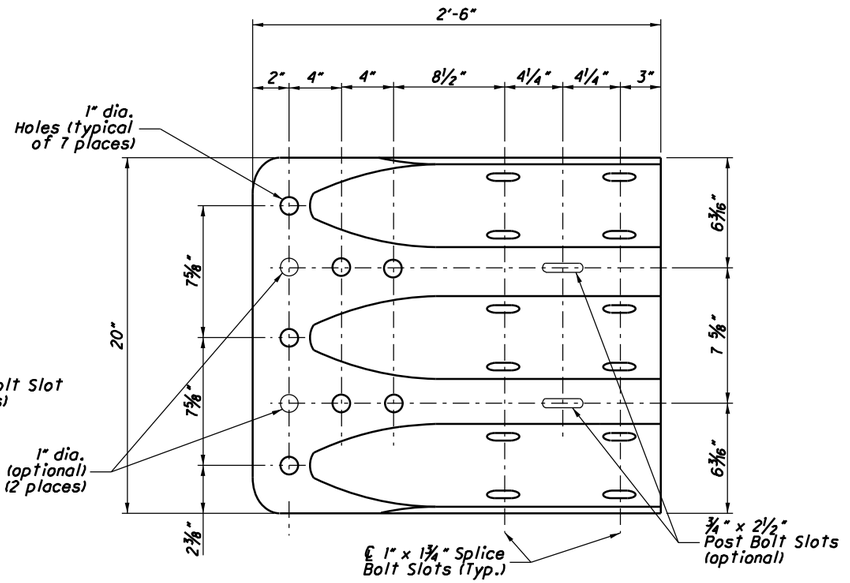
PLAN



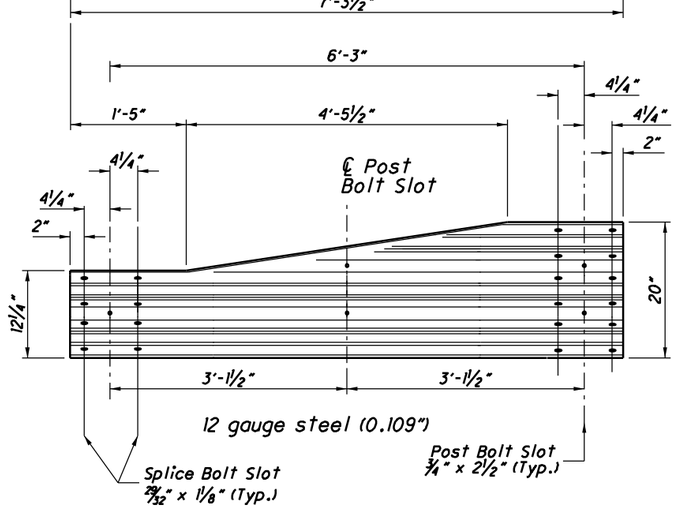
PLAN



ELEVATION
W-BEAM TERMINAL CONNECTOR

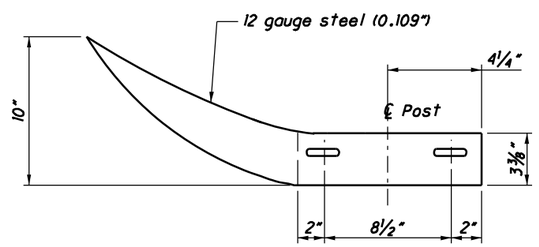


ELEVATION
THRIE-BEAM TERMINAL CONNECTOR

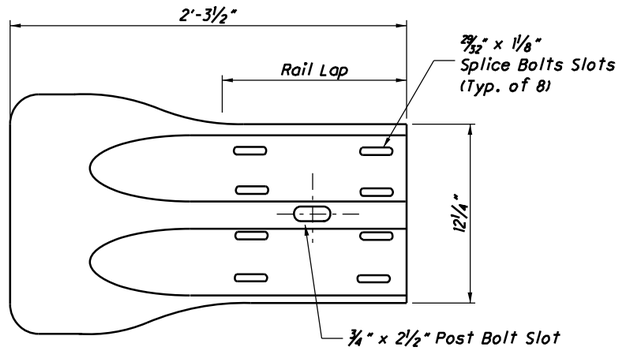


ELEVATION
TYPE 2 TRANSITION SECTION
(Asymmetric W to Thrie-Beam)

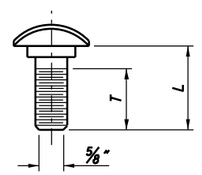
For details of Type 1 Transition Section (Symmetric), refer to AASHTO M 180, Figure 4.



