GENERAL NOTES

1. The illustrations for guardrail applications are standard configurations; adjustments are to be made as required by site specific conditions to attain optimum design for function, economy and serviceability.

2. The beginning of guardrail need shall be at the greatest of the upstream distances from the hazard, as determined from Figures 1 and 2, and other application details of this Index.

3. One Panel (i.e., panel length) equals 12'–6". Guardrail shall be constructed with rail elements 12'–6" in length except where 25'–0" elements are called for by this and other standards (indexes) or specifically called for in the plans.

   Post spacing shall be 6'–3" except that reduced spacing shall be used for (a) transitions to anchorages at rigid structures such as bridges (See Detail J and Index No. 402) and transitions to redirective crash cushions, (b) the conditions in Note No. 7 below, (c) special post applications, (d) reduced post spacing required for specific end anchorage assemblies, and, (e) specific spacing called for in the plans.

4. Guardrail mounting height for the W–beam without rub rail and for thrie–beam is 1'–9" to the center of beam, and for W–beam with rub rail 2'–0" to center of beam. Modified thrie–beam shall be mounted at a height of 2'–0" to center of beam. The height is critical and shall be attained in all cases; a tolerance of 3" above and 1" below the standard mounting heights is permissible over necessary surface irregularities (e.g., across shoulder gutters, inlets and roadway surface break lines). For guardrail placed on slopes beyond the shoulder point, there shall be no deviation more than 1" below to 3" above the desired height within any 25 foot section of guardrail.

5. All guardrail panels, end sections and special end shoes shall be lapped in the direction of adjacent traffic.

6. Flared end anchorage assemblies providing 4' offset are the standard end treatments for single face free standing guardrail approach ends. Parallel end anchorage assemblies for guardrail approach end treatments will be constructed only when restraints prevent construction of flared end anchorages.

   Guardrail end anchorage assemblies shall be of the type called for in the plans. If the plans call for end anchorage assembly "flared" and does not identify the specific system(s) to be used, the contractor has the option to construct any FDOT approved flared assembly provided in this Index or identified on the Qualified Products List (QPL), subject to the conditions identified in the approved Index drawings, or QPL drawings if applicable.

   If the plans call for end anchorage assembly "parallel" and does not identify the specific system(s) to be used, the contractor has the option to construct any FDOT approved parallel assembly provided in this Index or identified on the QPL, subject to the conditions identified in the approved Index drawings, or QPL drawings if applicable.

   If the plans call for a specific end anchorage assembly, substitutions with other end anchorage assemblies will not be permitted unless approved by the Engineer. Approved substitutions will not be eligible for CSIP consideration.

   When an end treatment is attached to guardrail with Pedestrian Safety Treatment, only end treatment systems with timber posts are to be used.

   Existing approved proprietary end anchorage systems are identified on the Qualified Products List (QPL). After January 1, 2011 – manufacturers seeking approval of new proprietary end anchorage systems for inclusion on the QPL must submit application along with design documentation showing the end anchorage system; is crash tested to Test Level 3 criteria in accordance with the Manual for Assessing Safety Hardware (MASH), is accepted by FHWA for use as a guardrail end anchorage system, and is compatible with FDOT guardrail systems. System approvals will be contingent on FDOT's evaluation of crash test performance results for consistency with FDOT guardrail application and use. If approved, installation drawings signed and sealed by a professional engineer licensed in the State of Florida will be required.

7. At above ground rigid hazards where the face of guardrail is offset from the hazard less than the 4' minimum for standard W–beam, other guardrail configurations with reduced post spacing may be applicable; see General Note No. 11 and the minimum offset table on Sheet 19. For guardrail with post spacing less than 6'–3" the reduced spacing should extend a minimum of one panel in advance of the hazard. When minimum offset cannot be attained safety shape concrete barrier wall shall be used unless other shielding is approved by the Engineer of Record. See Index No. 410 for safety shape concrete barrier walls and typical applications, and the plans for special barrier shapes and applications.

8. In addition to use at roadside hazards or other areas where the Engineer has deemed guardrail necessary, guardrail should be considered on flush shoulder sections where fill slopes are steeper than 1:3 within the clear zone and fill heights are 6' or greater. Curbed sections where fill slopes are steeper than 1:3 and fill heights are 6' or greater within 22' of the traveled way should be evaluated for installation of guardrail. Additional guidance for evaluating the need for guardrail can be found in the Plans Preparation Manual.

9. The guardrail to bridge connections contained in this Index are for bridges with Test Level 4 traffic railing barriers. For guardrail to concrete barrier wall connections see Index No. 410. For existing bridges receiving retrofit traffic railing barriers see Index No. 402.

10. The W–beam guardrail system in this index is the standard system to be used on the State Highway System where a Test Level 3 semi–rigid barrier is required.

11. Thrie–beam guardrail panels shall be used in guardrail transitions to bridge traffic railing barriers, to concrete and certain water filled safety shaped barriers, certain crash cushions and as a continuous barrier when called for in the plans. For additional information on rail attachment, post spacings, nested rails, location of thrie–beam transition panels and offset block configurations see details elsewhere in this Index, and Index Nos. 402, 410 and 414. The use of thrie–beam guardrail with standard offset blocks (Test Level 3 semi–rigid system) may be considered where one or more of the conditions listed below or similar conditions are anticipated or exist:

    a. W–beam deflection is marginal,
    b. W–beam with rub rail considered functionally deficient,
    c. Vehicle overriding W–beam is probable,
    d. Drainage will be impeded or blocked by the use of concrete barrier wall (subject to deflection space requirements),
    e. High frequency of repairs to W–beam,
    f. Spandrel beam with low deflection needed around unrelocatable structure,
    g. Accommodating passenger vehicles heavier or larger than the standard passenger car (e.g., passenger vans and small buses).

    The modified thrie–beam guardrail is a Test Level 4 semi–rigid system and may be used where a Test Level 4 guardrail is required.

12. Single face median guardrail for bridges located on divided roadways shall be constructed the same as outer roadway guardrail under the following conditions:

    a. Wide medians where approach end anchor is located outside of opposing roadway clear zone,
    b. Medians of uniform width that are occupied by other transportation and joint use facilities,
    c. Medians of uniform or variable widths with independent vertical alignments not suited to normal median guardrail installations,
    d. Medians of bifurcated roadways.

13. Straight rail sections may be used to construct radii of 125' or greater. For radii less than 125' the rail must be fabricated (shop–bent) to fit.

14. Crash cushions may be required in lieu of or in conjunction with guardrail at locations where space does not permit development of sufficient guardrail length, offset or crashworthiness at terminals. Crash cushions shall be constructed at or in lieu of Type II assemblies located in the approach clear zones.

15. Corrugated sheet steel beams, end shoes, end sections and backup plates shall conform to the current requirements of AASHTO M180, Class A, Type II (zinc) coating. All other metallic components, hardware and accessories shall be in conformance with the appropriate current AASHTO requirements.

16. Offset blocks:
    a. Steel offset blocks other than modified thrie–beam offset blocks are not permitted for new guardrail construction. Existing steel offset blocks may remain throughout the service life of the existing guardrail. PERMISSIBLE POST AND OFFSET BLOCK COMBINATIONS are tabulated on Sheet 16.
    b. Plastic offset block installations shall be constructed on guardrail outside of approach end anchorage assemblies or any transition system connecting to a rigid or thrie–beam barrier.

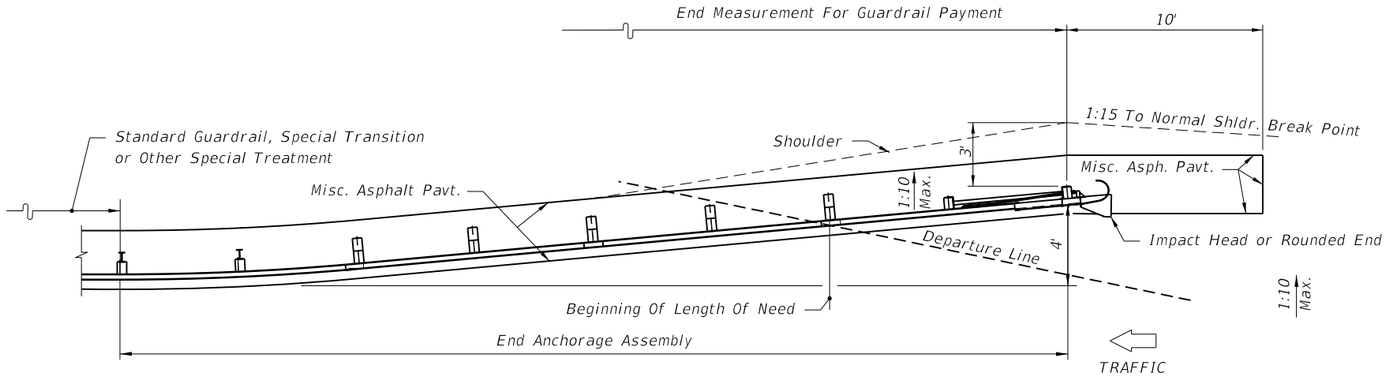
17. Where necessary to enlarge or add holes to galvanized guardrail, the work will be done by drilling or reaming. Damaged galvanized guardrail will be metalized in accordance with Sections 562 and 971 of the Standard Specifications. No burning of holes will be permitted.

18. For barrier delineators see detail M.

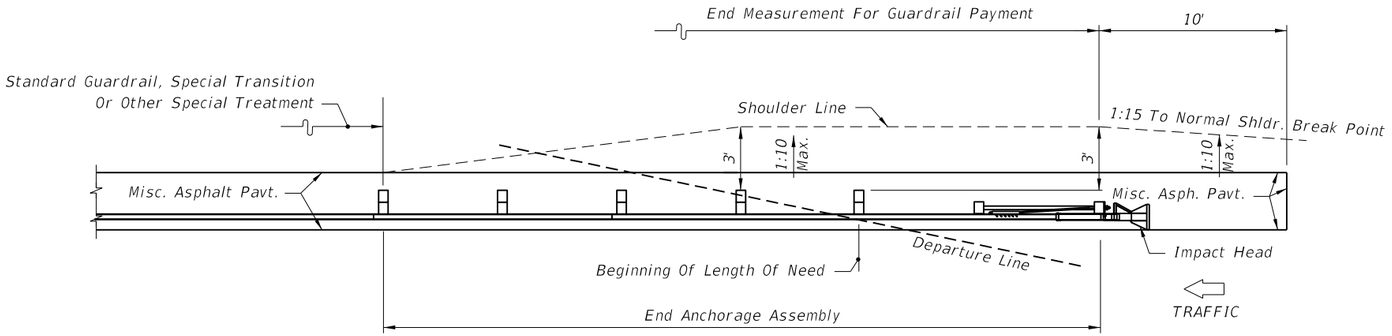
19. Any run of guardrail with existing concrete posts that is being reset under a construction or maintenance contract shall be reset using timber or steel posts. Repair within a run of guardrail with existing concrete posts can be made with either steel, timber, sound salvaged concrete posts; replacement in kind of damaged posts is to be made when like posts are on hand at time of repair.

20. Substitutions between thrie–beam guardrail and concrete barrier wall are not eligible for CSIP consideration.

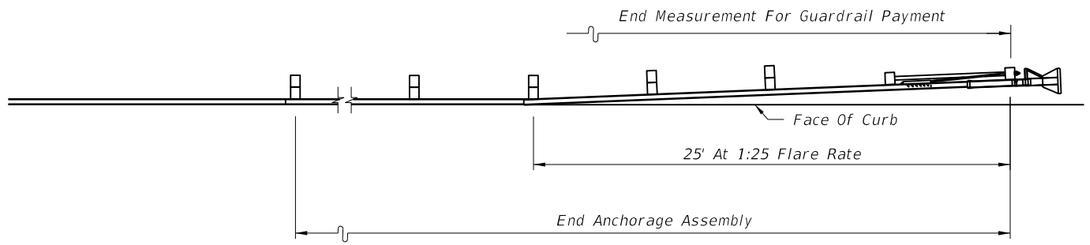
21. On roadways designated for reverse laning, all downstream ends of guardrail that are not shielded or that are not designed as approach end terminals shall be marked with post–mounted Type 3 Object Markers. Trailing bridge ends and trailing shoulder concrete barrier wall ends shall be marked with Type 3 Object Markers except where there is trailing end guardrail. Object markers to be installed facing reverse laning traffic. The cost of the object marker shall be included in the cost of the guardrail.



FLARED OPTION



PARALLEL OPTION



PLACEMENT OF PARALLEL OPTION AT CURBED LOCATIONS

GENERAL NOTES

1. These drawings are representative of the various proprietary guardrail end anchorage assemblies listed on the Department's Qualified Products List (QPL). For specific details and requirements see the vendor drawings on the QPL at

   www.dot.state.fl.us/specificationsoffice/

2. These drawings present the general graphics to show the limits of payment for guardrail and end anchorage assemblies, modifications to the shoulder and placement of the miscellaneous asphalt mow strips.

3. These drawings, along with the various vendor drawings on the QPL, are intended to show sufficient details for installation of the end anchorage assemblies and their connection to shoulder guardrail. This precludes the requirement for shop drawing submittals unless otherwise called for in the plans. The various end anchorage assemblies shall be assembled in accordance with the manufacturer's detailed drawings, procedures and specifications.

4. The various proprietary end treatments listed on the QPL are intended for use as approach end guardrail anchorages for shoulder guardrail. The effective length of the end treatments vary–refer to the vendor drawings on the QPL for the length and the use of special panels and details. Standard guardrail, guardrail transitions or other special treatments shall not be included within the limits of the end anchorage assembly. See the vendor drawings for the alignment of the end treatment with respect to the normal guardrail alignment.

5. Flared or parallel end anchorage assemblies shall not be used in medians where horizontal clearance requires use of a back rail.

