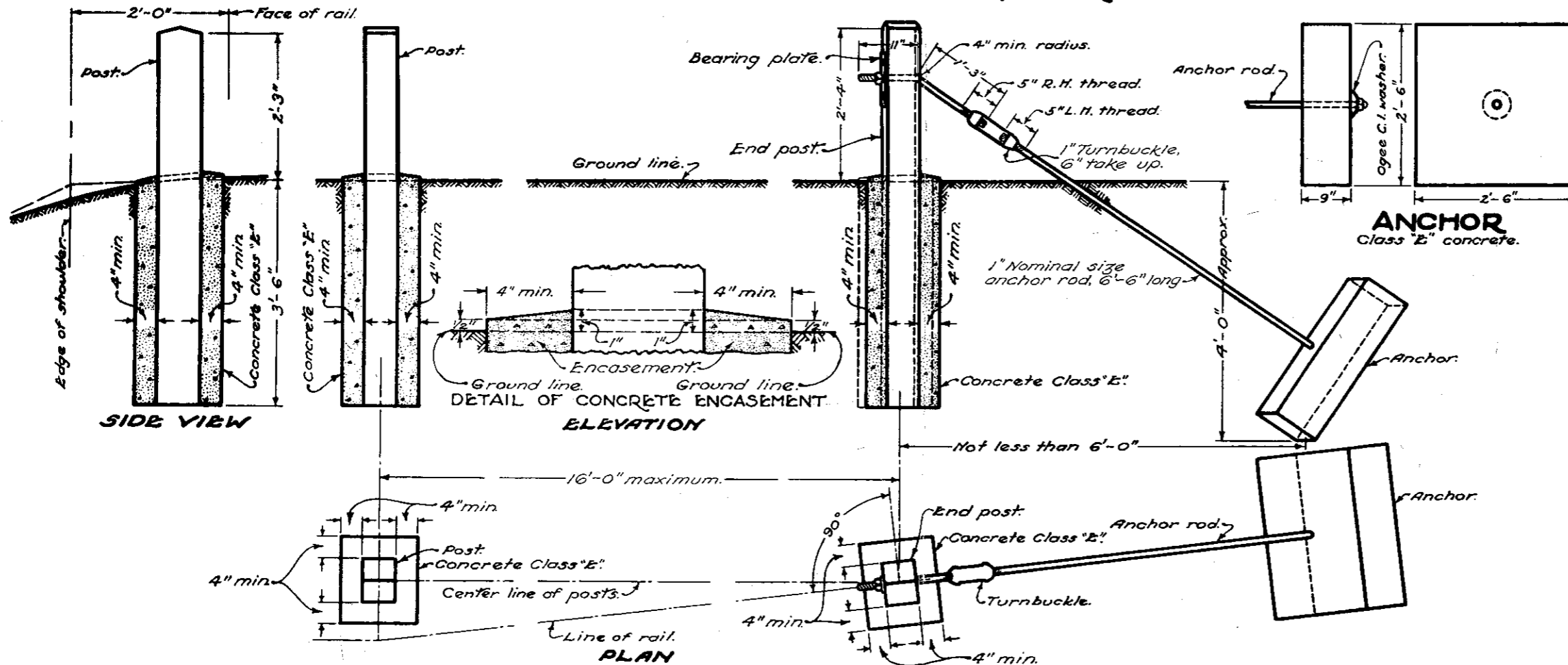


# STANDARD GUARD RAIL

## TWO END POSTS WITH ANCHOR



**NOTES**

**GENERAL**—Standard Construction Drawings showing rail types shall be used in conjunction with this drawing.

**POSTS**—Wood posts may be either round or square sawed. For flexible plate Type 2, deep beam Type 4, and 4 wire ropes Type 1, square sawed posts, when used, shall be full 6" x 8". For 3 wire ropes Type 1, square sawed posts, when used, may be full 6" x 6".

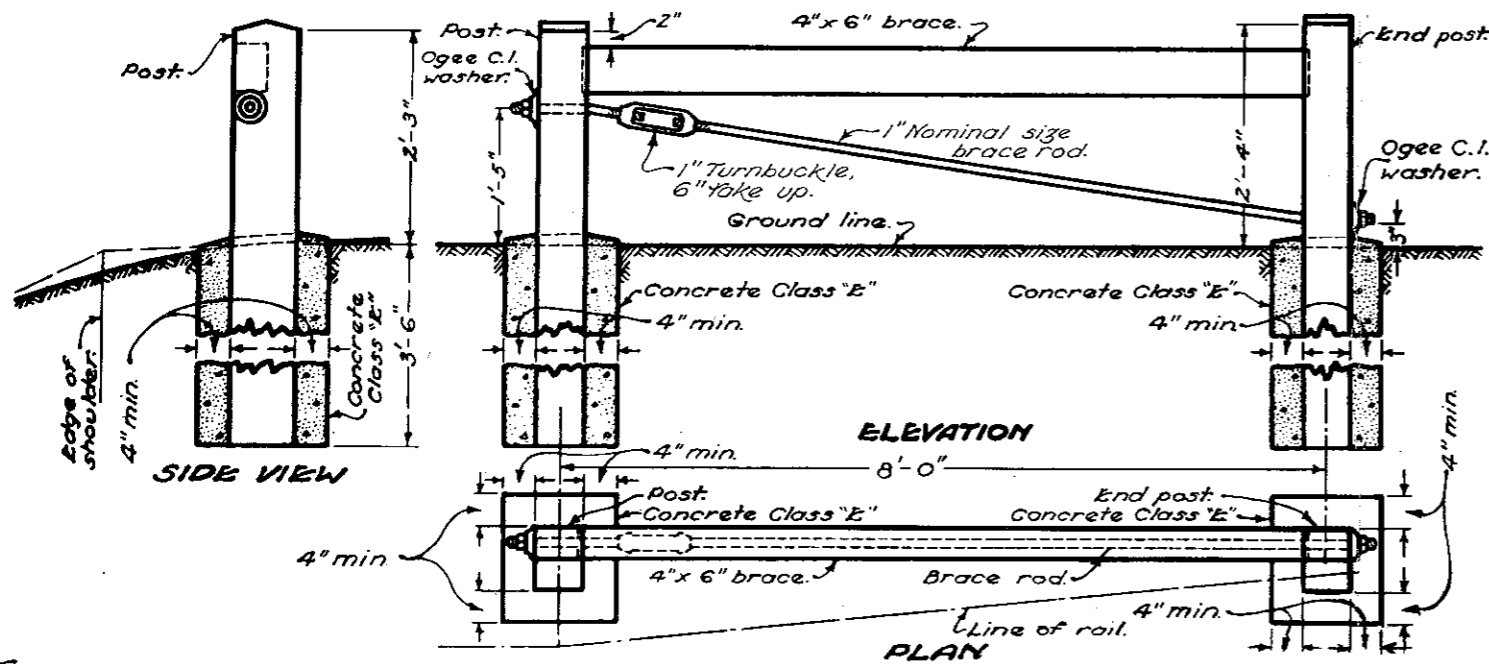
Bolt holes shall be bored and tops of posts trimmed after posts are set.

**END ANCHORAGE**—Where end anchorage is required deadmen shall be used except where physical features such as bridges, drives, road intersections, etc. make this impractical, in which case the end anchorage shall be of the bracing type with the two end posts spaced 8 feet on centers.