PLAN



ELEVATION
W-BEAM FLARED END SECTION



GUARDRAIL BOLT (For Post and Splice Bolts)		
L	**T min.**	**Bolt Use**
18" (Standard Rail)	4"	Type 5: WP/WB, PB
26" (Barrier Rail)		
10"	4"	Type 5: SP/WB, PB
1¼	1⅛	Splice Bolt

WP = Wood Post WB = Wood Blockout
SP = Steel Post PB = Plastic Blockout

Longer Bolt may be needed for round Wood Post larger than 8" dia.

THIS DRAWING REPLACES gr-1.1 DATED 7-16-04.

STATE OF OHIO DEPARTMENT OF TRANSPORTATION
Michael Bline — ADMINISTRATOR
7-20-12 — DATE

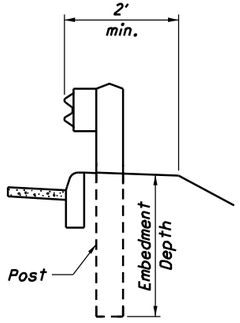
STDS. ENGINEER: M. Ruppe

OFFICE OF ROADWAY ENGINEERING

STANDARD ROADWAY CONSTRUCTION DRAWING

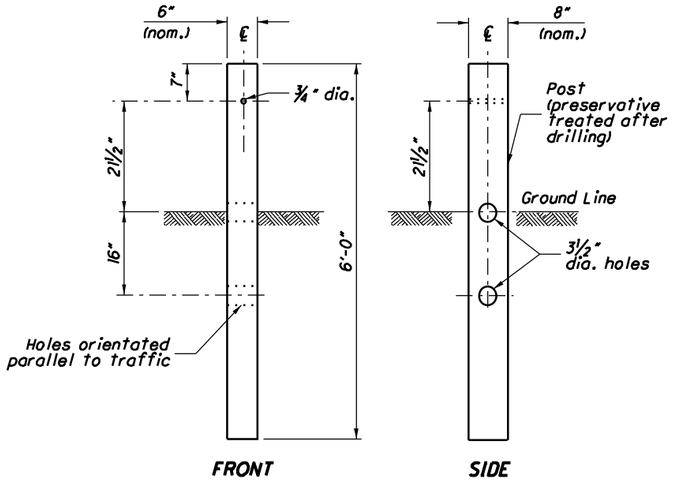
GUARDRAIL DETAILS (Rail Components)

SCD NUMBER GR-1.1

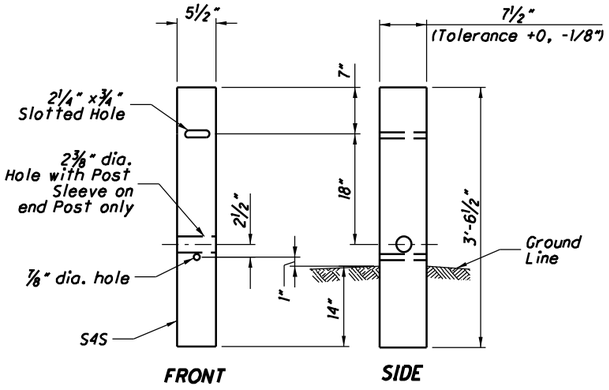


DETAIL A

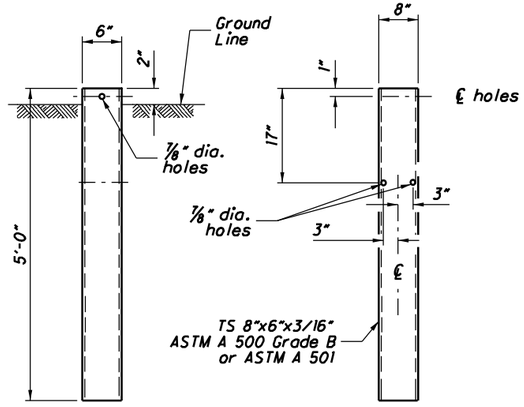
See POST EMBEDMENT DEPTH Note



TYPE 1 BREAKAWAY CRT POST



TYPE 2 BREAKAWAY CRT POST



STEEL GROUND TUBE

NOTES

GUARDRAIL HEIGHT: For initial installation, construct the guardrail within ± 1" of the standard height, h, or **29"** to the top of W-Beam rail. (See MEASURING GUARDRAIL HEIGHT Detail.)