6. Each of the various end anchorage assemblies have unique features. Careful attention should be given to the types and orientation of the posts and other components. Refer to the vendor drawings on the QPL for the specific requirements of each system.

7. For galvanizing requirements of the metallic components see Standard Specifications Section 967.

8. Test Level 3 crash tested end anchorage assemblies shown on the QPL are suitable for all design speeds.

9. Flared end anchorage assemblies shall be paid for under the contract unit price for Guardrail, End Anchorage Assembly (Flared), EA.

   Parallel end anchorage assemblies shall be paid for under the contract unit price for Guardrail, End Anchorage Assembly (Parallel), EA.

   The unit price for end anchorage assemblies shall be full compensation for furnishing and installing all components in accordance with the plans, the manufacturer's detail drawings, procedures and specifications and these drawings.

APPROACH END ANCHORAGE DETAILS

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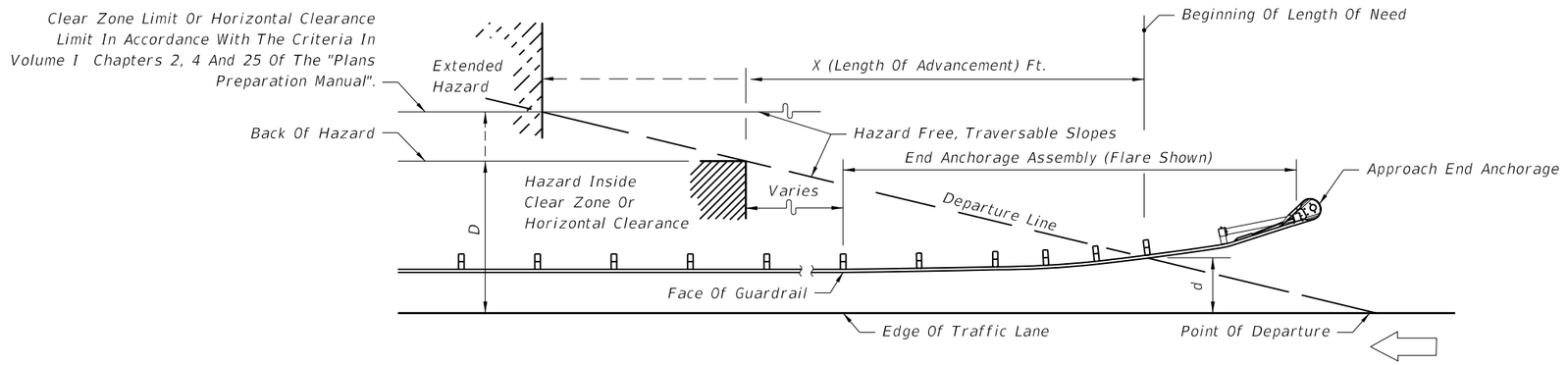


Design Speed mph	X (Length Of Advancement) Ft. (See NOTES 1 & 2)
≤ 45	= 16 (D–d)
≥ 50	= 13 (D–d)

NOTES

1. Length of advancement determined from the diagram and equations above establishes the location of the upstream beginning length of need for guardrail, however, the length of advancement can be no less than that required by other details of this index.

2. The flared end anchorage with 4' nose offset is shown in the diagram above, however, the diagram applies to other configurations that may occur at the beginning of length of need, such as, other flare designs; upstream returns; and, other upstream deflected, tangent and curvilinear conditions.

Equation Variables:

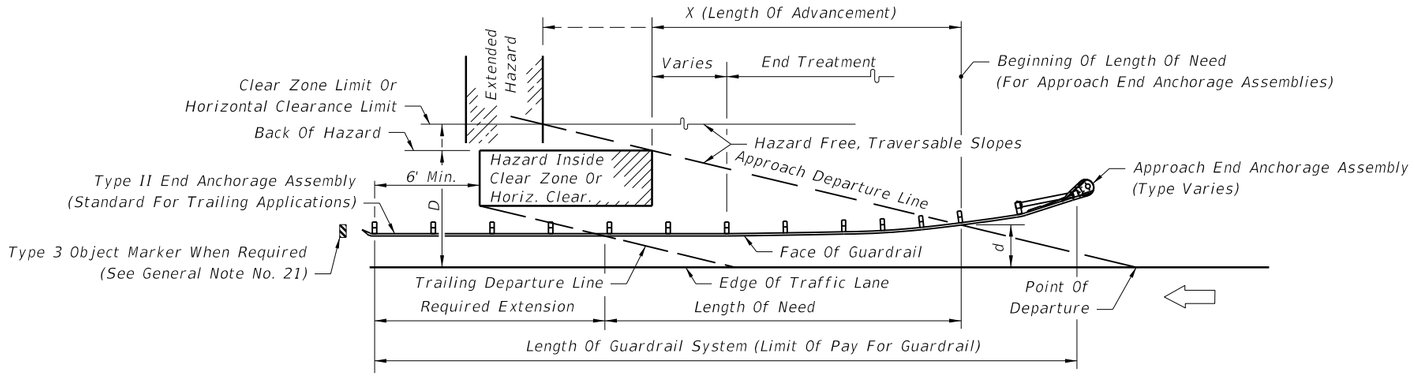
D = Distance in feet from near edge of the near approach traffic lane to either (a) the back of hazard, when the hazard is located inside the clear zone or horizontal clearance or (b) the clear zone or horizontal clearance outer limit, when the hazard extends to or goes beyond the clear zone or horizontal clearance limit. For left side hazards on two-way undivided facilities, D is measured from the inside edge of the near approach traffic lane (see Figure 2).

d = Distance in feet from the near edge of the near approach traffic lane to the face of guardrail at its intersection with the departure line. For left side hazards on two-way undivided facilities, d is measured from the inside edge of the near approach traffic lane (see Figure 2).

For flared and parallel end anchorage assemblies the beginning length of need is to be set at the center of post #3. That is, the departure line must intersect the face of the rail at post #3.

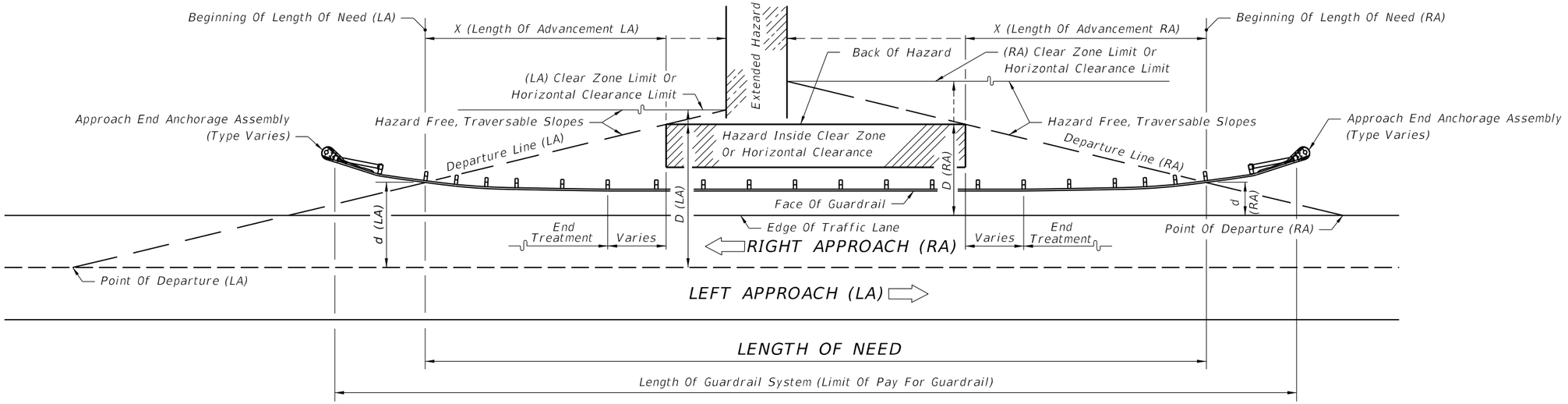
For flared end anchorage assemblies the offset distance "d" will equal the normal guardrail offset measured from the face of the guardrail to the edge of the near approach travel lane plus 1'-2" for 45 mph or less and 1'-9¼" for greater than 45 mph.

LENGTH OF ADVANCEMENT - FIGURE 1



(LEFT SIDE OPPOSITE HAND)

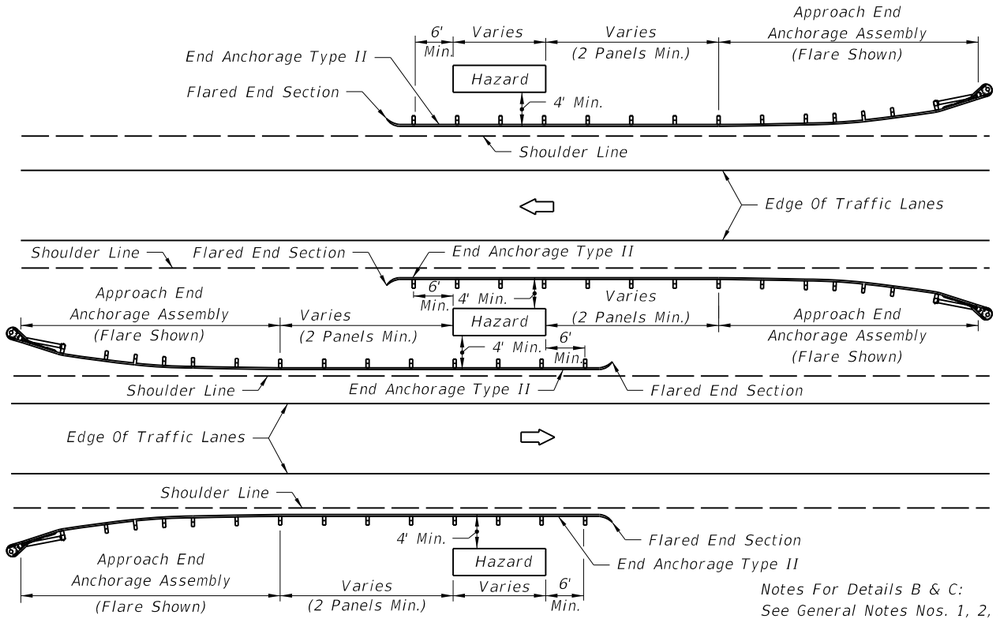
ONE-WAY TRAFFIC



TWO-LANE TWO-WAY TRAFFIC

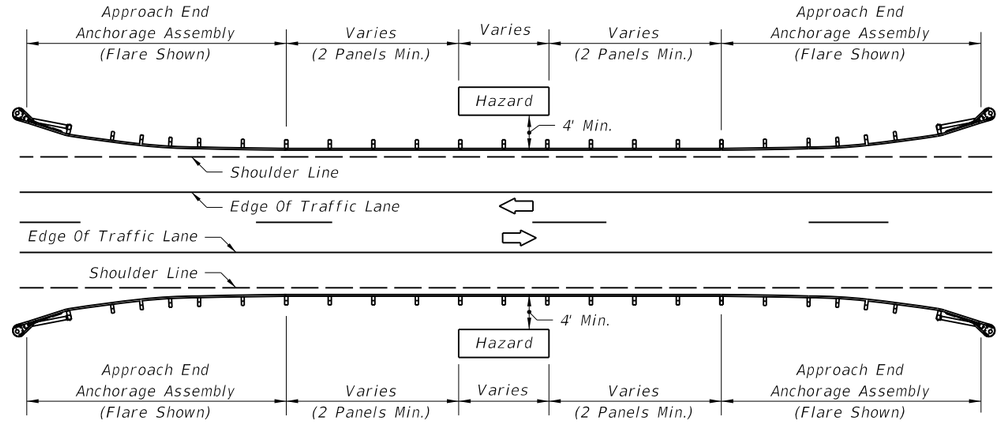
For description of the dimensions D, d and X, see Length of Advancement - Figure 1.
For additional shoulder guardrail information, see Details B and C.

LOCATING TERMINALS ON SHOULDER GUARDRAILS - FIGURE 2



Median Guardrail Applications Shown Are For Locations Where Approach End Anchorage Assemblies Are Outside Of The Opposing Roadway Clear Zone.

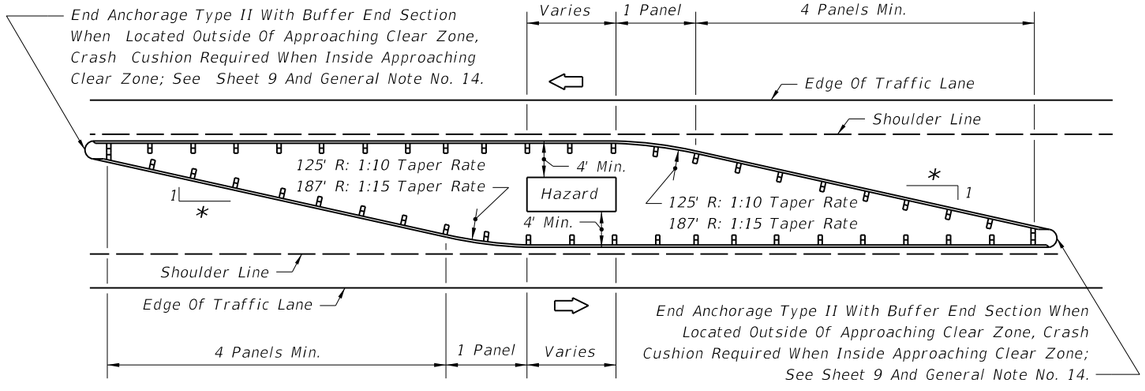
DIVIDED ROADWAY- DETAIL B



UNDIVIDED ROADWAY- DETAIL C

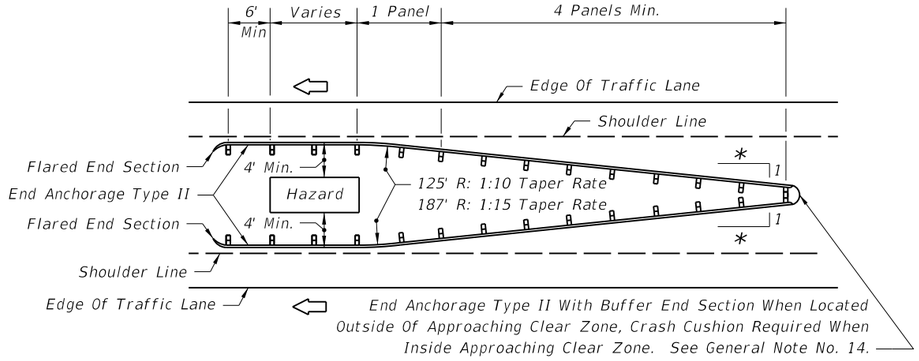
Notes For Details B & C:
See General Notes Nos. 1, 2, 3, 4, 5, 6, 7 and 8.
See Details K and L for guardrail offsets.
For end anchorage assemblies see sheets elsewhere in this Index and the plans.
For hazards that require shielding and are located back of curb see other sheets of this index, and where rigid barrier is required see Index No. 410.