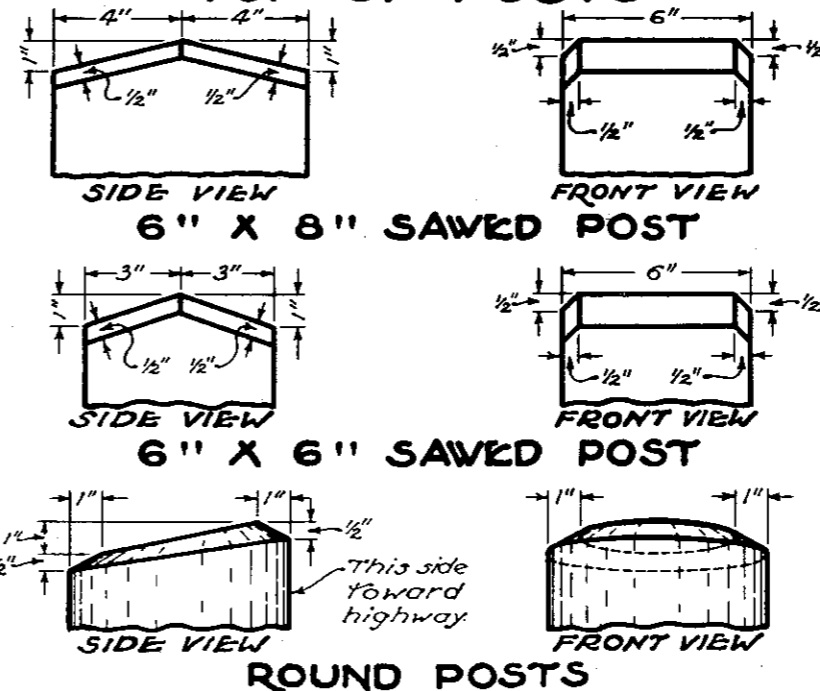
**CONCRETE ENCASEMENT**—The two posts at each end of each run of all guard rail shall be encased in concrete.

**GUARD POSTS**—The posts shall conform to 606 and shall be spaced 6'-0" c. to c. unless otherwise indicated on the plans. Wood posts may be either round or square sawed as dimensioned on this drawing. Concrete encasement is not required.

## TWO END POSTS WITH BRACING



## TOP OF POSTS

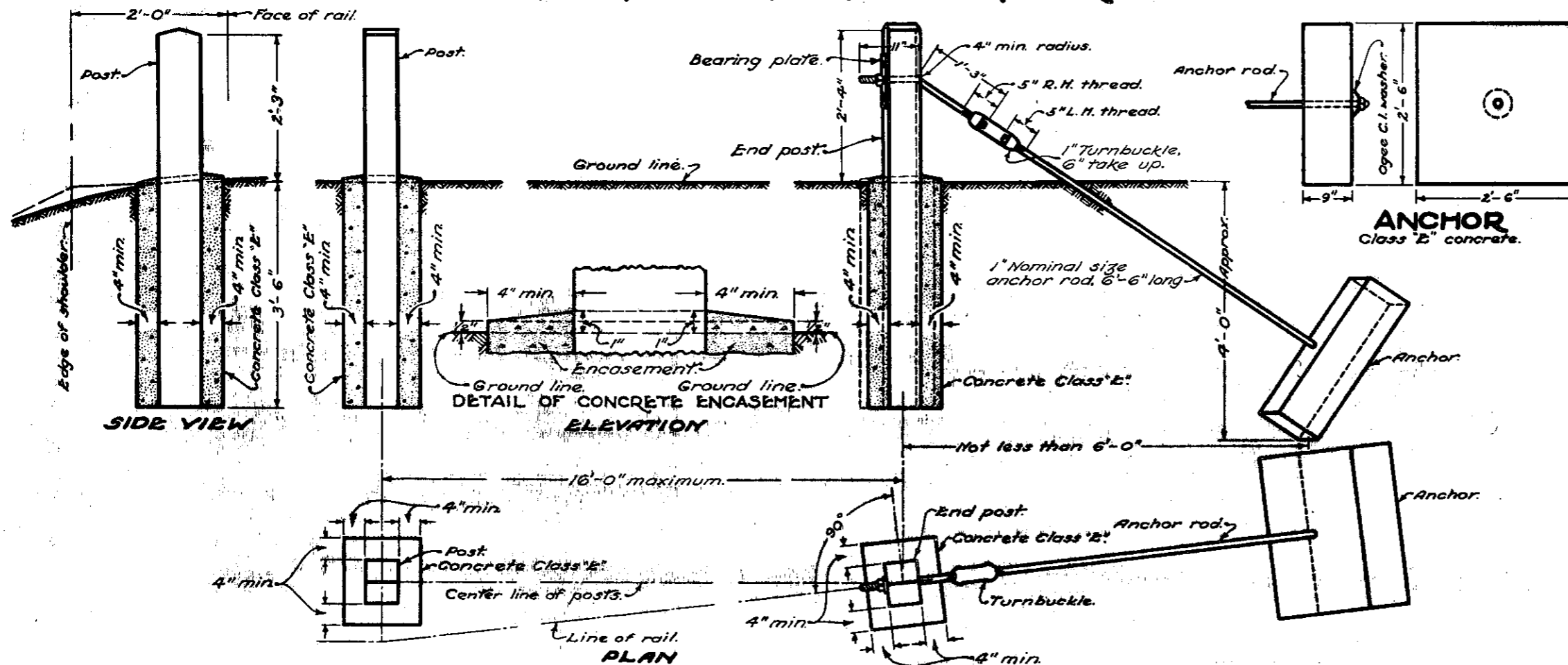


BUREAU OF LOCATION AND DESIGN OHIO DEPARTMENT OF HIGHWAYS	
<b>GUARD RAIL</b>	
STANDARD CONSTRUCTION DRAWING	<b>GR-1</b>
APPROVED: <i>R. R. Jones</i> ENGR. L. & D.	

DATE: 6-1-65

# STANDARD GUARD RAIL

## TWO END POSTS WITH ANCHOR



### NOTES

**GENERAL:** Standard Construction Drawings showing rail types shall be used in conjunction with this drawing.

**POSTS:** Wood posts may be either round or square-sawed. For flexible plate Type 2, deep beam Type 4, and 4 wire ropes Type 1, square-sawed posts, when used, shall be full 6x8. For 3 wire ropes Type 1, square-sawed posts, when used, may be full 6x6. Galvanized steel posts shall be 6B x 8 1/2 pounds.

Bolt holes shall be bored and tops of posts trimmed after posts are set.

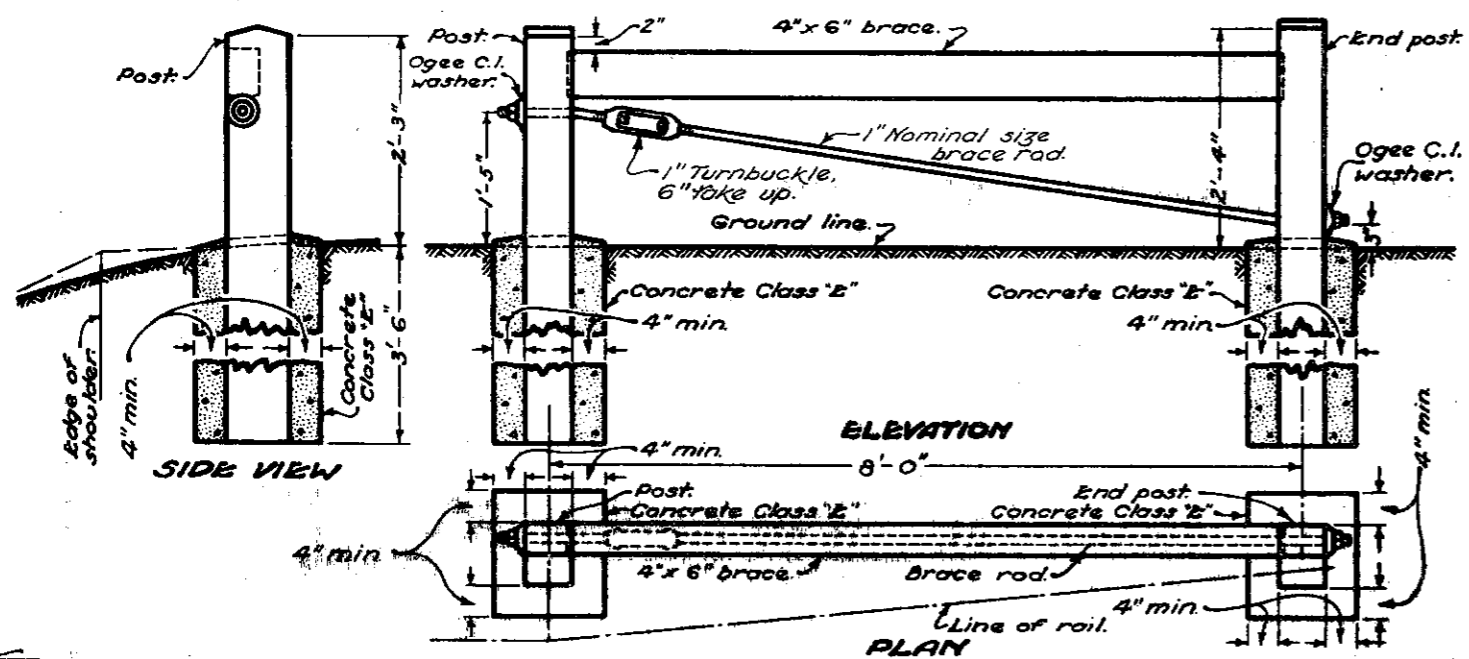
**END ANCHORAGE:** Except for Type 3 or 4, deadmen shall be used for end anchorage unless physical features such as bridges, drives, road intersections, etc., make this impractical, in which case the end anchorage shall be of the bracing type with the two end posts spaced 3 feet on centers. Brace rod or deadman assembly shall develop a tensile strength of at least 50,000 pounds.