When subsequent projects, such as resurfacings, affect the height of existing guardrail, the finished height is to be within ±2.5" of the standard height.

POST EMBEDMENT DEPTH: Standard embedment is 3'-5" min. Where less than 2' of graded shoulder width (10:1 or flatter) exists, measured from the face of the guardrail (see DETAIL "A"), use longer posts so that a minimum of 5'-5" embedment depth is provided. Payment for the longer posts will be made at the unit price bid for **ITEM 606 - GUARDRAIL POST, 9', Each.**

SPECIAL POST MOUNTINGS: Install posts located over a drainage inlet or structure as shown in the FOOTING ANCHOR Detail, or anchor per the details shown on **SCD GR-2.2.**

Install posts located over a footing with a cover of less than 2'-6" with a footing anchor as detailed here. (A plate, as detailed on SECTION B-B of **SCD GR-2.2**, may be used as an alternative attachment method.) Where the cover is between 2'-6" and 3'-5", the footing anchor may be omitted and the post encased instead with 4" (min.) of concrete.

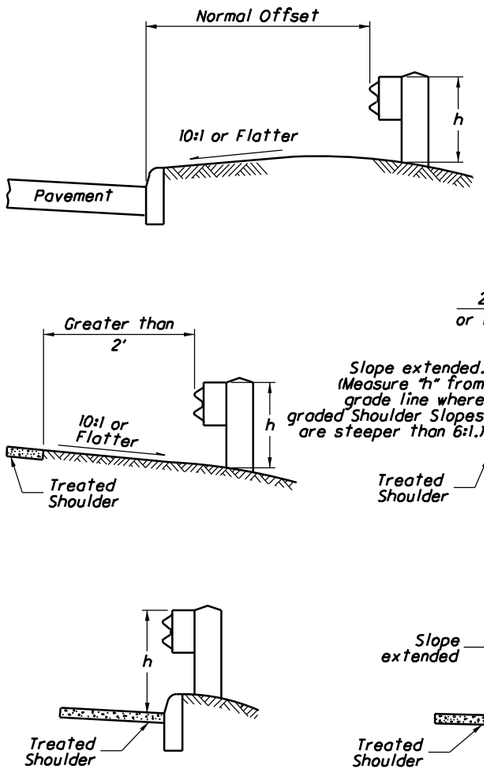
Do not drive posts located over a culvert with less than 4'-3" of cover; instead set in drilled or dug holes. Where the available post embedment depth is less than 3'-5", encase the post with a minimum of 4" concrete.

All costs associated with special post mountings are included in the unit price bid of Item 606 Guardrail of the type specified in the plans.

ANCHORS: Holes and grouting shall comply with CMS 510. Use either cement or non-shrink, nonmetallic grout.

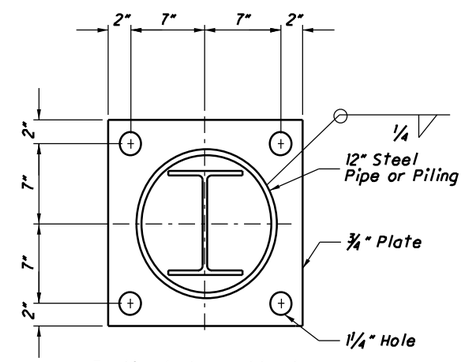
Expansion shield anchors as specified in CMS 712.01 may be substituted except where concrete deterioration has occurred, as determined by the Engineer. Where self-drilling anchors are used, drill the holes with the expansion shield (not by a drill bit) and install the shield flush with the concrete surface.

PROTECTIVE COATING: In lieu of the complying with CMS 710.06, coat expansion shields, anchors and concrete insert anchor assemblies embedded in concrete in accordance with ASTM A 153 or be of stainless steel. Any bolts screwed into these devices shall meet CMS 710.06. (See sheet 3 for Concrete Insert Anchor Assembly Detail.)