GUARDRAIL APPLICATION FOR ROADSIDE HAZARDS



This Guardrail Configuration Applies Where Approach End Anchorage Assemblies Cannot be Located Outside Of The Opposing Roadway Clear Zone.

OPPOSING TRAFFIC- DETAIL D



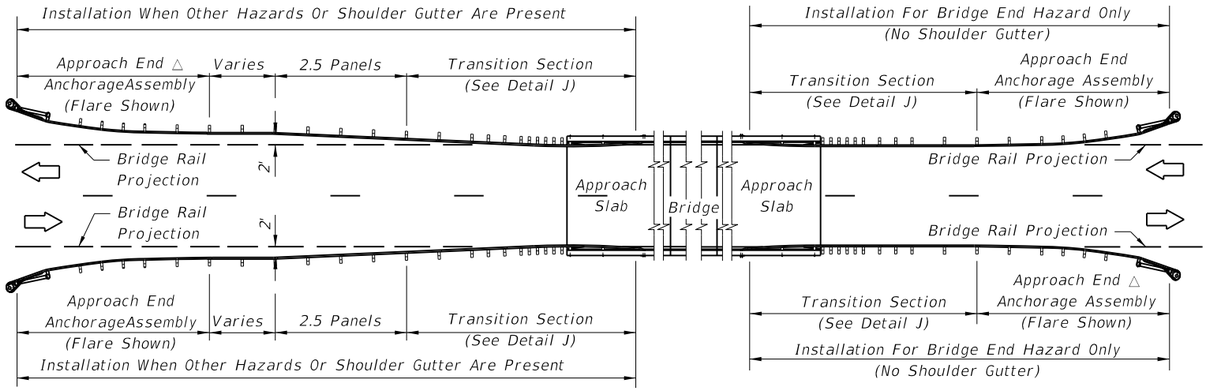
ONE-WAY TRAFFIC- DETAIL G

* 1:10 Taper Rate For Design Speeds ≤45 mph
1:15 Taper Rate For Design Speeds ≥50 mph

Notes For Details D & G:
See General Notes Nos. 1, 2, 3, 4, 5, 7, and 14.
See Details K and L for guardrail offsets.
For hazards that require shielding and are located back of curb see other sheets of this index, and where rigid barrier is required see Index No. 410.

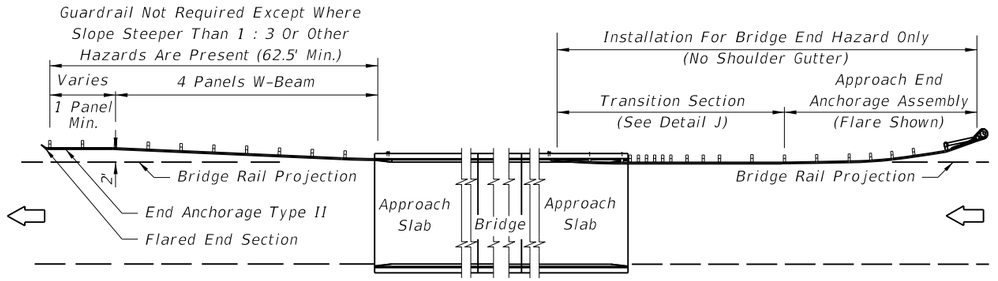
GUARDRAIL APPLICATION FOR NARROW MEDIAN AND GORE HAZARDS

LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/05			FDOT 2014 DESIGN STANDARDS	GUARDRAIL	400	5 of 26

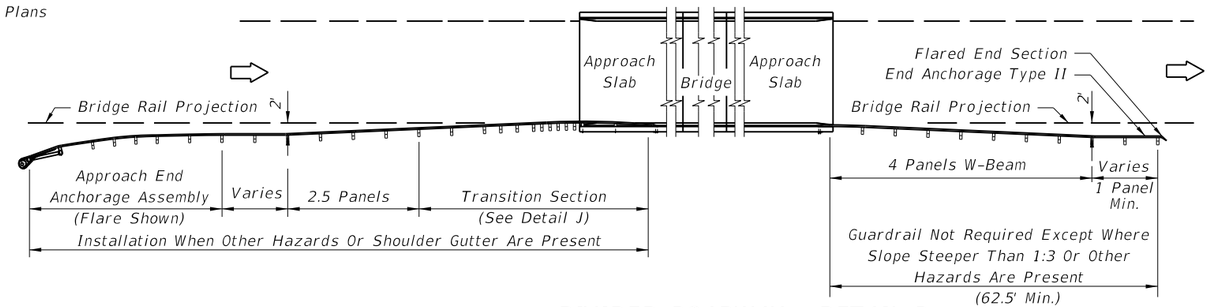


△ With Four Or More Lanes Trailing Guardrail Anchorages May Be As Shown In Detail P Unless Other Anchorage Called Out In The Plans

UNDIVIDED ROADWAY - DETAIL O



For Median Guardrail See Sheets 8 & 9 And General Note 12.



DIVIDED ROADWAY - DETAIL P

Notes For Details O & P:
See General Notes Nos. 1, 2, 3, 4, 5, 6, 8 and 9. See Detail J for approach connections to bridges.
For end anchorage assemblies see sheets elsewhere in this Index and the plans.
Shoulder gutter in itself does not require the installation of guardrail.

GUARDRAIL APPLICATIONS FOR BRIDGES WITH FULL WIDTH SHOULDERS AND SAFETY SHAPE TRAFFIC RAILING BARRIER EXTENDING FULL LENGTH OF APPROACH SLAB

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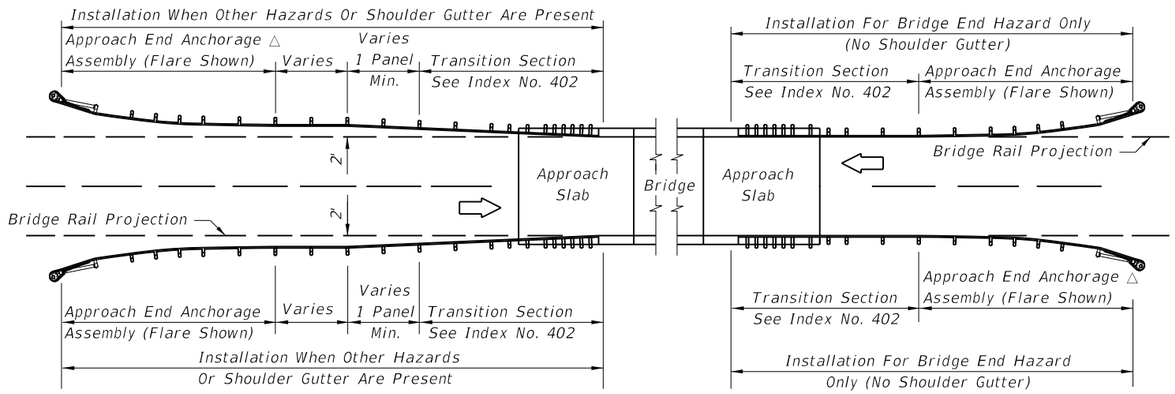
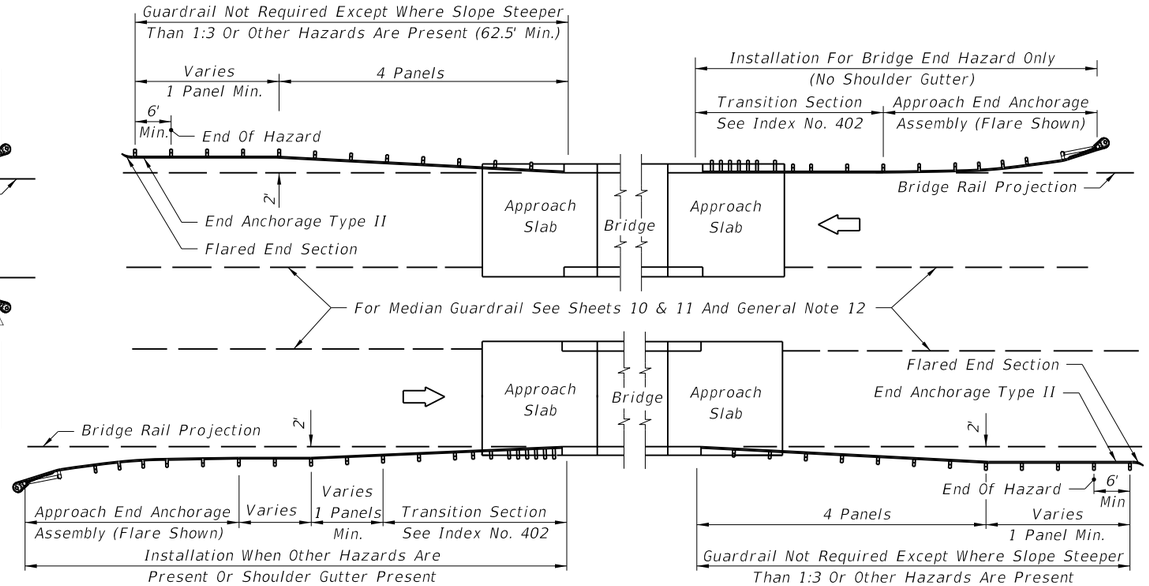
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/13			FDOT 2014 DESIGN STANDARDS	GUARDRAIL	400	6 of 26



△ With Four Or More Lanes Trailing Guardrail Anchorages May Be As Shown In Detail I Unless Other Anchorage Called Out In The Plans

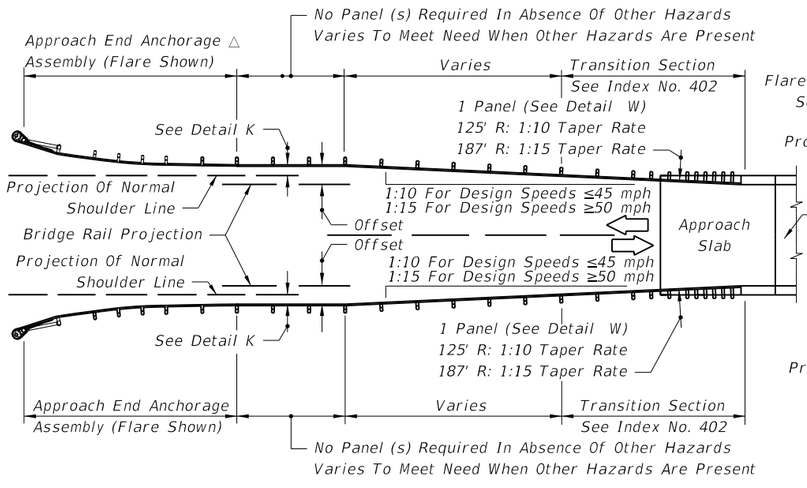
UNDIVIDED ROADWAY - DETAIL H



DIVIDED ROADWAY - DETAIL I

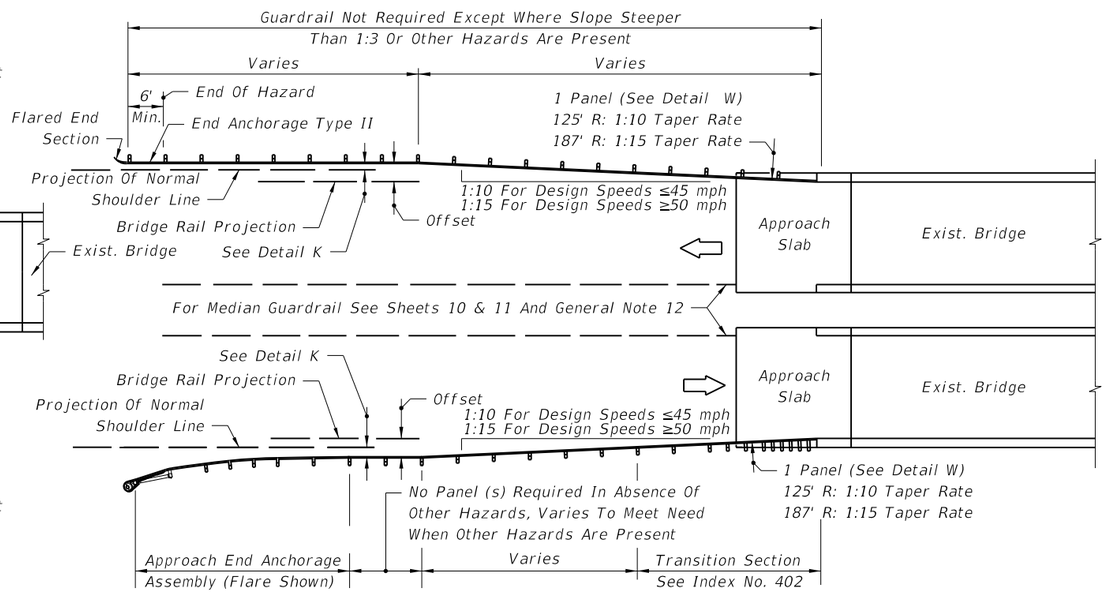
Notes For Details H & I:
See General Notes Nos. 1, 2, 3, 4, 5, 6, 8, and 9. See Index No. 402 for approach connections to bridges.
For end anchorage assemblies see sheets elsewhere in this Index and in the plans.
Shoulder gutter in itself does not require the installation of guardrail.