**CONCRETE ENCASEMENT:** The two posts at each end of each run of all guard rail shall be encased in concrete. When Type 4 rail is used, the final three posts at each end of each run shall be encased in concrete.

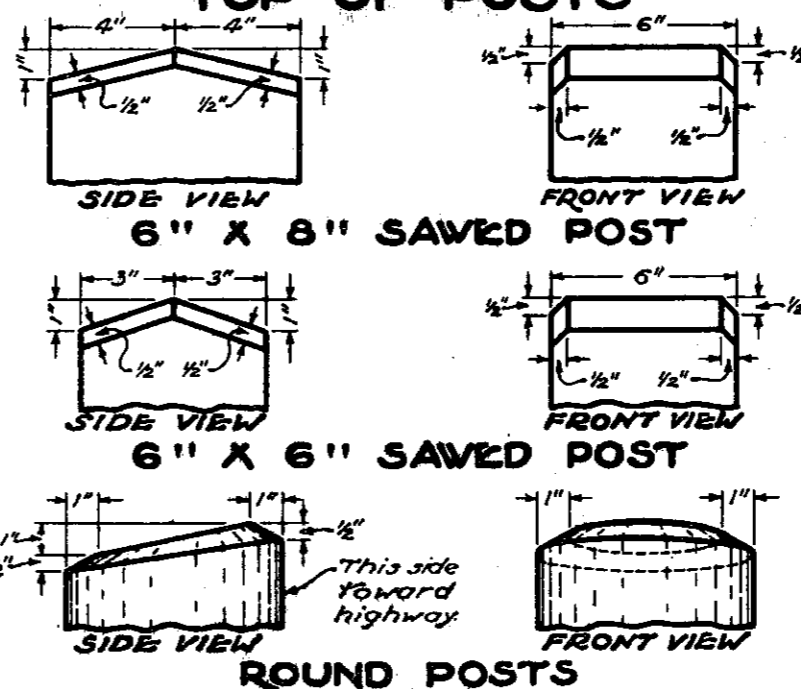
**GUARD POSTS:** The posts shall conform to 606 and shall be spaced 6'-0" center to center unless otherwise indicated on the plans. Wood posts may be either round or square-sawed as dimensioned on this drawing. Concrete encasement is not required. Rail shall be omitted.

**PREFABRICATED POSTS:** Cutting and trimming of post tops set within 1/2" of grade will not be required. Posts shall be fabricated with square ends and should not be longer than specified length plus one inch. Posts that are a part of an anchor assembly shall be set in concrete. All other posts may be set in drilled holes or may be driven to grade.

## TWO END POSTS WITH BRACING



## TOP OF POSTS



BUREAU OF LOCATION AND DESIGN  
OHIO DEPARTMENT OF HIGHWAYS

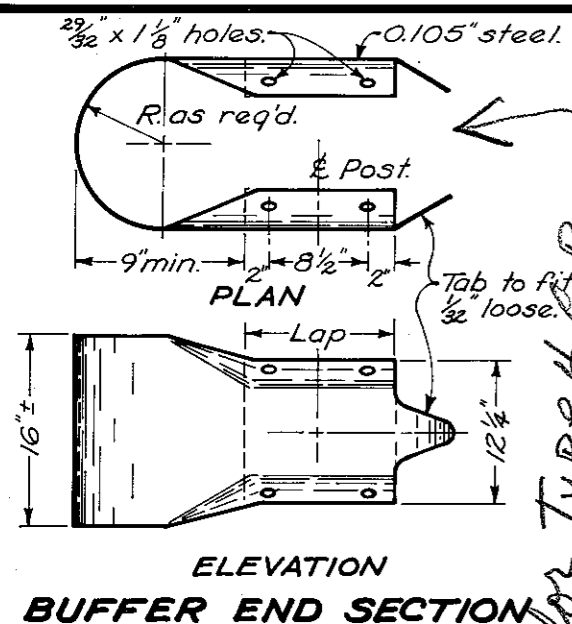
# GUARD RAIL

STANDARD  
CONSTRUCTION  
DRAWING

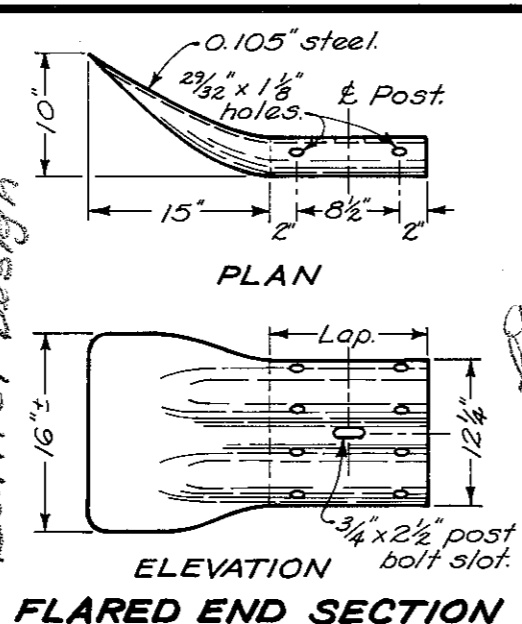
GR-1

APPROVED *R.E. Lathin* ENGR. L & D.