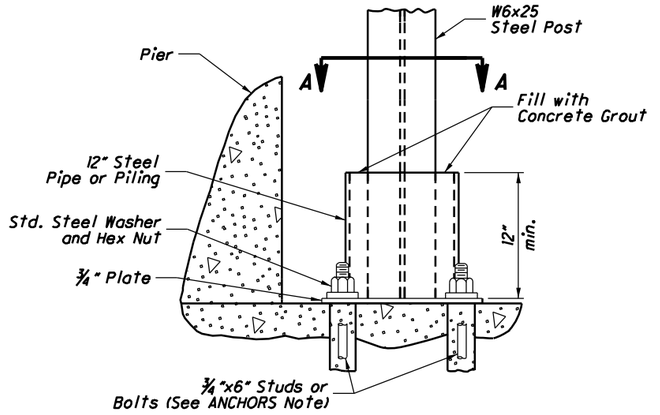
h = Standard Height (See GUARDRAIL HEIGHT Note)

MEASURING GUARDRAIL HEIGHT



Footing Anchor and hardware need not be galvanized

SECTION A-A



ELEVATION
FOOTING ANCHOR

See SPECIAL POST MOUNTINGS Note.

STATE OF OHIO DEPARTMENT OF TRANSPORTATION
Michael Blume — ADMINISTRATOR
7-20-12 — DATE

STDS. ENGINEER: M. Ruppe

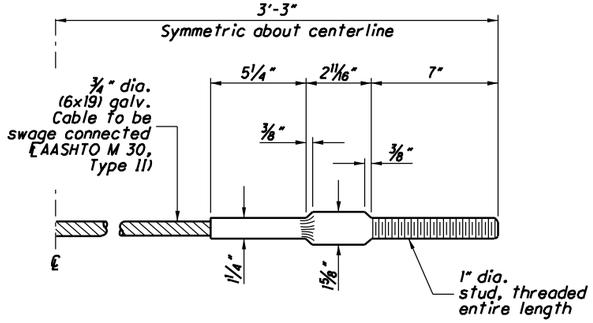
OFFICE OF ROADWAY ENGINEERING

THIS DRAWING REPLACES gr-1.1 DATED 7-16-04.

STANDARD ROADWAY CONSTRUCTION DRAWING

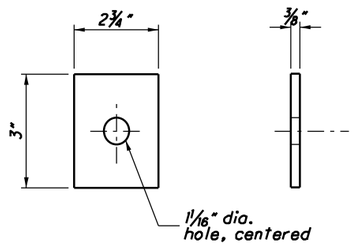
GUARDRAIL DETAILS (Posts)