GUARDRAIL APPLICATIONS FOR BRIDGES WITH FULL WIDTH SHOULDERS AND SAFETY SHAPE TRAFFIC RAILING BARRIER EXTENDING LESS THAN FULL APPROACH SLAB LENGTH



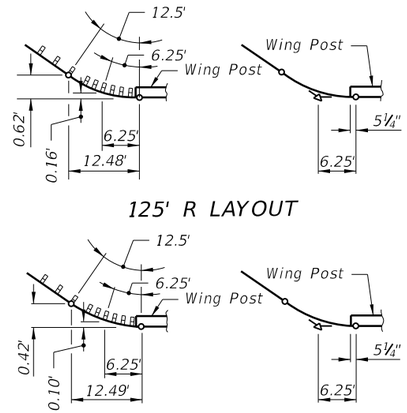
△ With Four Or More Lanes Trailing Guardrail Anchorages May Be As Shown In Detail I Unless Other Anchorage Called Out In The Plans

UNDIVIDED ROADWAY - DETAIL S



DIVIDED ROADWAY - DETAIL T

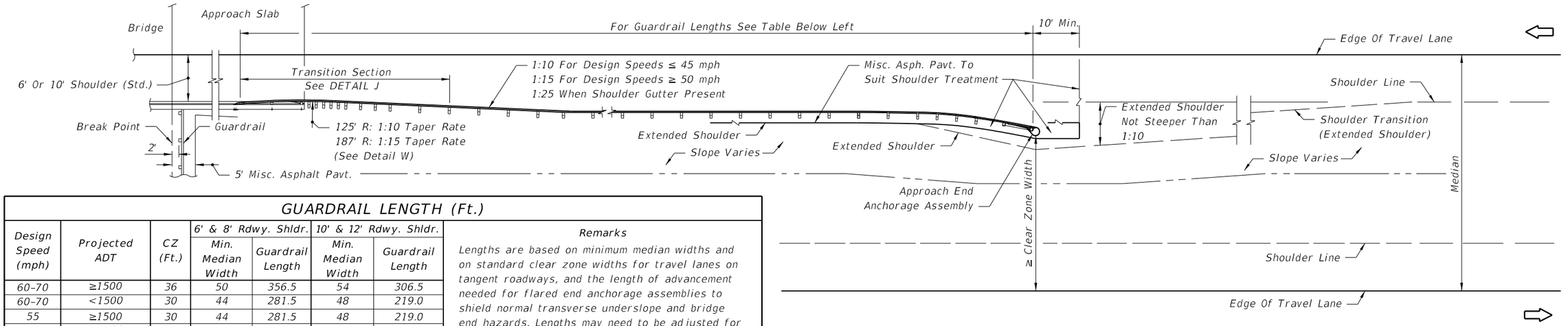
Notes for Details S & T:
See General Notes Nos. 1, 2, 3, 4, 5, 6, 8 and 9. See Index No. 402 for approach connections to bridges.
For end anchorage assemblies see sheets elsewhere in this Index and the plans.



See General Note No. 13

STANDARD PANELS SET TO RADIALS ADJOINING BRIDGES DETAIL W

GUARDRAIL APPLICATIONS FOR BRIDGES WITH LESS THAN FULL WIDTH SHOULDERS AND SAFETY SHAPE TRAFFIC RAILING BARRIER EXTENDING LESS THAN FULL APPROACH SLAB LENGTH



GUARDRAIL LENGTH (Ft.)

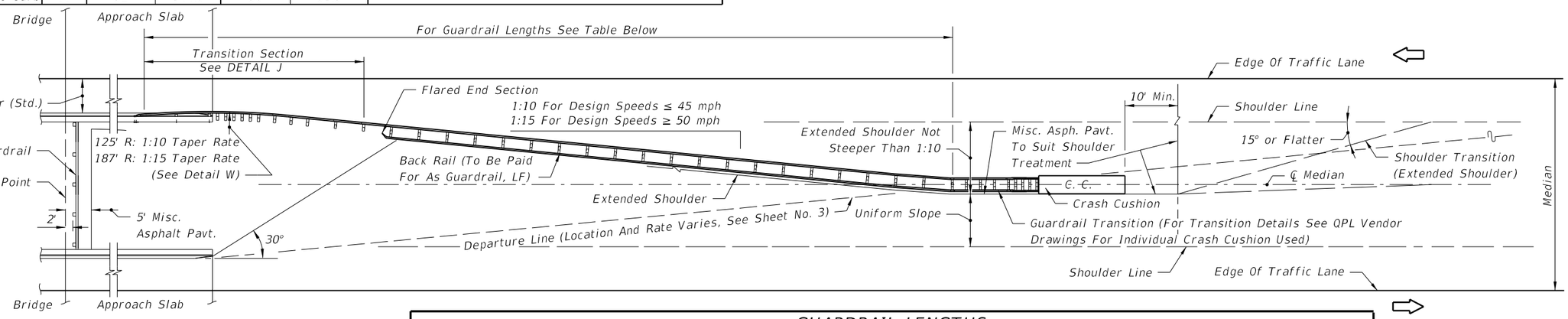
Design Speed (mph)	Projected ADT	CZ (Ft.)	6' & 8' Rdwy. Shldr. Min. Median Width	6' & 8' Rdwy. Shldr. Guardrail Length	10' & 12' Rdwy. Shldr. Min. Median Width	10' & 12' Rdwy. Shldr. Guardrail Length
60-70	≥1500	36	50	356.5	54	306.5
60-70	<1500	30	44	281.5	48	219.0
55	≥1500	30	44	281.5	48	219.0
55	<1500	24	38	194.0	42	144.0
45-50	≥1500	24	38	194.0	42	144.0
45-50	<1500	20	34	144.0	38	94.0
45-50	Urban w/o Curb	24	38	194.0	42	144.0
35-40	Urban w/o Curb	18	32	144.0	36	81.5

Remarks

Lengths are based on minimum median widths and on standard clear zone widths for travel lanes on tangent roadways, and the length of advancement needed for flared end anchorage assemblies to shield normal transverse underslope and bridge end hazards. Lengths may need to be adjusted for auxiliary lanes, curved roadways, parallel end anchorage assemblies, skewed crossings and other hazards present.

Note: For approach end anchorage assemblies see sheets elsewhere in this Index and the plans.

WHEN END TERMINAL IS OUTSIDE OF OPPOSING ROADWAY CLEAR ZONE



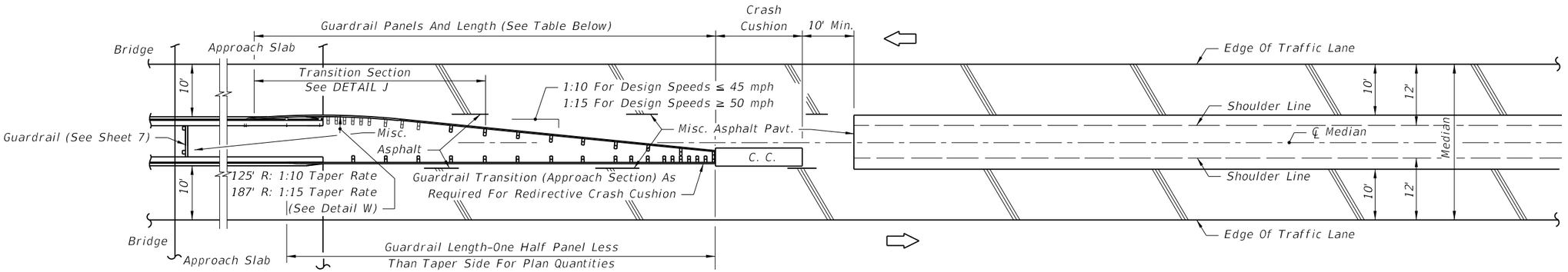
GUARDRAIL LENGTHS

Median Width (Ft.)	1:10 TAPER RATE								1:15 TAPER RATE							
	6' Bridge Shoulder				10' Bridge Shoulder				6' Bridge Shoulder				10' Bridge Shoulder			
	Panels (No.)			Length (Ft.)	Panels (No.)			Length (Ft.)	Panels (No.)			Length (Ft.)	Panels (No.)			Length (Ft.)
	Front	Back	Total	Total	Front	Back	Total	Total	Front	Back	Total	Total	Front	Back	Total	Total
32	9.5	6	15.5	193.75	6.5	4	10.5	131.25	13.5	10	23.5	293.75	8.5	6	14.5	181.25
34	10.5	7	17.5	218.75	7.5	5	12.5	156.25	14.5	11	25.5	318.75	9.5	7	16.5	206.25
36	10.5	7	17.5	218.75	7.5	5	12.5	156.25	15.5	12	27.5	343.75	10.5	8	18.5	231.25
38	11.5	8	19.5	243.75	8.5	6	14.5	181.25	16.5	13	29.5	368.75	11.5	9	20.5	256.25
40	12.5	9	21.5	268.75	9.5	6	15.5	193.75	17.5	13	30.5	381.25	13.5	11	24.5	306.25
42	13.5	9	22.5	281.25	10.5	7	17.5	218.75	19.5	15	34.5	431.25	14.5	11	25.5	318.75
44	14.5	10	24.5	306.25	10.5	7	17.5	218.75	20.5	16	36.5	456.25	15.5	12	27.5	343.75
46	14.5	10	24.5	306.25	11.5	8	19.5	243.75	21.5	17	38.5	481.25	16.5	13	29.5	368.75
48	15.5	11	26.5	331.25	12.5	9	21.5	268.75	22.5	17	39.5	493.75	17.5	13	30.5	381.25

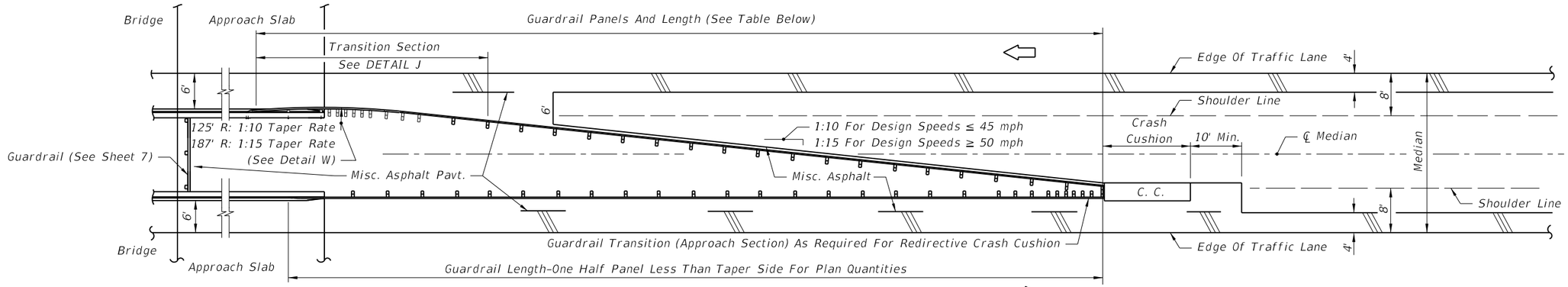
The lengths shown on this table are typical for roadways with standard width shoulders. Length requirements shall be determined on a site specific basis for both standard width and narrow bridge shoulders and end anchorage or end shielding use.

WHEN END TERMINAL CANNOT BE LOCATED OUTSIDE OF OPPOSING ROADWAY CLEAR ZONE

APPROACH GUARDRAIL TREATMENTS FOR BRIDGES WITH SAFETY SHAPE TRAFFIC RAILING EXTENDING FULL APPROACH SLAB LENGTH IN WIDE MEDIANS WITH FLUSH SHOULDERS

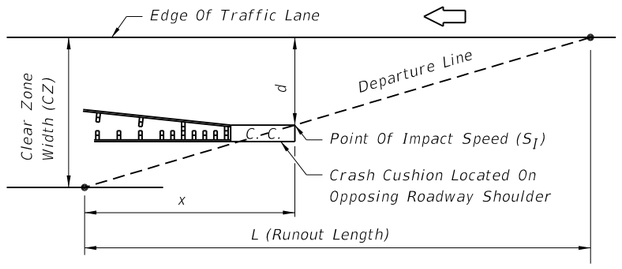


MEDIANS WITH 10' BRIDGE SHOULDERS



MEDIANS WITH 6' BRIDGE SHOULDERS

Note: The guardrail configurations shown apply only to parallel or near parallel bridges with open medians.