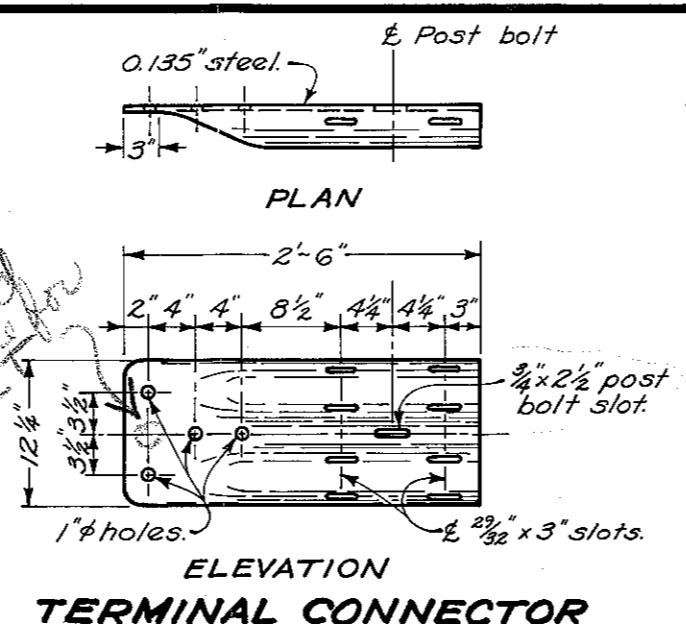
DATE  
6-1-65  
1-1-67



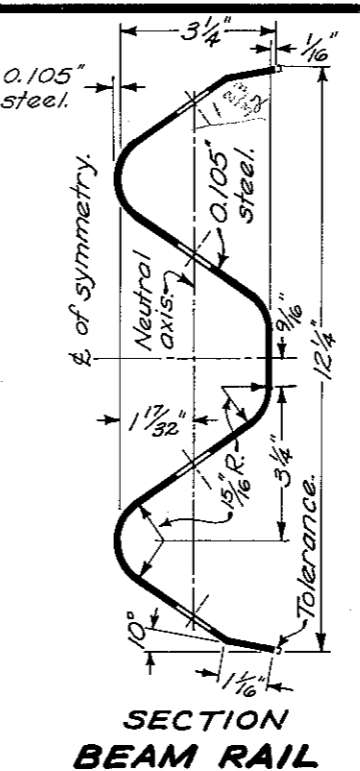
**BUFFER END SECTION**



**FLARED END SECTION**



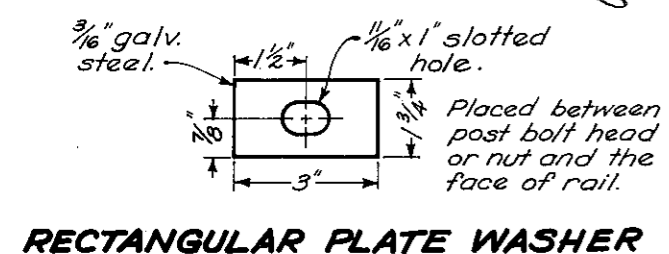
**TERMINAL CONNECTOR**



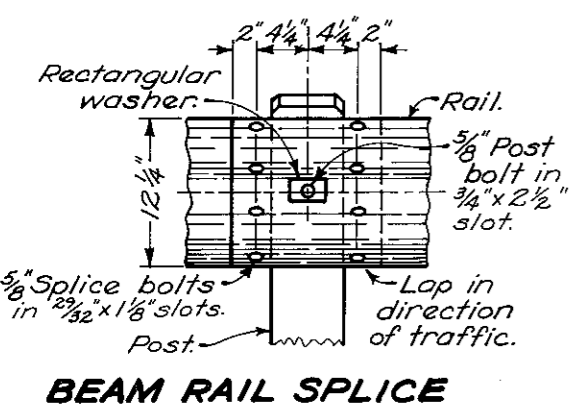
**NOTES**  
**BEAM RAIL ELEMENTS** shall be 12'-6" effective length, unless otherwise specified, with 3/4 x 2 1/2 post bolt slots on 6'-3" centers regardless of post spacing. Field punching or drilling of bolt holes or slots for irregularly spaced posts shall be according to 606.05.  
**BEAM RAIL SPLICE** between two rail elements, or rail and terminal connector shall be lapped in the direction of traffic. The buffer or flared end sections shall lap on the traffic face. A 12" back-up plate shall be provided at intermediate posts not having a rail splice.

**SPECIAL POST MOUNTINGS:** Inlet mounted posts are required for guardrail posts located on a drainage inlet. Footing anchors are required for guardrail posts located on footers with less than 3'-5" cover except that for footer cover of 2'-6" to 3'-5" the posts may be installed by using a 4" minimum concrete encasement. The inlet mounted post may be used for footing anchors in runs with steel posts.  
 Cost of the inlet mounted posts and footing anchors shall be included in the unit price bid for guardrail of the type required by the plan unless paid for separately.

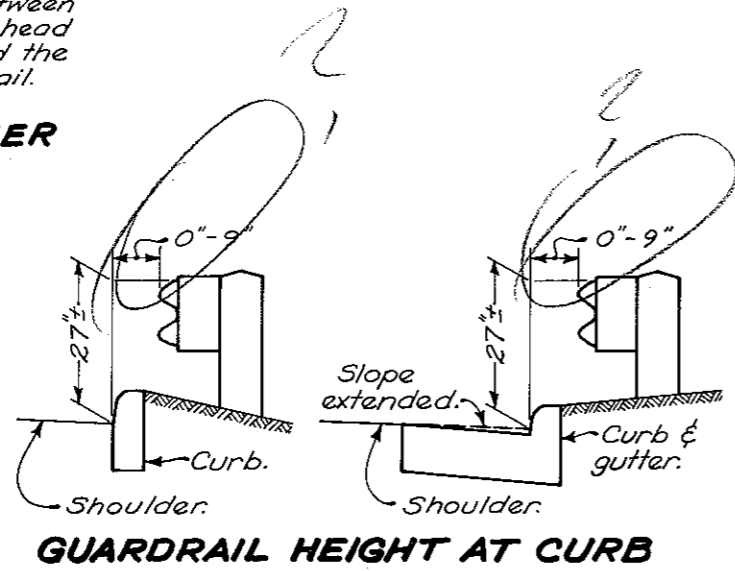
\* Self-drilling anchors conforming to 712.01, or anchors per FF-5-325 Group II, Type 4, Class 1 or 2 with proof load certification per 712.01, may be substituted with the same bolt diameter specified.