SCD NUMBER: **GR-1.1**

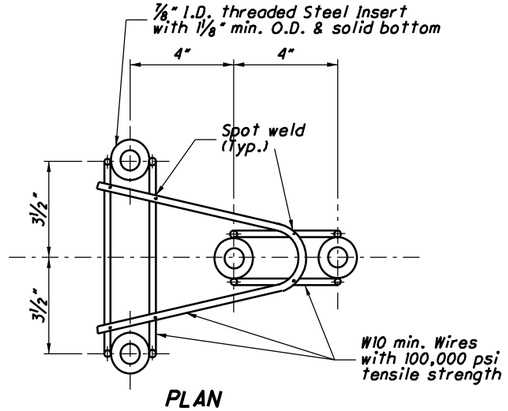


STANDARD SWAGED FITTING AND STUD

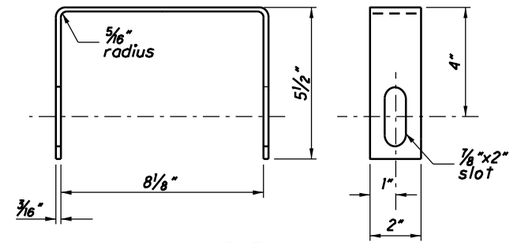
CABLE ANCHOR



END PLATE

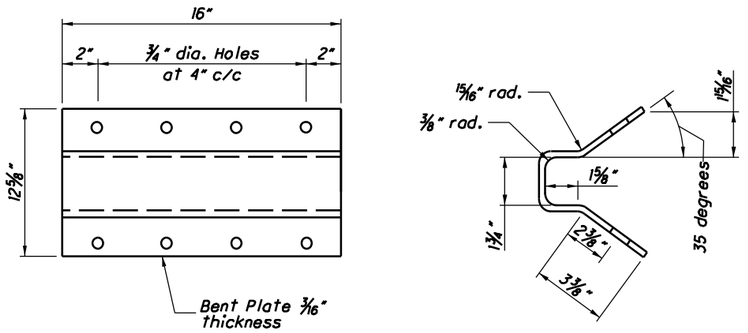


PLAN

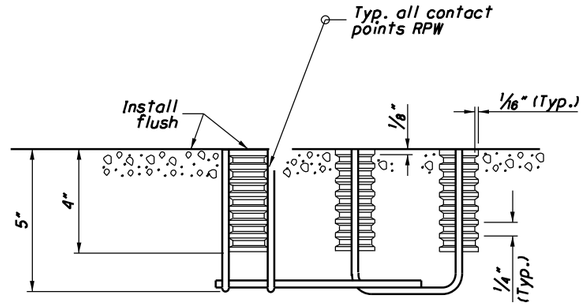


YOKE

Two required in Assembly



ANCHOR BRACKET

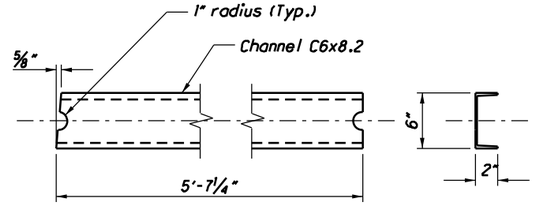


Four ⅞" Bolts required

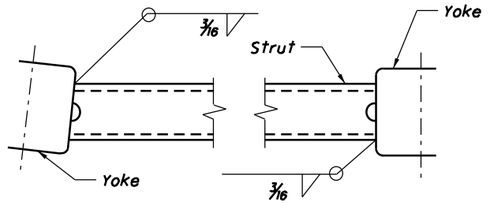
ELEVATION

CONCRETE INSERT ANCHOR ASSEMBLY (W-BEAM ONLY)

See ANCHORS and PROTECTIVE COATINGS Notes on Sheet 2

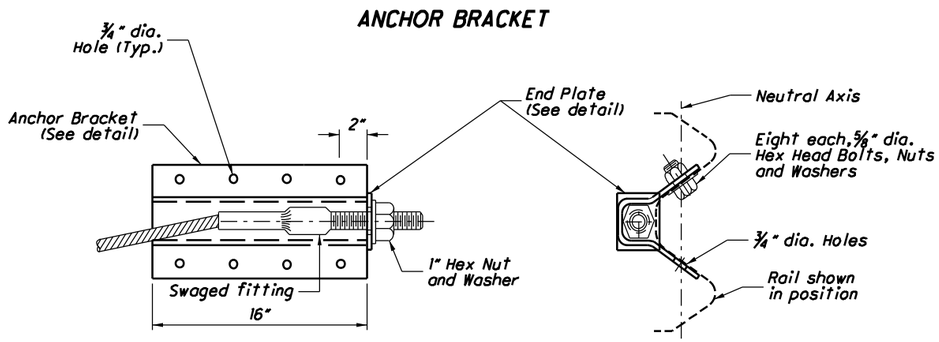


STRUT

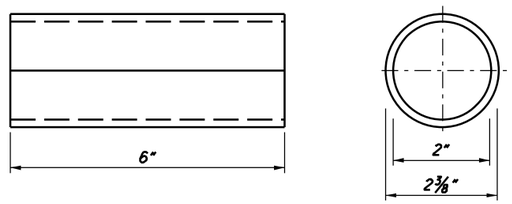


Channel legs shown down. For opposite hand, install Channel legs up.

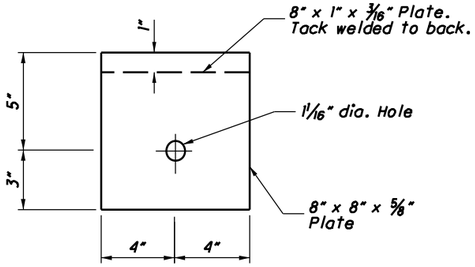
STRUT AND YOKE ASSEMBLY



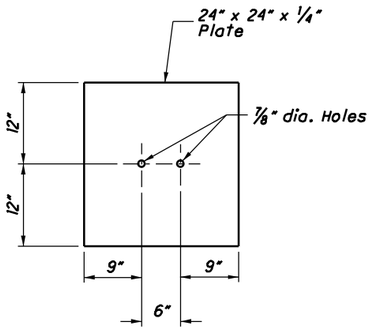
ANCHOR BRACKET ASSEMBLY DETAILS



POST SLEEVE



BEARING PLATE



SOIL PLATE

THIS DRAWING REPLACES gr-1.1 DATED 7-16-04.

STATE OF OHIO DEPARTMENT OF TRANSPORTATION
Michael Blume — ADMINISTRATOR
7-20-12 — DATE

STDS. ENGINEER: M. Ruppe

OFFICE OF ROADWAY ENGINEERING

STANDARD ROADWAY CONSTRUCTION DRAWING

GUARDRAIL DETAILS (Misc. Components)

SCD NUMBER: GR-1.1