Speed (S_I) For Determining Crash Cushion Size:

$$S_I = \frac{x}{L}\,(\text{Design Speed}) = \left\lceil \frac{(CZ-d)}{CZ} \right\rceil \text{Design Speed}$$

SIZING CRASH CUSHIONS LOCATED ON OPPOSING ROADWAY SHOULDERS

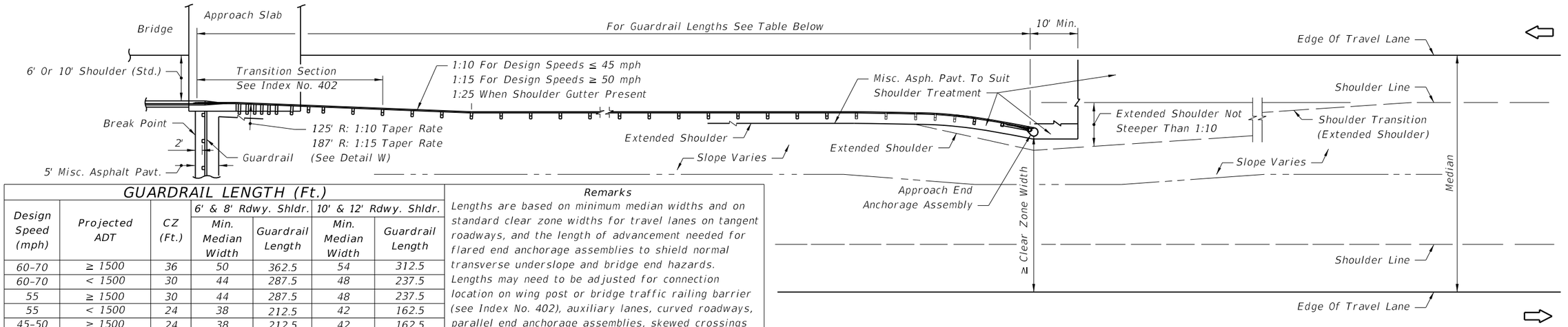
GUARDRAIL LENGTHS

MEDIAN WIDTH (Ft.)	6' BRIDGE SHOULDERS				10' BRIDGE SHOULDERS			
	1:10 TAPER RATE		1:15 TAPER RATE		1:10 TAPER RATE		1:15 TAPER RATE	
	PANELS (No.)	LENGTH (Ft.)	PANELS (No.)	LENGTH (Ft.)	PANELS (No.)	LENGTH (Ft.)	PANELS (No.)	LENGTH (Ft.)
30	14.5	181.25	20.5	256.25	7.5	93.75	10.5	131.25
28	12.5	156.25	18.5	231.25	6.5	81.25	8.5	106.25
26	11.5	143.75	15.5	193.75	5.5*	68.75	6.5	81.25
24	9.5	118.75	13.5	168.75	5.5*	68.75	5.5*	68.75

The lengths shown in this table are based on standard widths for roadway and bridge median shoulders. Length requirements for both standard width and narrow bridge shoulders and end anchorage or end shielding requirements shall be determined on a site specific basis. When crash cushions are required on opposing roadway shoulders, their sizes may be determined by the residual speeds (S_I's) along the runouts from the approach roadways; however, when calculated speeds (S_I's) are less than 30 mph; crash cushions shall be no less in size than for 30 mph, see speed diagram left. The number of panels may be reduced when installing a crash cushion more than 2.5' in width, see * below.

* Number shown is the minimum number of panels plus a W-Thrie beam transition panel; single faced guardrail must have a length of five (5) or more panels.

APPROACH GUARDRAIL TREATMENTS FOR BRIDGES WITH SAFETY SHAPE TRAFFIC RAILING EXTENDING FULL APPROACH SLAB LENGTH IN NARROW MEDIANS WITH FLUSH SHOULDERS



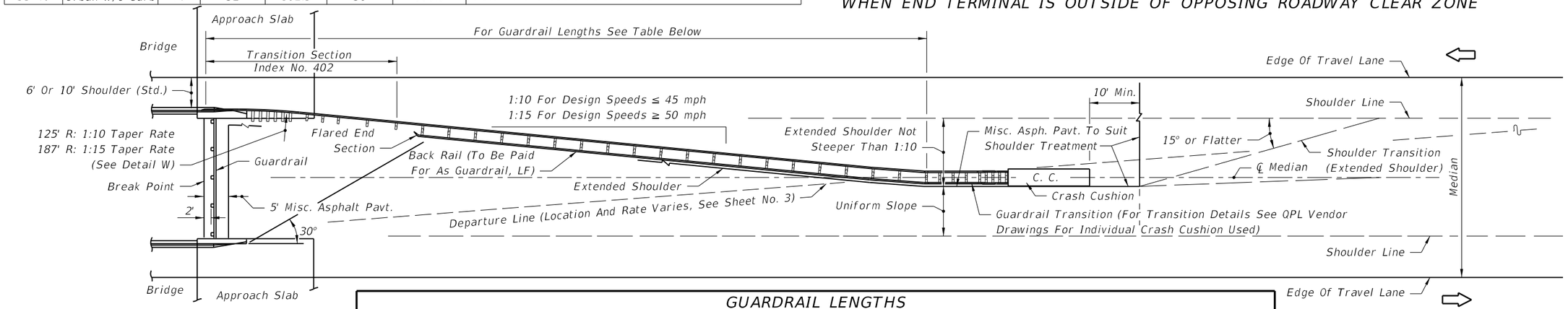
GUARDRAIL LENGTH (Ft.)						
Design Speed (mph)	Projected ADT	CZ (Ft.)	6' & 8' Rdwy. Shldr.		10' & 12' Rdwy. Shldr.	
			Min. Median Width	Guardrail Length	Min. Median Width	Guardrail Length
60–70	≥ 1500	36	50	362.5	54	312.5
60–70	< 1500	30	44	287.5	48	237.5
55	≥ 1500	30	44	287.5	48	237.5
55	< 1500	24	38	212.5	42	162.5
45–50	≥ 1500	24	38	212.5	42	162.5
45–50	< 1500	20	34	162.5	38	112.5
45–50	Urban w/o Curb	24	38	212.5	42	162.5
35–40	Urban w/o Curb	18	32	162.5	36	100.0

Remarks

Lengths are based on minimum median widths and on standard clear zone widths for travel lanes on tangent roadways, and the length of advancement needed for flared end anchorage assemblies to shield normal transverse underslope and bridge end hazards. Lengths may need to be adjusted for connection location on wing post or bridge traffic railing barrier (see Index No. 402), auxiliary lanes, curved roadways, parallel end anchorage assemblies, skewed crossings and other hazards present. When the wing post is replaced by bridge traffic railing barrier, reference Detail J and see Index No. 402.

Note: For approach end anchorage assemblies see sheets elsewhere in this Index and the plans.

WHEN END TERMINAL IS OUTSIDE OF OPPOSING ROADWAY CLEAR ZONE

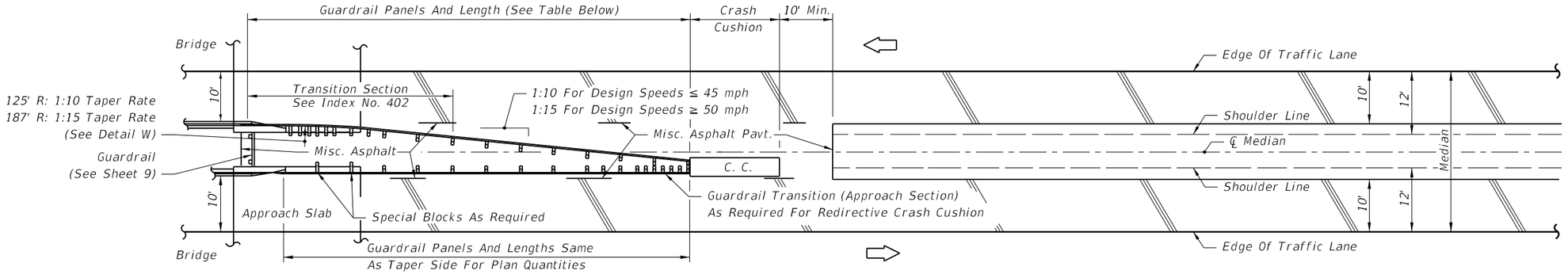


GUARDRAIL LENGTHS																
Median Width (ft.)	1:10 TAPER RATE								1:15 TAPER RATE							
	6' Bridge Shoulder				10' Bridge Shoulder				6' Bridge Shoulder				10' Bridge Shoulder			
	Panels (No.)			Length (Ft.)	Panels (No.)			Length (Ft.)	Panels (No.)			Length (Ft.)	Panels (No.)			Length (Ft.)
	Front	Back	Total	Total	Front	Back	Total	Total	Front	Back	Total	Total	Front	Back	Total	Total
32	7.5	6	13.5	168.75	4.5	3	7.5	93.75	11.5	9	20.5	256.25	7.5	6	13.5	168.75
34	8.5	6	14.5	181.25	5.5	4	9.5	118.75	12.5	10	22.5	281.25	7.5	6	13.5	168.75
36	9.5	7	16.5	206.25	6.5	5	11.5	143.75	13.5	11	24.5	306.25	8.5	7	15.5	193.75
38	10.5	8	18.5	231.25	7.5	6	13.5	168.75	14.5	12	26.5	331.25	10.5	9	19.5	243.75
40	10.5	8	18.5	231.25	7.5	6	13.5	168.75	16.5	13	29.5	368.75	11.5	9	20.5	256.25
42	11.5	8	19.5	243.75	8.5	6	14.5	181.25	17.5	14	31.5	393.75	12.5	10	22.5	281.25
44	12.5	9	21.5	268.75	9.5	7	16.5	206.25	18.5	15	33.5	418.75	13.5	11	24.5	306.25
46	12.5	9	21.5	268.75	10.5	8	18.5	231.25	19.5	16	35.5	443.75	14.5	12	26.5	331.25
48	14.5	11	25.5	318.75	11.5	9	20.5	256.25	20.5	16	36.5	456.25	16.5	13	29.5	368.75

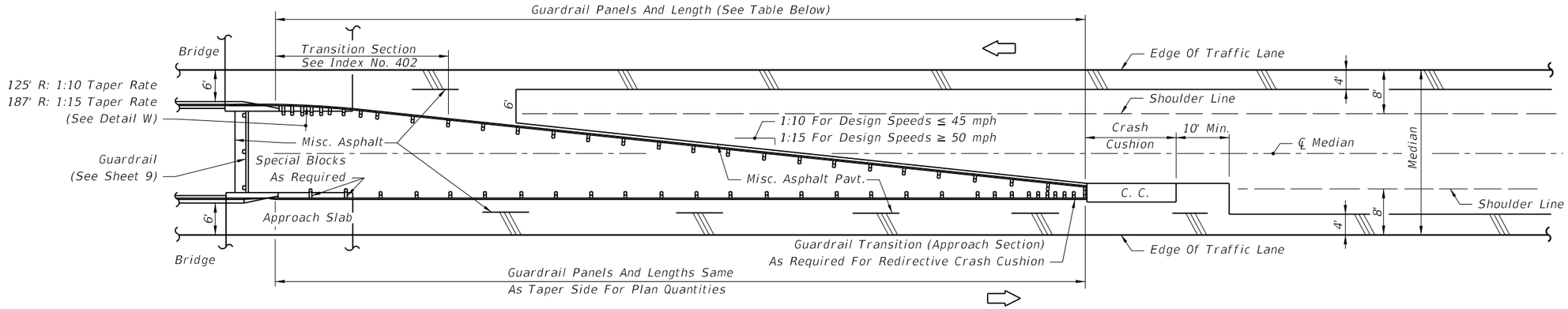
The lengths shown on this table are typical for roadways with standard width shoulders and a relocated connection to the existing wing post. When the wing post is replaced by bridge traffic railing barrier, reference Detail J and see Index No. 402. Length requirements shall be determined on a site specific basis for both standard width and narrow bridge shoulders and for end anchorage or end shielding use.

WHEN END TERMINAL CANNOT BE LOCATED OUTSIDE OF OPPOSING ROADWAY CLEAR ZONE

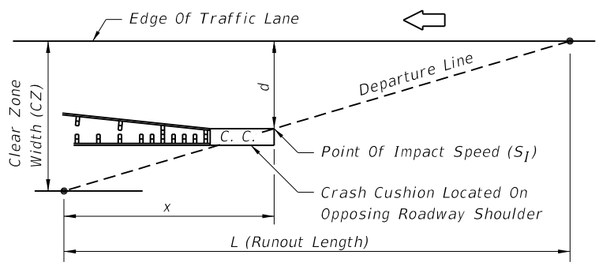
APPROACH GUARDRAIL TREATMENTS FOR BRIDGES WITH SAFETY SHAPE TRAFFIC RAILING EXTENDING LESS THAN FULL APPROACH SLAB LENGTH IN WIDE MEDIANS WITH FLUSH SHOULDERS



MEDIANS WITH 10' BRIDGE SHOULDERS



MEDIANS WITH 6' BRIDGE SHOULDERS



Speed (S_I) For Determining Crash Cushion Size:

$$S_I = \frac{x}{L}\,(\text{Design Speed}) = \left[\frac{(CZ-d)}{CZ}\right]\,\text{Design Speed}$$

SIZING CRASH CUSHIONS LOCATED ON OPPOSING ROADWAY SHOULDERS

Note: The guardrail configurations shown apply only to parallel or near parallel bridges with open medians.

GUARDRAIL LENGTHS

MEDIAN WIDTH (Ft.)	6' BRIDGE SHOULDERS				10' BRIDGE SHOULDERS			
	1:10 TAPER RATE		1:15 TAPER RATE		1:10 TAPER RATE		1:15 TAPER RATE	
	PANELS (No.)	LENGTH (Ft.)	PANELS (No.)	LENGTH (Ft.)	PANELS (No.)	LENGTH (Ft.)	PANELS (No.)	LENGTH (Ft.)
30	12.5	156.25	18.5	231.25	6.5	81.25	9.5	118.75
28	11.5	143.75	16.5	206.25	5.5	68.75	7.5	93.75
26	9.5	118.75	14.5	181.25	5.5*	68.75	5.5*	68.75
24	8.5	106.25	11.5	143.75	5.5*	68.75	5.5*	68.75

The lengths shown in this table are based on standard widths for roadway and bridge median shoulders. Length requirements for both standard width and narrow bridge shoulders and end anchorage or end shielding requirements shall be determined on a site specific basis. When crash cushions are required on opposing roadway shoulders, their sizes may be determined by the residual speeds (S_I's) along the runouts from the approach roadways; however, when calculated speeds (S_I's) are less than 30 mph crash cushions shall be no less in size than for 30 mph; see speed diagram left. The number of panels may be reduced when installing a crash cushion more than 2.5' in width; see * below.

*Number shown is the minimum number of panels plus a W-Thrie beam transition panel; single faced guardrail must have a length of five (5) or more panels.