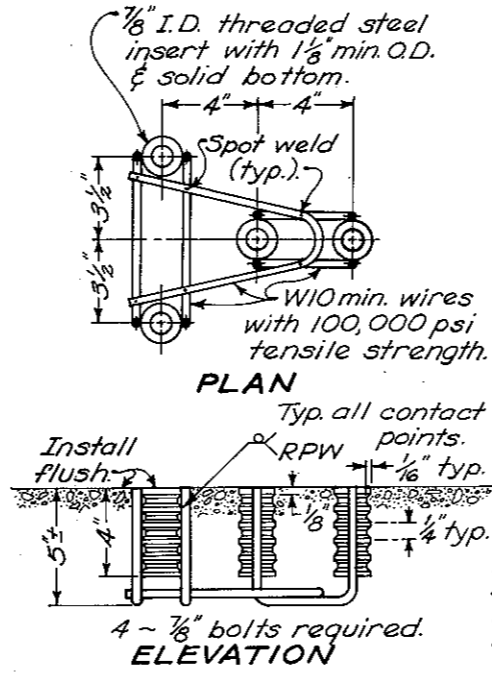
**RECTANGULAR PLATE WASHER**



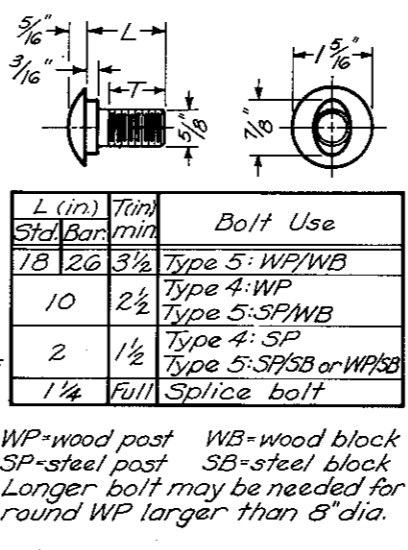
**BEAM RAIL SPLICE**



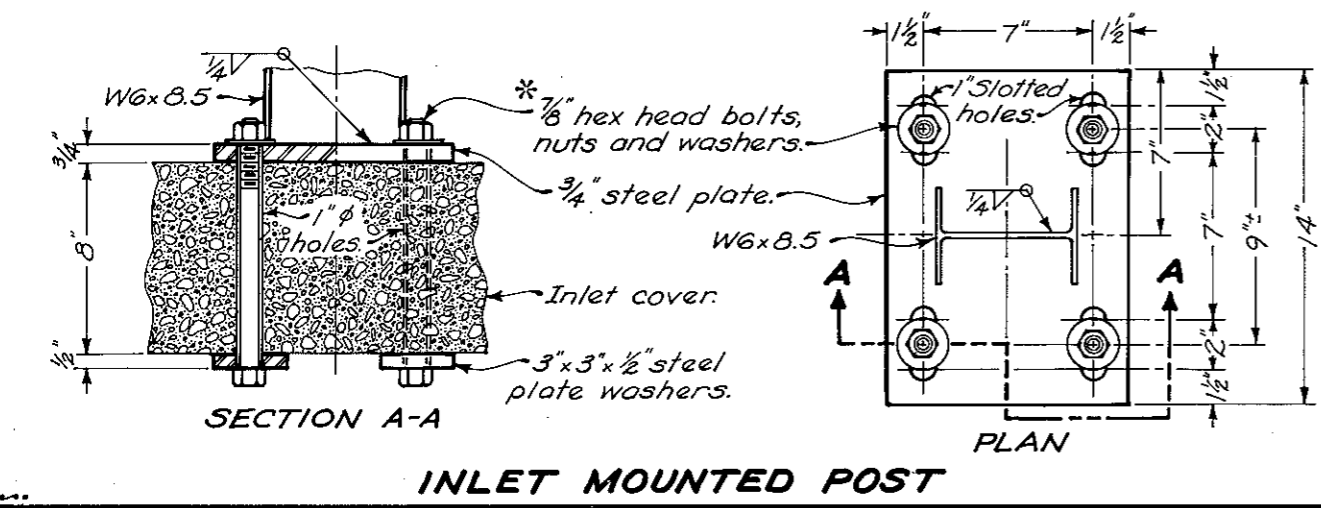
**GUARDRAIL HEIGHT AT CURB**



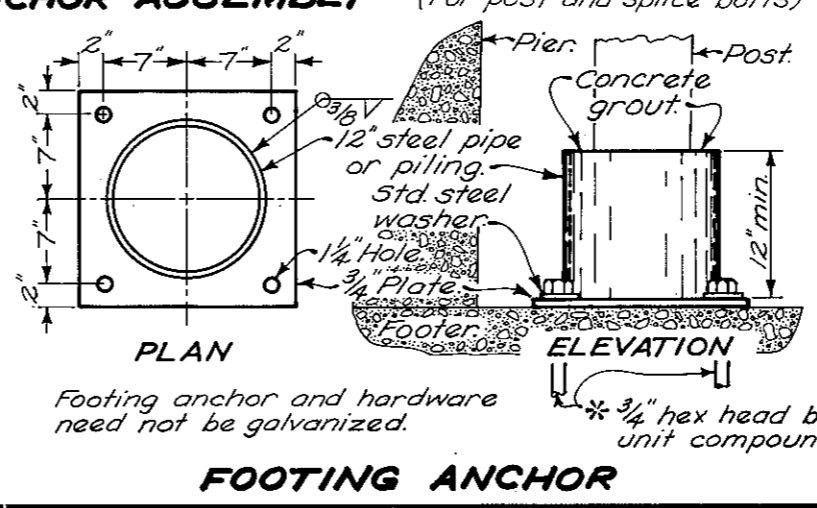
**CONCRETE INSERT ANCHOR ASSEMBLY**



**BUTTON HEAD BOLT**  
 (For post and splice bolts)



**INLET MOUNTED POST**



**FOOTING ANCHOR**

*CWG mentioned that there was some concern about concrete in inlet*

*add 1-76 (76-7)*

BUREAU OF LOCATION AND DESIGN  
 OHIO DEPARTMENT OF TRANSPORTATION

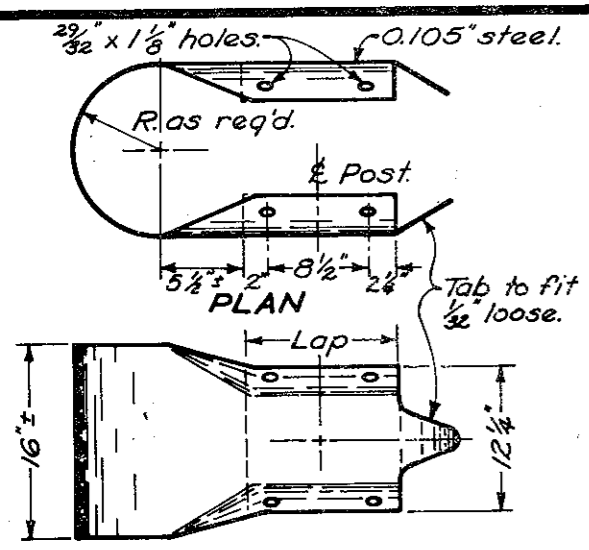
**GUARDRAIL DETAILS**

DATE 12-6-76

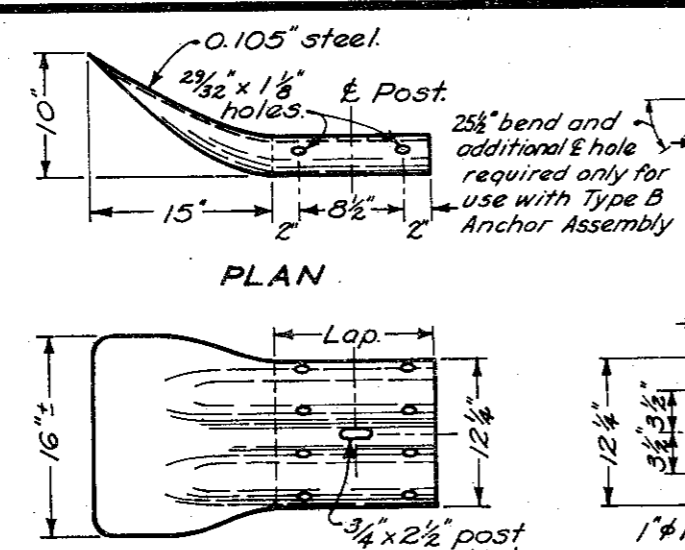
STANDARD CONSTRUCTION DRAWING GR-1

APPROVED *[Signature]* ENGR., L. & D.

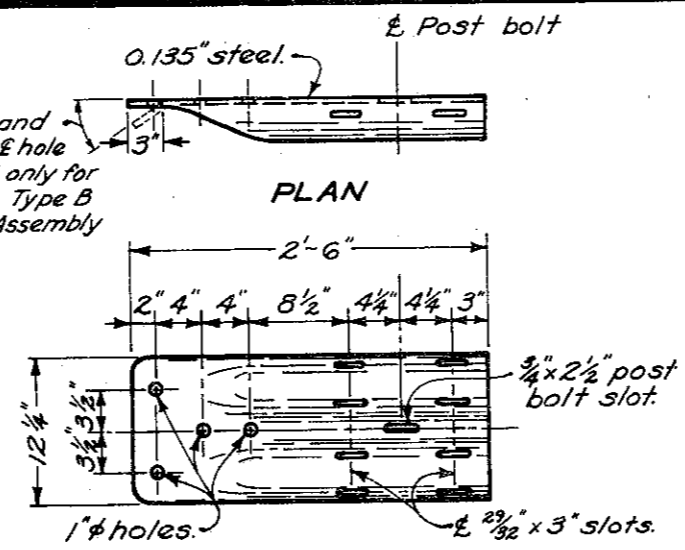
1981?