APPROACH GUARDRAIL TREATMENTS FOR BRIDGES WITH SAFETY SHAPE TRAFFIC RAILING EXTENDING LESS THAN FULL APPROACH SLAB LENGTH IN NARROW MEDIANS WITH FLUSH SHOULDERS

LEGEND

(1) Edge of traffic lane for simple curve turnouts.
Edge of travel lane for taper turnouts.

(2) Taper.

(3) Pavement return (radius R_1).

(4) Flared end anchorage to be installed except when existing guardrail on intersecting drive or side road adjoins the project.

(5) Post for locating flare, proximate to PC or PT:
No. 2 post for Radii 25' or less.
No. 3 post for Radii > 25' and < 50'.
Between No. 4 and No. 5 posts for Radii 50' or greater.

(6) Post for locating flare, proximate to PC or PT:
No. 3 post for Radii 25' or less.
Between No. 4 and No. 5 posts for Radii greater than 25'.

(7) Expanded shoulder for guardrail.

(8) Expanded shoulder for flared guardrail end anchorage.

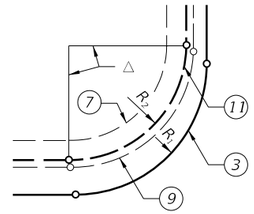
(9) Shoulder in absence of guardrail.

(10) Flared end anchorage assembly.

(11) Radial guardrail to be installed when guardrail required on the intersecting drive or side road (radius R_2).

(12) End anchorage Type II (radial return only).

(13) Guardrail installation limited to roadway right of way unless otherwise called for in the plans.

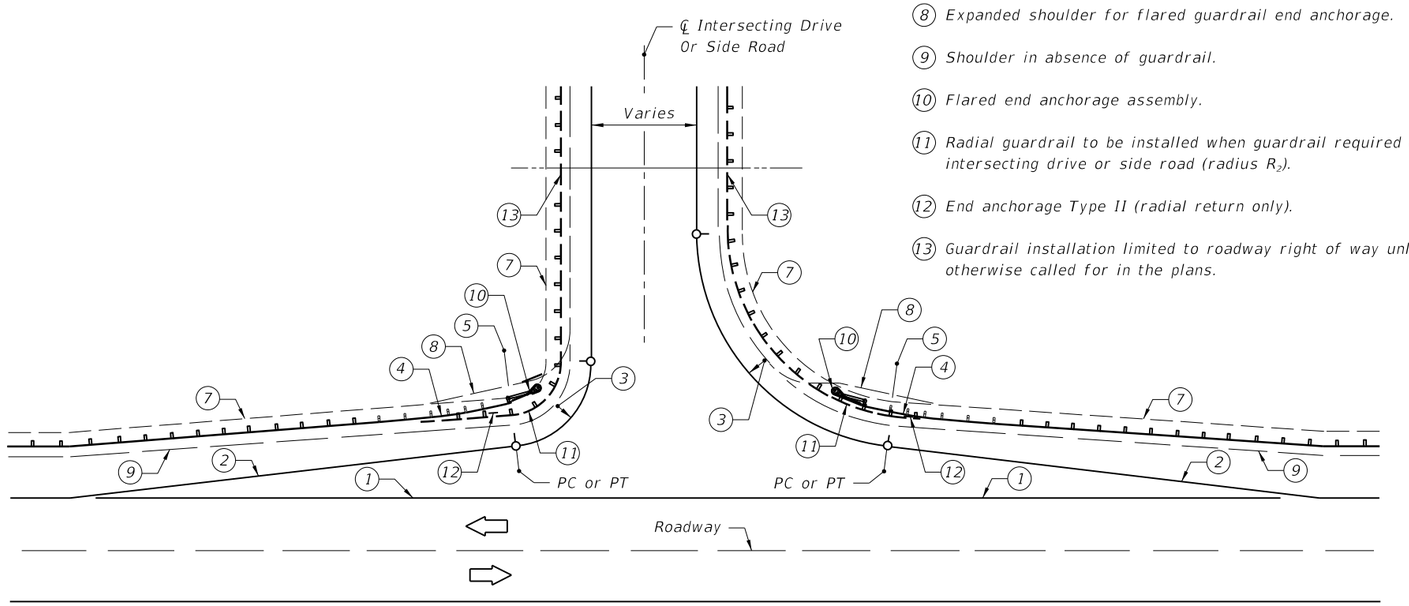


RADIAL GUARDRAIL

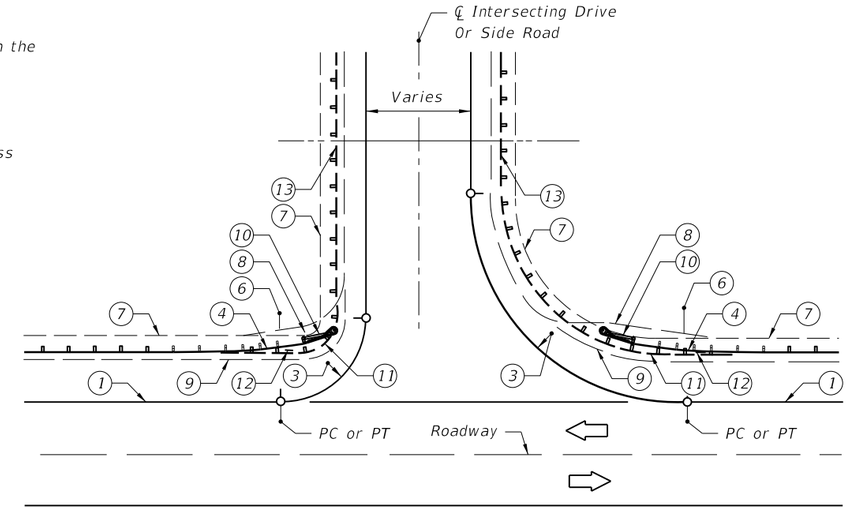
RADIAL GUARDRAIL

R_1	Normal Turnouts					
	Taper			Simple Curve		
	R_2	Panels Required	△	R_2	Panels Required	△
15'	25'	3	85°56'	25'	3	85°56'
20'	25'	3	85°56'	25'	3	85°56'
25'	25'	3	85°56'	25'	3	85°56'
30'	25'	3	85°56'	25'	3	85°56'
35'	25'	3	85°56'	25'	3	85°56'
40'	40'	5	89°31'	40'	5	89°31'
45'	40'	5	89°31'	40'	5	89°31'
50'	40'	5	89°31'	40'	5	89°31'

Note: Only 25' and 40' radius panels are to be used for return guardrail on normal turnouts. On skewed turnouts the number of panels used and their arrangement with straight panels will be as shown in the plans or as directed by the Engineer.



TAPER TURNOUTS



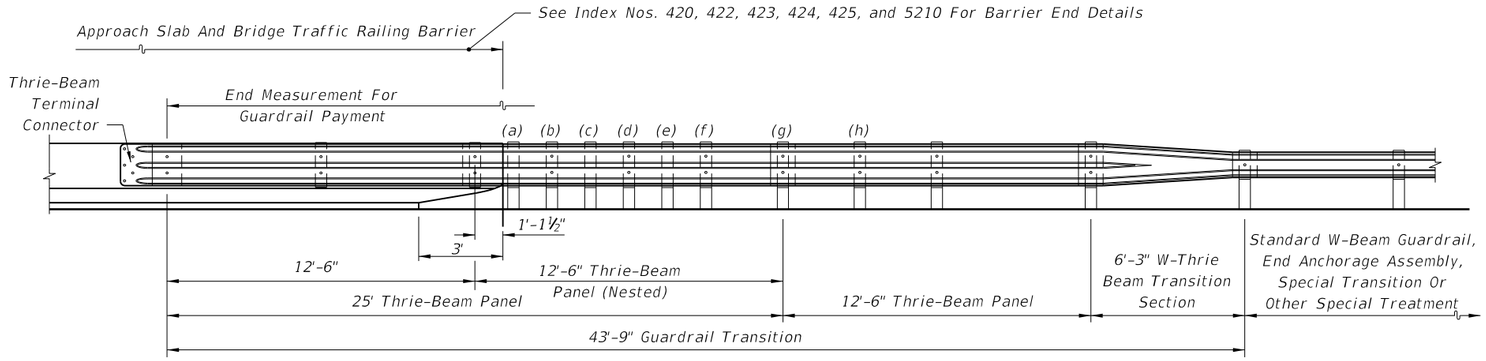
SIMPLE CURVE TURNOUTS

Note: The guardrail application shown on this sheet are for highways with flush shoulders and no restraints for constructing flared end anchorages and minimum lengths of guardrail. For highways with flush shoulders and restraints to constructing flared anchorages, see General Note No. 6.

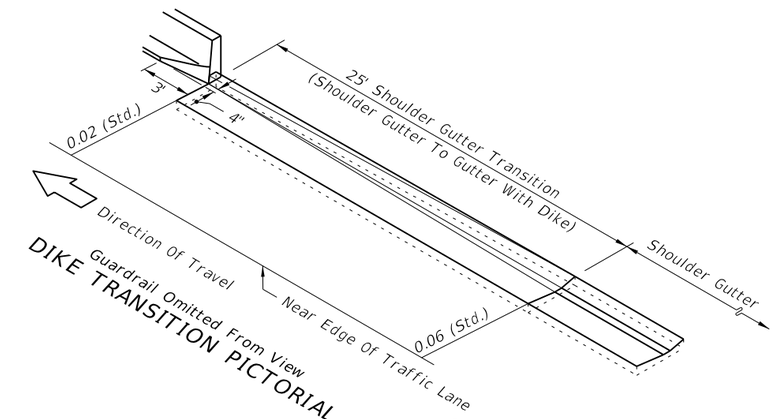
Where openings in guardrail are required in close proximity to bridge traffic rails or ends of concrete barrier walls, and minimum length guardrail with flared end anchorages can not be applied, either controlled release returns or energy absorbing terminals are to be applied.

GUARDRAIL APPLICATIONS FOR INTERSECTING DRIVES AND SIDE ROADS ON RURAL FACILITIES

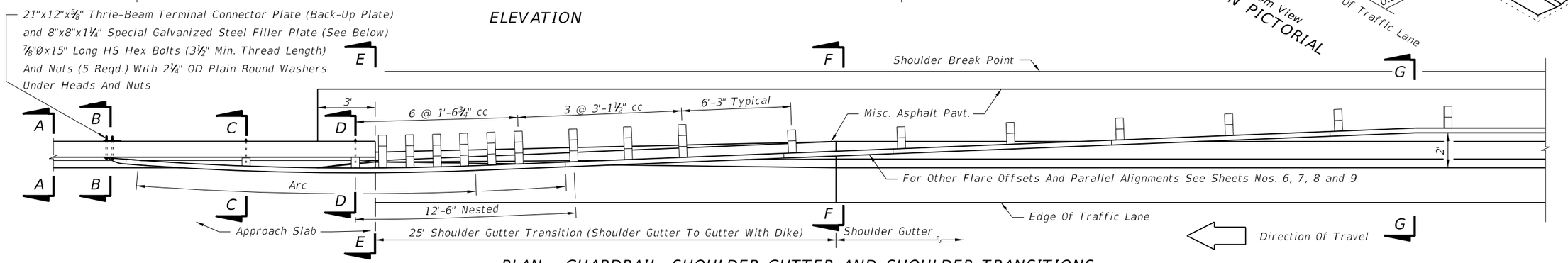
LAST REVISION	REVISION	DESCRIPTION:				
07/01/04			FDOT 2014 DESIGN STANDARDS	GUARDRAIL	INDEX NO. 400	SHEET NO. 12 of 26



ELEVATION



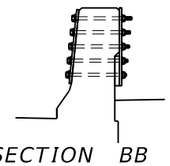
DIKE TRANSITION PICTORIAL



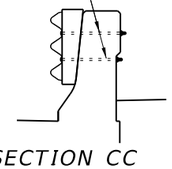
PLAN - GUARDRAIL, SHOULDER GUTTER AND SHOULDER TRANSITIONS

⅝" Øx18.5" Long Upper And 17.5" Long Lower Post Bolt And Nut With 1¾" OD Steel Washers Under Nuts

SECTION AA

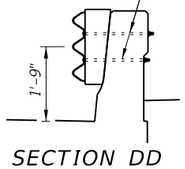


SECTION BB

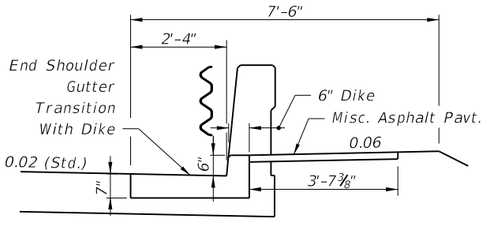


SECTION CC

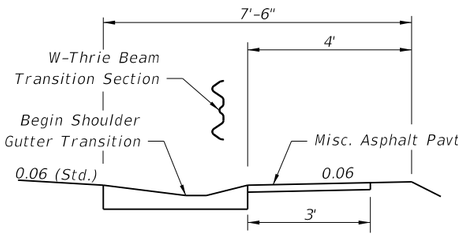
⅝" Øx20" Long Upper And 19" Long Lower Post Bolt And Nut With 1¾" OD Steel Washers Under Nuts



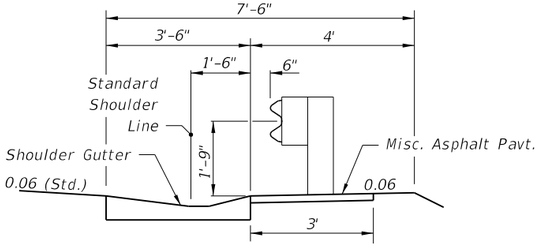
SECTION DD



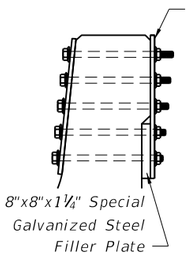
SECTION EE



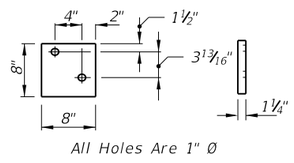
SECTION FF

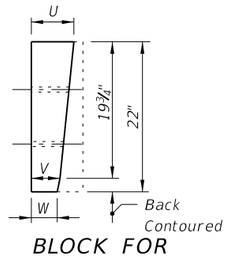


SECTION GG

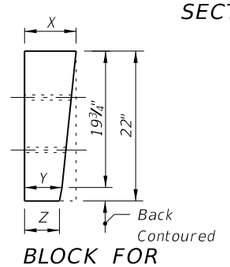


SPECIAL GALVANIZED STEEL FILLER PLATE FOR USE AT SECTION BB





BLOCK FOR SECTION CC



BLOCK FOR SECTION DD

APPLICATIONS	SECTION CC			SECTION DD		
	U	V	W	X	Y	Z
Single Face Guardrail	6⅛"	4⅛"	3⅝"	7½" nom.	5½" nom.	5" nom.
Double Face Guardrail With Timber Posts	5⅛"	3⅛"	2⅝"	6½" nom.	4½" nom.	4" nom.
Double Face Guardrail With Steel Posts	4⅜"	2⅜"	1⅞"	5¾"	3¾"	3¼"

For Double Face Guardrail Connections To Median Bridge Traffic Railing Barrier, See Index No. 410, 'Guardrail Connection To Concrete Barrier Wall Approach Ends'.

GUARDRAIL TRANSITION NOTE

When shoulder gutter is required, the 25' long dike transition, shown in the 'PLAN' and 'PICTORIAL' above, is required. Double offset blocks are shown for guardrail installations adjacent to shoulder gutter/dike transitions; single offset blocks shall be installed in absence of shoulder gutter. Nested rails shall not be bolted to the blocks and posts at posts (a), (c), and (e). One 16d galvanized nail shall be driven between each post and block, and between double blocks, in order to prevent block rotation, see '16d NAIL FOR PREVENTION OF OFFSET BLOCK ROTATION', this Index.

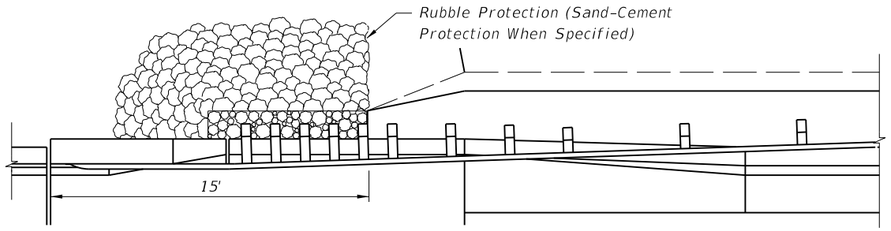
THRIE-BEAM OFFSET BLOCKS FIELD TRIMMED FOR USE AT SECTIONS CC & DD

GUARDRAIL APPROACH TRANSITION AND CONNECTION FOR BRIDGES WITH SAFETY SHAPE TRAFFIC RAILING BARRIERS EXTENDING FULL LENGTH OF APPROACH SLAB

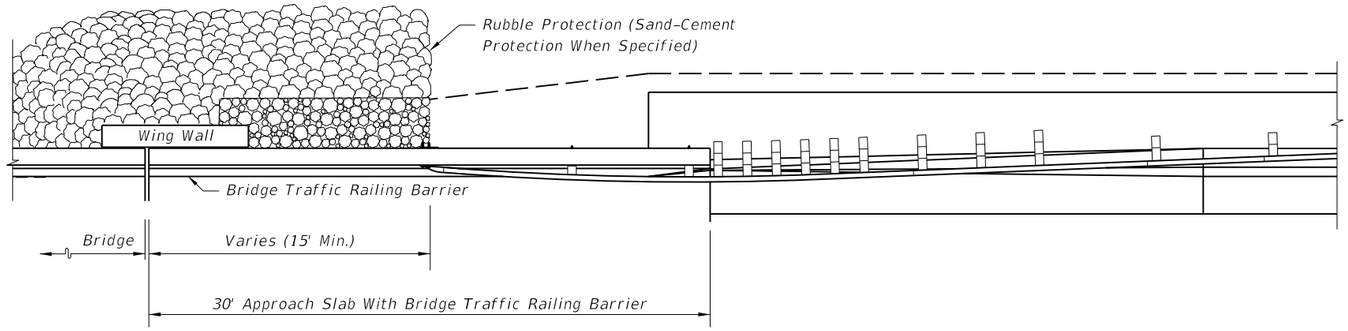
DETAIL J

C:\d\projects\standards\roadway\00400-s\00400.dgn
sm970re
5:14:52 PM
6/24/2013

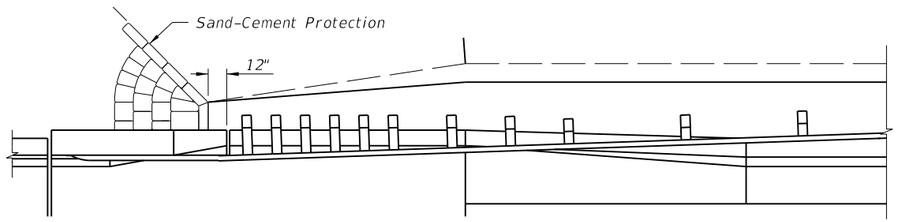
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/12			FDOT 2014 DESIGN STANDARDS	GUARDRAIL	400	13 of 26



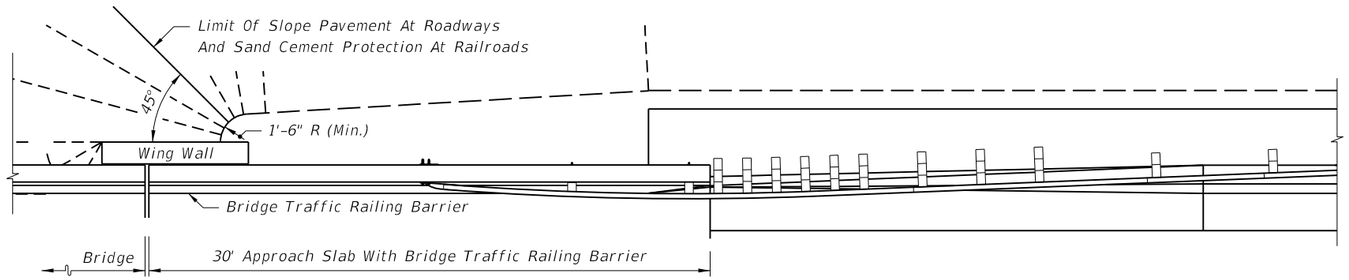
BRIDGES OVER STREAMS



BRIDGES OVER STREAMS



BRIDGES OVER RAILROADS



BRIDGES OVER ROADWAYS OR RAILROADS

For Additional Information See Index No. 402

SKETCHES - BRIDGES WITH SAFETY SHAPE TRAFFIC RAILING BARRIER EXTENDING LESS THAN FULL APPROACH SLAB LENGTH

For Additional Guardrail Information See Sheet 13

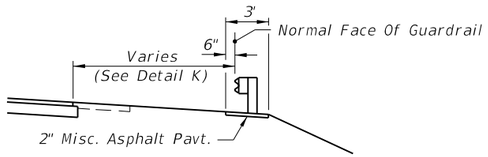
SKETCHES - BRIDGES WITH SAFETY SHAPE TRAFFIC RAILING BARRIER EXTENDING FULL APPROACH SLAB LENGTH

SKETCH NOTES

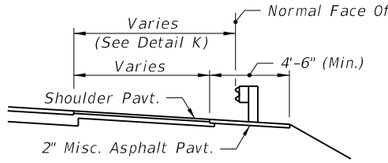
1. These sketches are for showing shoulder interface between roadways and bridges where crossings are normal to other roadways, railroads and streams. For site specific applications and details see the plans and the FDOT Structures Design Office "Detailing Manual" and "Design Guidelines".

2. Shoulder treatments shown in these sketches are for locations with shoulder gutter; shoulder hinge location will vary for facilities without shoulder gutter.

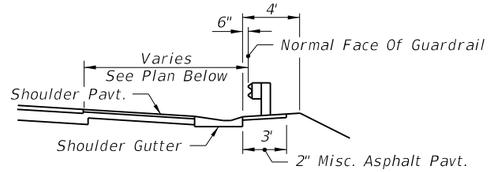
SHOULDER INTERFACE BETWEEN ROADWAYS AND BRIDGES



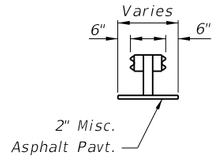
SHOULDER WITH OR WITHOUT 5' PAVEMENT



PAVED SHOULDERS

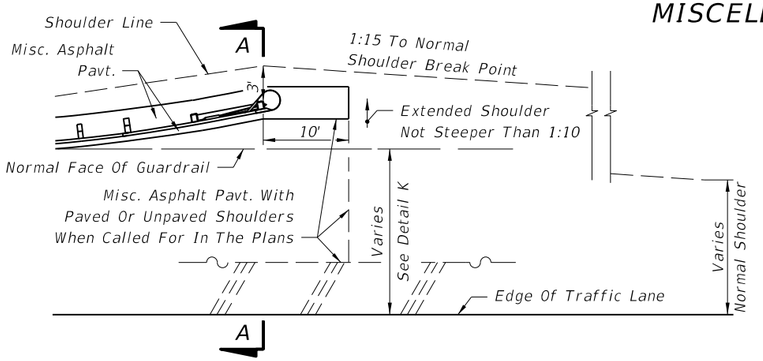


SHOULDER GUTTER

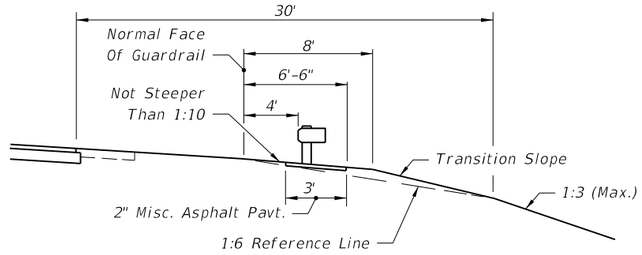


DOUBLE FACE RAIL

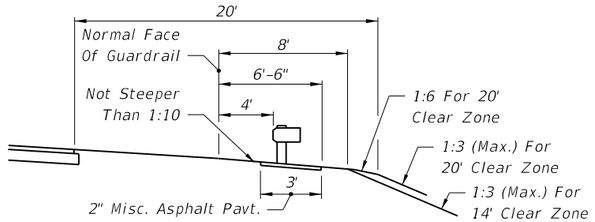
MISCELLANEOUS PAVING FOR STANDARD GUARDRAIL SECTIONS



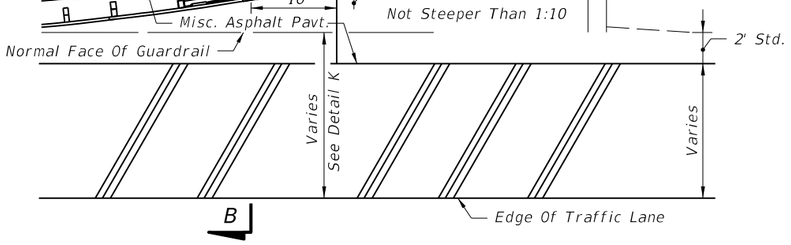
SHOULDER WITH OR WITHOUT 5' PAVEMENT



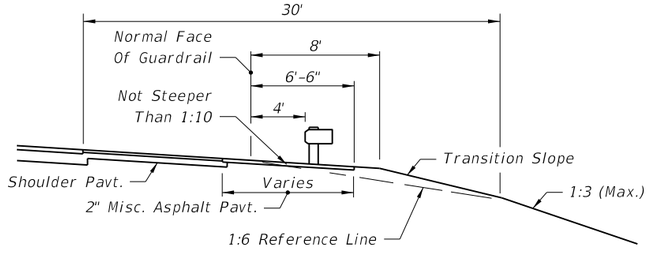
SECTION AA (EXAMPLE FOR 30' CLEAR ZONE)



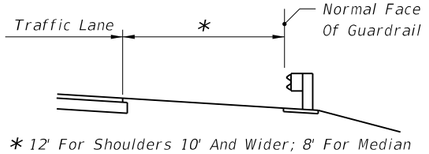
SECTION AA (EXAMPLE FOR 20' CLEAR ZONE)



PAVED SHOULDERS



SECTION BB (EXAMPLE FOR 30' CLEAR ZONE)

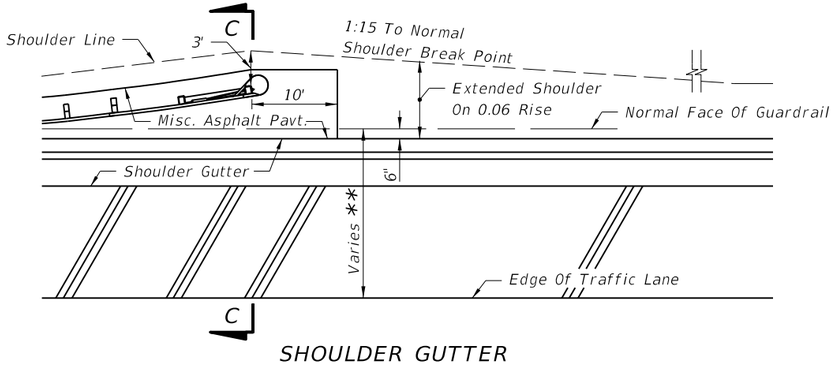


* 12' For Shoulders 10' And Wider; 8' For Median Shoulders 8' Or Less In Width; and, Shoulder Width Plus 2' For All Others Shoulders.