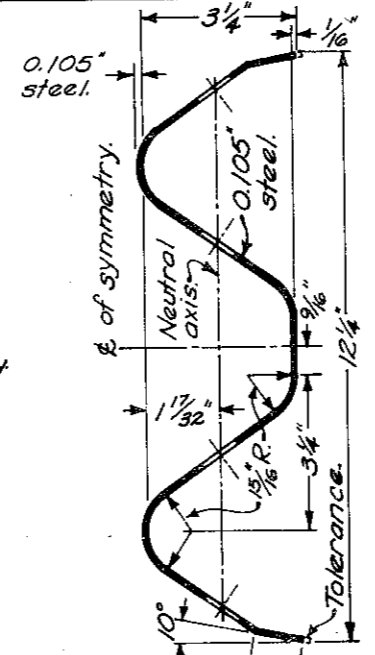
**BUFFER END SECTION**



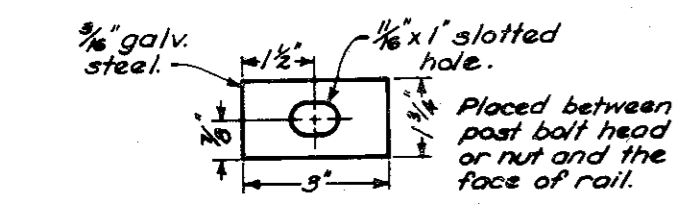
**FLARED END SECTION**



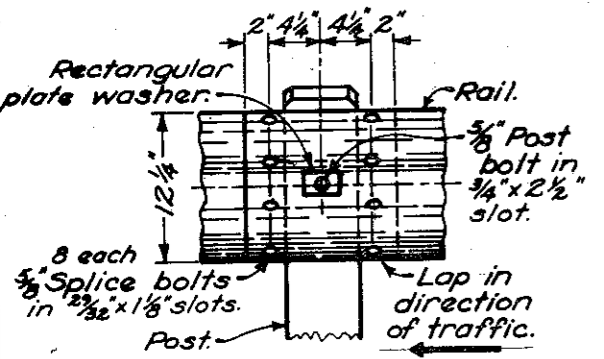
**TERMINAL CONNECTOR**



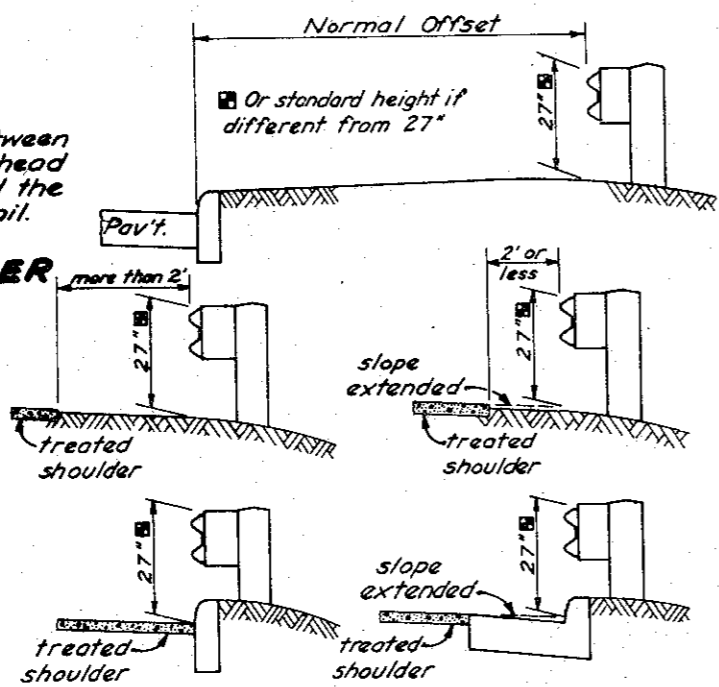
**SECTION BEAM RAIL**



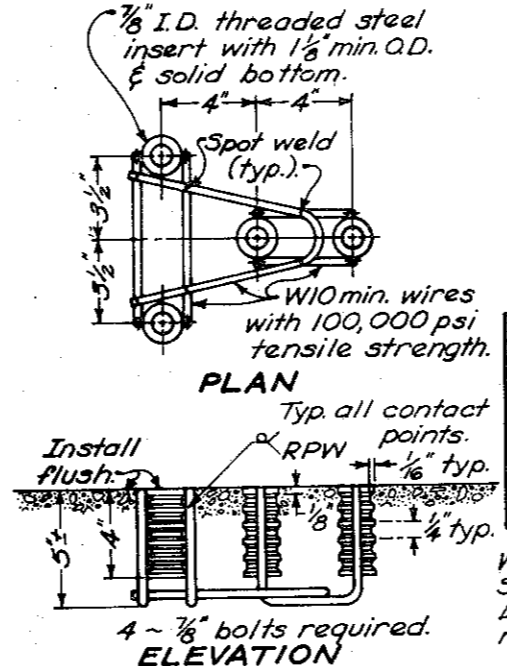
**RECTANGULAR PLATE WASHER**



**BEAM RAIL SPLICE**



**GUARDRAIL HEIGHT**

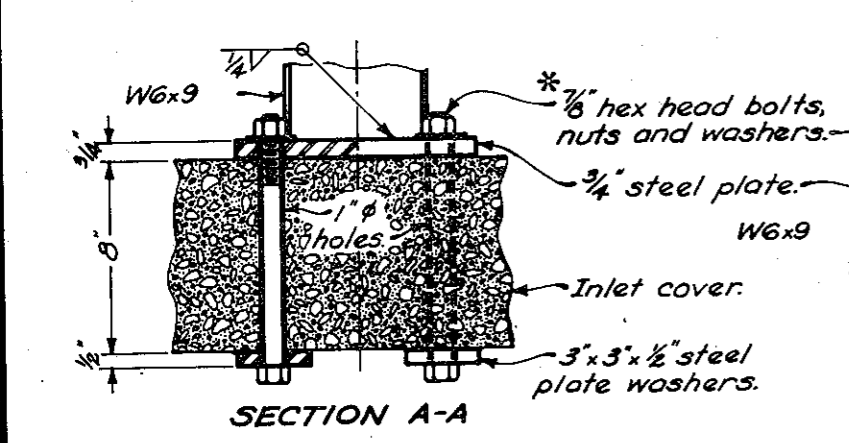


**CONCRETE INSERT ANCHOR ASSEMBLY**

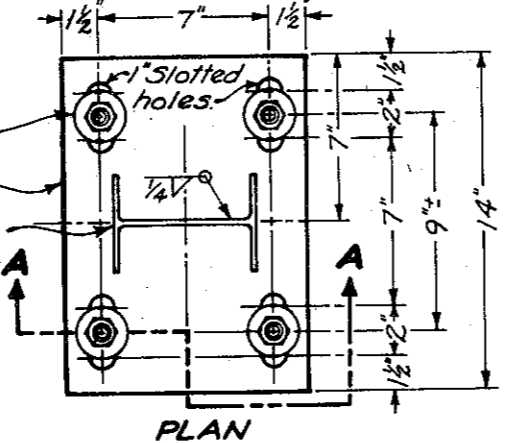
L (in.)	Trim Std. Bar.	Trim min.	Bolt Use
18	2 1/2	3 1/2	Type 5: WP/WB
10	2 1/2	2 1/2	Type 4: WP
2	1 1/2	1 1/2	Type 5: SP/WB
1 1/4	Full	Full	Type 4: SP
			Type 5: SP/SB or WP/SB
			Splice bolt

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

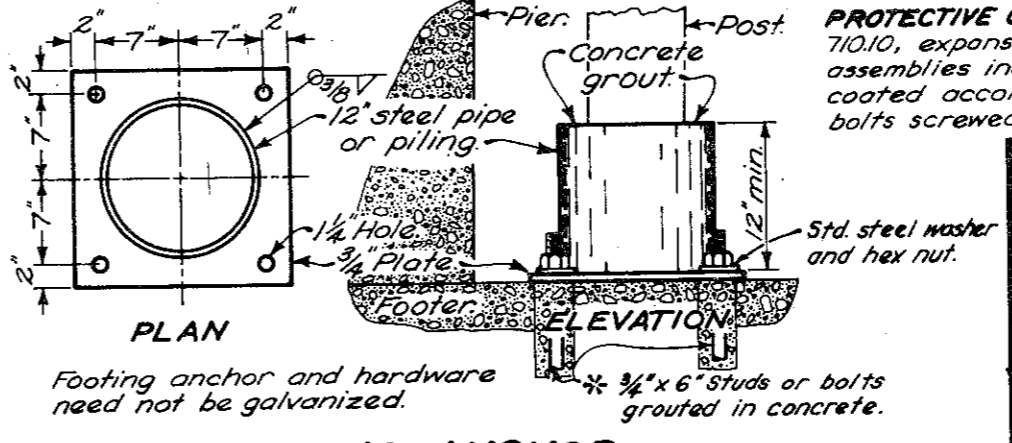
**BUTTON HEAD BOLT**  
(For post and splice bolts)



**INLET MOUNTED POST**



**PLAN**



**FOOTING ANCHOR**

**NOTES**  
BEAM RAIL ELEMENTS shall be 12'-6" effective length, unless otherwise specified, with 3/4 x 2 1/2 post bolt slots on 6'-3" centers regardless of post spacing. Field punching or drilling of bolt holes or slots for irregularly spaced posts shall be according to 606.05.

BEAM RAIL SPLICE between two rail elements, or rail and terminal connector shall be lapped in the direction of traffic. The buffer or flared end sections shall lap on the traffic face. A 12" length of beam rail (Back-Up Plate), with a 3/4 dia. bolt hole or a 3/4 x 2 1/2 slot, shall be provided at posts not having a rail splice.

**SPECIAL POST MOUNTINGS:** Inlet mounted posts are required for guardrail posts located on a drainage inlet. Footing anchors are required for guardrail posts located on footers with less than 3'-5" cover except that for footer cover of 2'-6" to 3'-5" the posts may be installed by using a 4" minimum concrete encasement. The inlet mounted post may be used for footing anchors in runs with steel posts.

When standard post depth is not available due to a culvert, the guardrail posts directly over the culvert shall not be driven, but set in holes with a 4" minimum concrete encasement for the maximum post depth available. Cost of the inlet mounted posts, footing anchors, and concrete encasement shall be included in the unit price bid for guardrail of the type required by the plan.

STEEL POSTS are specified as 9# or 15# but 8.5# and 15.5# sizes respectively may be used.

\* ANCHORS conforming to 712.01, or anchors per FF-5-325 Group II, Type 4, Class 1 or 2 or Group VIII, Type 1 or 2 with proof load certification per 712.01, may be substituted with the same bolt diameter specified. If there is any question of deteriorated concrete, expansion anchors will not be allowed, as determined by the Engineer. Where self-drilling anchors are permitted and used for guardrail construction, the holes shall be drilled with the expansion shield (not by a drill bit) and the shield shall be installed flush with the concrete surface.

The Engineer shall visually inspect, after installation, all expansion anchors used in guardrail construction. The Engineer may require the Contractor to test load any expansion anchor to 1/4 the certified proof load in direct pull. The equipment and method used shall meet the approval of the Engineer. Each expansion anchor that fails to meet the test requirements shall be reset or removed and replaced with bolts extending through the concrete or grouted in place, as directed by the Engineer.

**PROTECTIVE COATING:** In lieu of the requirements of 710.10, expansion shields, anchors and insert anchor assemblies installed (embedded) in concrete may be coated according to good commercial practices. Any bolts screwed into these embedded devices shall meet 710.10.

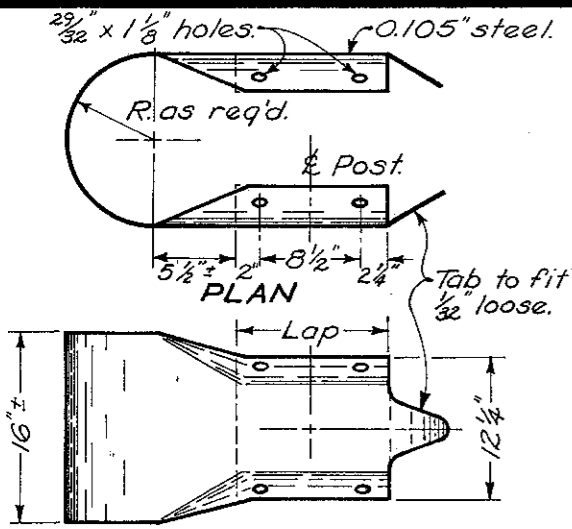
BUREAU OF LOCATION AND DESIGN  
OHIO DEPARTMENT OF TRANSPORTATION

**GUARDRAIL DETAILS**

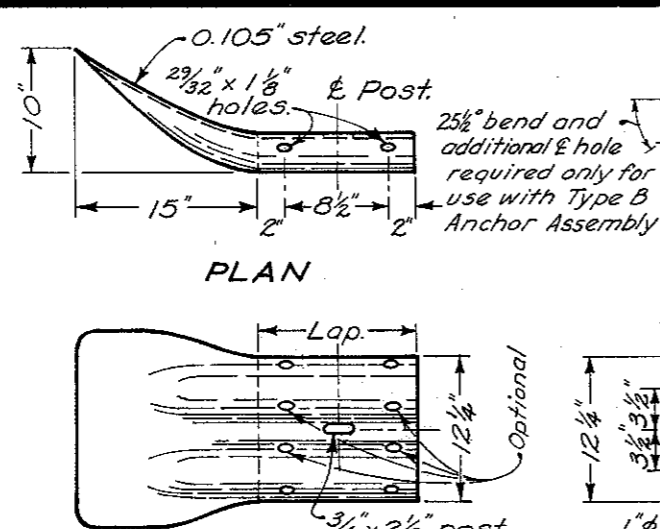
STANDARD CONSTRUCTION DRAWING GR-1

APPROVED [Signature] ENGR. L.S.D.

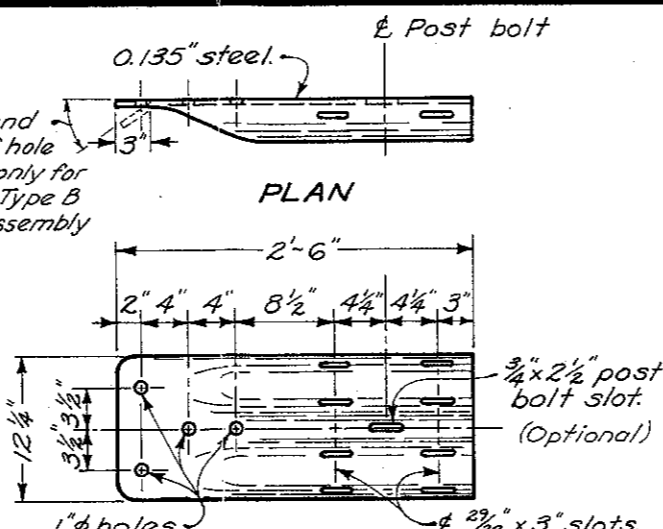
DATE 12-6-76 2-5-82



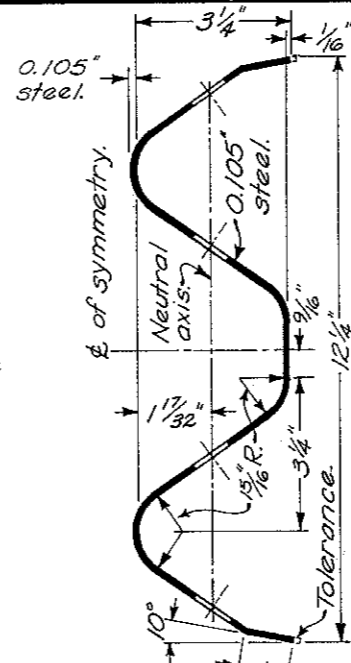
**ELEVATION**  
**BUFFER END SECTION**



**ELEVATION**  
**FLARED END SECTION**



**ELEVATION**  
**TERMINAL CONNECTOR**



**SECTION**  
**BEAM RAIL**

**NOTES**

**BEAM RAIL ELEMENTS** shall be 12'-6" effective length, unless otherwise specified, with 3/4" x 2 1/2" post bolt slots on 6'-3" centers regardless of post spacing. Field punching or drilling of bolt holes or slots for irregularly spaced posts shall be according to 606.05.

**BEAM RAIL SPLICE** between two rail elements, or rail and terminal connector shall be lapped in the direction of traffic. The buffer or flared end sections shall lap on the traffic face. A 12" length of beam rail (Back-Up Plate), with a 3/4" dia. bolt hole or a 3/4" x 2 1/2" slot, shall be provided at posts not having a rail splice.

**SPECIAL POST MOUNTINGS:** Inlet mounted posts are required for guardrail posts located on a drainage inlet. Footing anchors are required for guardrail posts located on footers with less than 3'-5" cover except that for footer cover of 2'-6" to 3'-5" the posts may be installed by using a 4" minimum concrete encasement. The inlet mounted post may be used for footing anchors in runs with steel posts.

When standard post depth is not available due to a culvert, the guardrail posts directly over the culvert shall not be driven, but set in holes with a 4" minimum concrete encasement for the maximum post depth available.

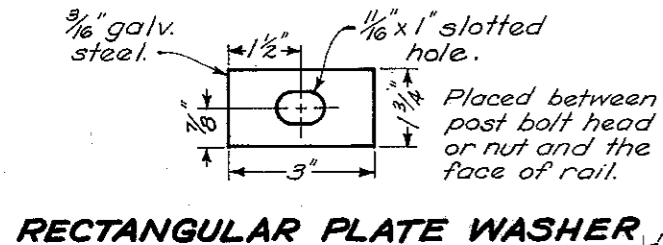
Cost of the inlet mounted posts, footing anchors, and concrete encasement shall be included in the unit price bid for guardrail of the type required by the plan.

**STEEL POST SIZES:** The W6 x 8.5 and W6 x 15.5 posts may be used in lieu of the W6 x 9 and W6 x 15 respectively which are shown on the various Standard Construction Drawings for guardrail.

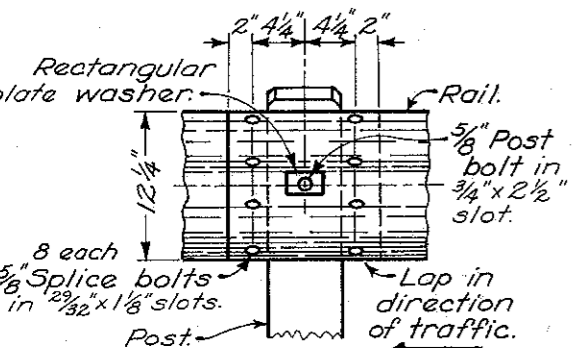
**ANCHORS** conforming to 712.01, or anchors per FF-5-325 Group II, Type 4, Class 1 or 2 or Group VIII, Type 1 or 2 with proof load certification per 712.01, may be substituted with the same bolt diameter specified. If there is any question of deteriorated concrete, expansion anchors will not be allowed, as determined by the Engineer. Where self-drilling anchors are permitted and used for guardrail construction, the holes shall be drilled with the expansion shield (not by a drill bit) and the shield shall be installed flush with the concrete surface.

The Engineer shall visually inspect, after installation, all expansion anchors used in guardrail construction. The Engineer may require the Contractor to test load any expansion anchor to 1/4 the certified proof load in direct pull. The equipment and method used shall meet the approval of the Engineer. Each expansion anchor that fails to meet the test requirements shall be reset or removed and replaced with bolts extending through the concrete or grouted in place, as directed by the Engineer.

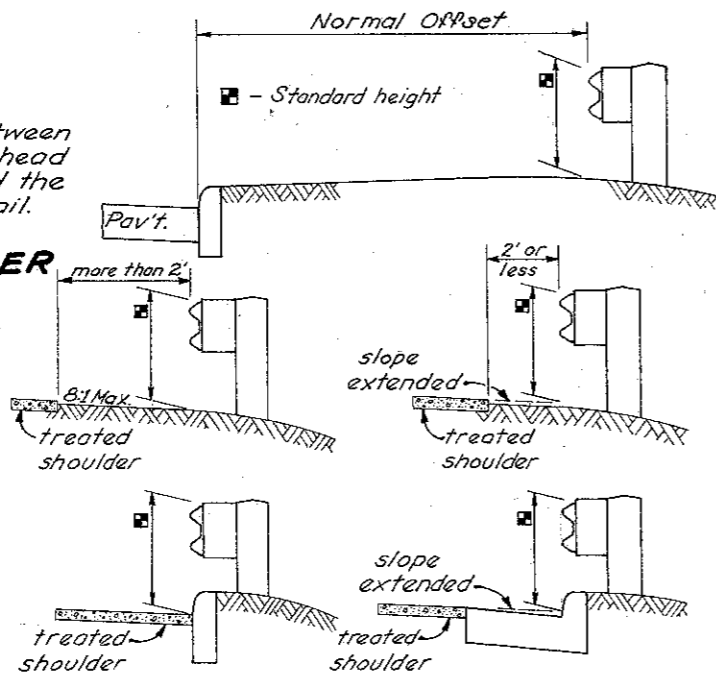
**PROTECTIVE COATING:** In lieu of the requirements of 710.06, expansion shields, anchors and insert anchor assemblies installed (embedded) in concrete may be coated according to good commercial practices. Any bolts screwed into these embedded devices shall meet 710.06.



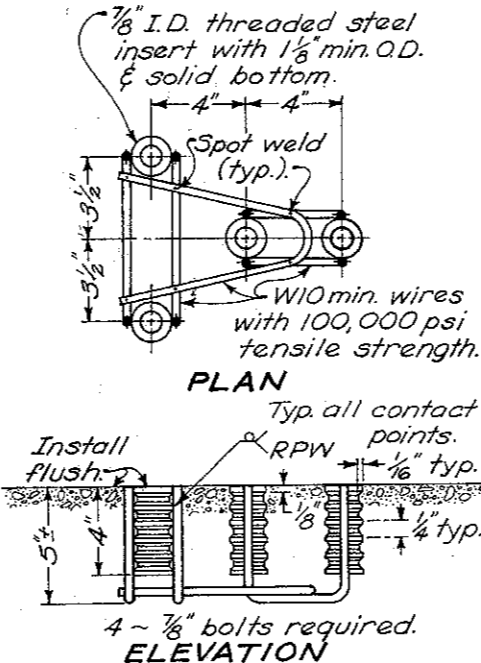
**RECTANGULAR PLATE WASHER**



**BEAM RAIL SPLICE**



**MEASURING GUARDRAIL HEIGHT**

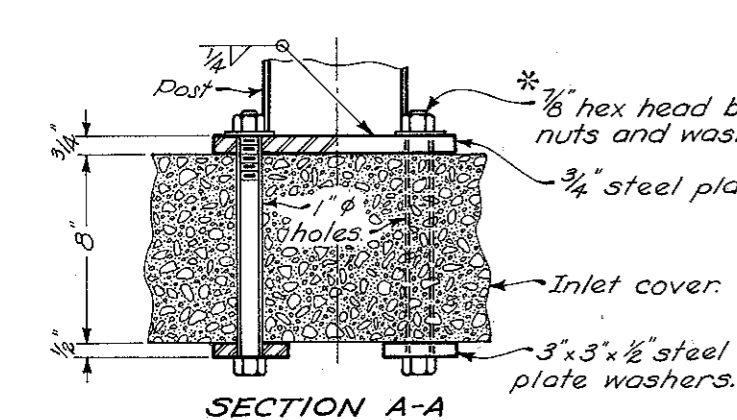


**CONCRETE INSERT ANCHOR ASSEMBLY**

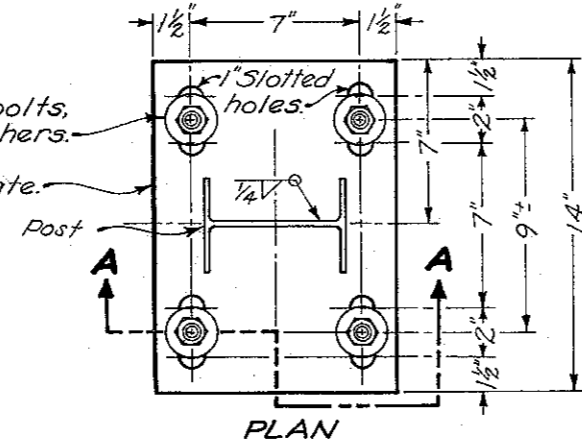
L (in)	T (in)	Bolt Use
18	2 1/2	Type 5: WP/WB
10	2 1/2	Type 4: WP
2	1 1/2	Type 4: SP
1 1/4	Full	Type 5: SP/SB

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

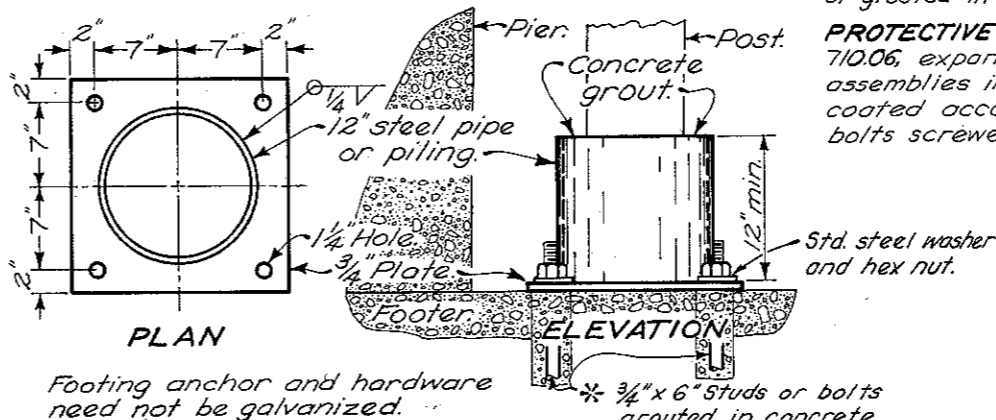
**BUTTON HEAD BOLT**  
(For post and splice bolts)



**SECTION A-A**  
**INLET MOUNTED POST**



**PLAN**



Footing anchor and hardware need not be galvanized.

**PLAN**  
**ELEVATION**  
**FOOTING ANCHOR**

BUREAU OF LOCATION AND DESIGN  
OHIO DEPARTMENT OF TRANSPORTATION

**GUARDRAIL DETAILS**

STANDARD CONSTRUCTION DRAWING  
APPROVED: [Signature] ENGR., L. & D.

DATE  
12-6-76  
2-5-82  
1-11-85

GR-1