STANDARD LOCATIONS

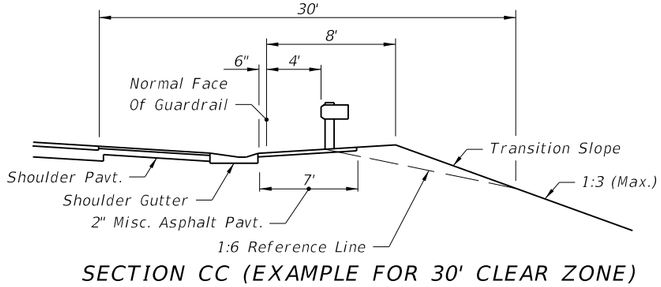
For Guardrail on slopes see Sheet 26.

GUARDRAIL LOCATION-DETAIL K



SHOULDER GUTTER

** 8' For 6' Shoulders 10' For 8' Shoulders 12' For 10' And 12' Shoulders Applies To Left And Right Side Shoulders. (See Index No. 525 For Shoulder Widths And Shoulder Gutter Locations On Ramps And Auxiliary Lanes)



SECTION CC (EXAMPLE FOR 30' CLEAR ZONE)

SHOULDERS, SLOPES AND MISCELLANEOUS PAVING FOR FLARED END ANCHORAGE ASSEMBLIES

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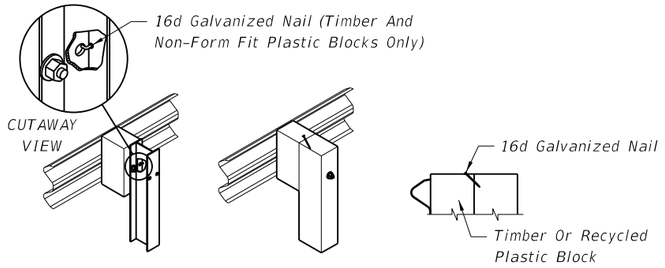
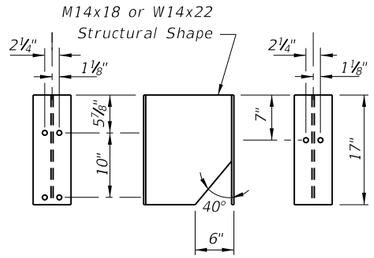
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/09			FDOT 2014 DESIGN STANDARDS	GUARDRAIL	400	15 of 26



STEEL POST TIMBER POST

16d NAIL FOR PREVENTION OF OFFSET BLOCK ROTATION



POST FACE SIDE VIEW TRAFFIC FACE

All Holes Are 13⁄16"Ø

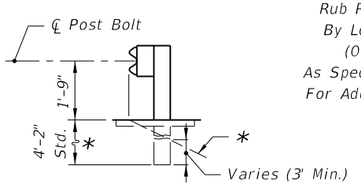
STEEL MODIFIED THRIE-BEAM OFFSET BLOCK

PERMISSIBLE POST AND OFFSET BLOCK COMBINATIONS

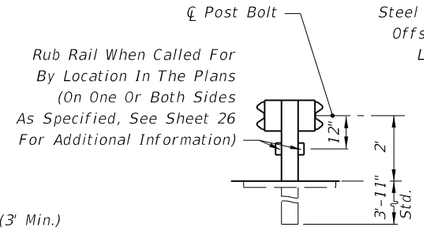
POSTS	OFFSET BLOCKS	REMARKS
Timber	Timber 6"x8"x14" (Nominal) For W-Beam And 6"x8"x22" (Nominal) For Thrie-Beam Recycled Plastic (See Notes)	Post bolt hole in timber and plastic blocks to be centered ± ¼"). All timber offset blocks shall be dressed on all four sides (S4S). One 16d galvanized nail per block is to be used to prevent rotation of block (see detail left).
Steel W6x8.5, W6x9 Or 6" C	Timber 6"x8"x14" (Nominal) For W-Beam And 6"x8"x22" (Nominal) For Thrie-Beam Recycled Plastic (See Notes)	Same as above for timber and plastic blocks except that form fit plastic block holes align with holes in steel posts and do not require nails.
Steel W6x8.5, W6x9 Or 6" C	W14x22x17" (M14x18x17") (Steel Modified Thrie-Beam)	5⁄8"Øx1½" long hex head bolts with full length thread and nuts (2 Reqd.) and 5⁄8" plain round washers (4 Reqd.) for mounting steel block to post. Bolts are to be installed in opposite holes, top and bottom.

Notes: 1. Timber and recycled plastic offset blocks of identical size and shape can be intermixed within a run of rail.

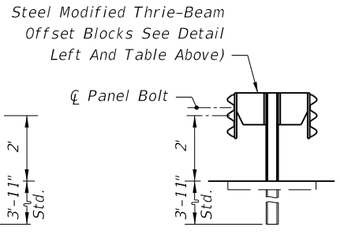
2. Recycled plastic offset blocks shall meet the passing evaluation criteria for Test Level 3 crash tests. The blocks shall be tested as a component in a semi-rigid guardrail test article under full scale crash test conditions. The blocks shall be in conformance with Sections 536 and 972 of the Specifications and be included on the Qualified Products List. W-Beam blocks shall be 14" in height and thrie-beam blocks shall be 22" in height. The blocks shall be capable of providing a 7½" (Min.) offset. For additional information on plastic offset block installations refer to Sheet 1, GENERAL NOTE 16.



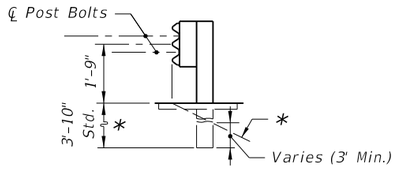
W-BEAM



W-BEAM WITH RUB RAIL



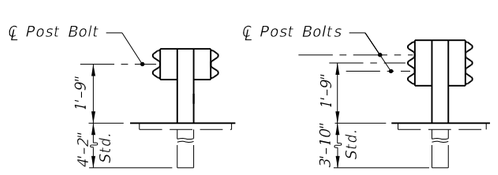
MODIFIED THRIE-BEAM



THRIE-BEAM

* Front Slope When Right Of Way, Environmental Or Other Restrictions Prohibit Normal Shoulder Extension

SINGLE FACED GUARDRAIL

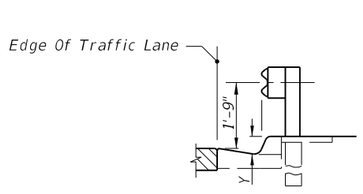


For Narrow Medians With No Median Swale. See Sheet 26 For Median With Swale.

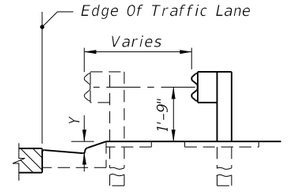
W-BEAM THRIE-BEAM

DOUBLE FACED GUARDRAIL

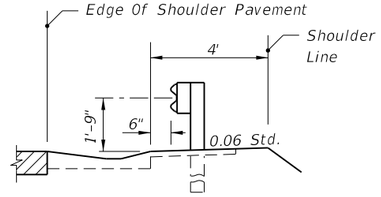
MOUNTING HEIGHTS ON SHOULDERS AND IN MEDIANS



Y = 6" Or Greater



Y = Less Than 6"



Shoulder Gutter

NOTE:
For location of guardrail with offset behind curb and gutter refer to the Plans Preparation Manual, Volume 1, Section 4.3.5.

LOCATION AT CURB & GUTTER SECTIONS-DETAIL L

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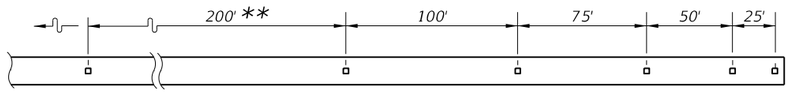
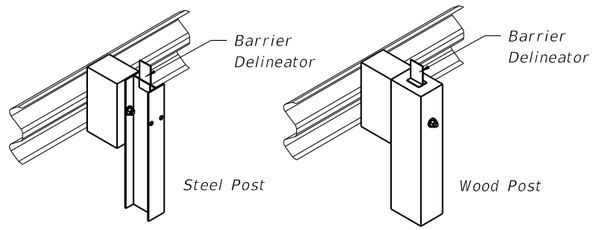
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/09			FDOT 2014 DESIGN STANDARDS	GUARDRAIL	400	16 of 26



Note: Adjustment in spacing may be required to fit exact guardrail lengths as directed by the Engineer. For minimum installations (length 62.5') provide one barrier delineator at each end and one at the approximate center.

** For curves greater than 2° the spacing shall be reduced to 100' increments through the curve.

BARRIER DELINEATOR SPACING

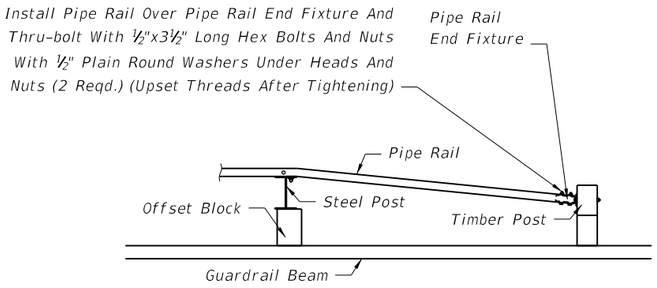


PICTORIAL VIEW
BARRIER DELINEATOR MOUNTING

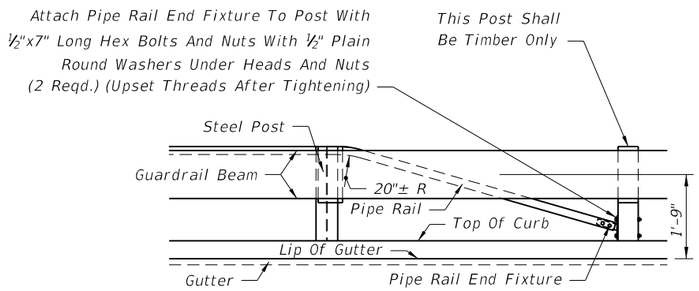
BARRIER DELINEATORS - DETAIL M

BARRIER DELINEATOR NOTES

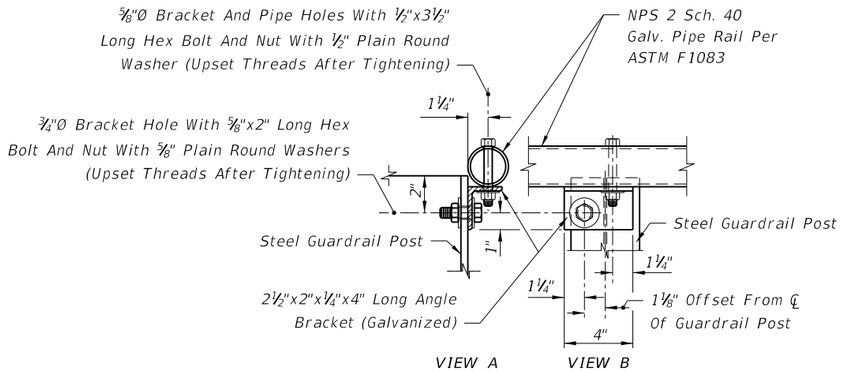
1. Barrier delineators shall conform to Specification Section 993.
2. Barrier delineator color (white or yellow) shall conform to the color of the near lane edgeline.
3. Barrier delineators installed on median guardrail shall have retro-reflective sheeting on both sides of the barrier delineator.
4. The cost for barrier delineators shall be included in the contract unit price for Guardrail.



PLAN



ELEVATION



PIPE RAIL MOUNTING

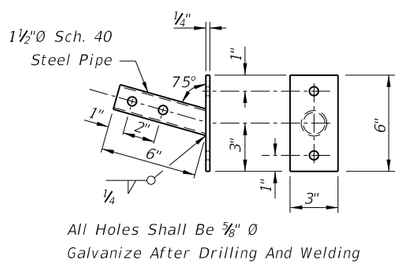
NOTES

1. Pipe Rail is required on steel guardrail posts when the front of sidewalks or shared use paths are located 4' or less from behind the back of the post. Pipe rail shall not extend beyond the last post of the approach end anchorage assembly. Begin and end the Pipe Rail in accordance with the PIPE RAIL END FIXTURE detail.

   Refer to Sheet 1, GENERAL NOTE 6 for guardrail end treatment requirements.

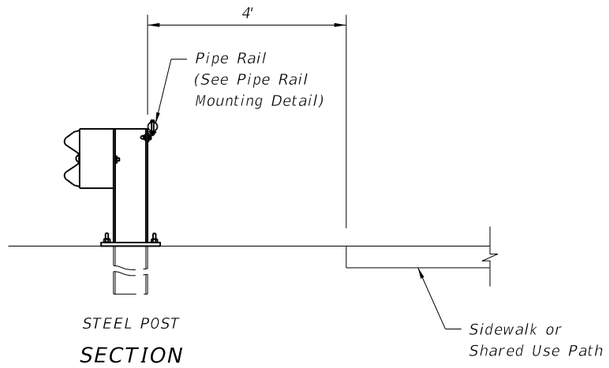
2. When guardrail with timber posts are located with the back of post 4' or less from the near front of sidewalks or shared use paths, the bolt ends will require one of the following treatments:

   a. Trim back flush with the face of nut and metalize or
   b. Use post bolts 15" in length with washers and nuts counter sunk into sinks 1" to 1½" deep or
   c. Use post bolts 15" in length with sleeve nuts and washers.



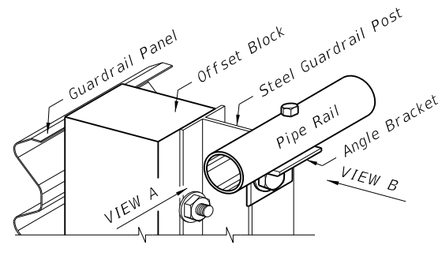
All Holes Shall Be ⅝" Ø
Galvanize After Drilling And Welding

PIPE RAIL END FIXTURE



STEEL POST

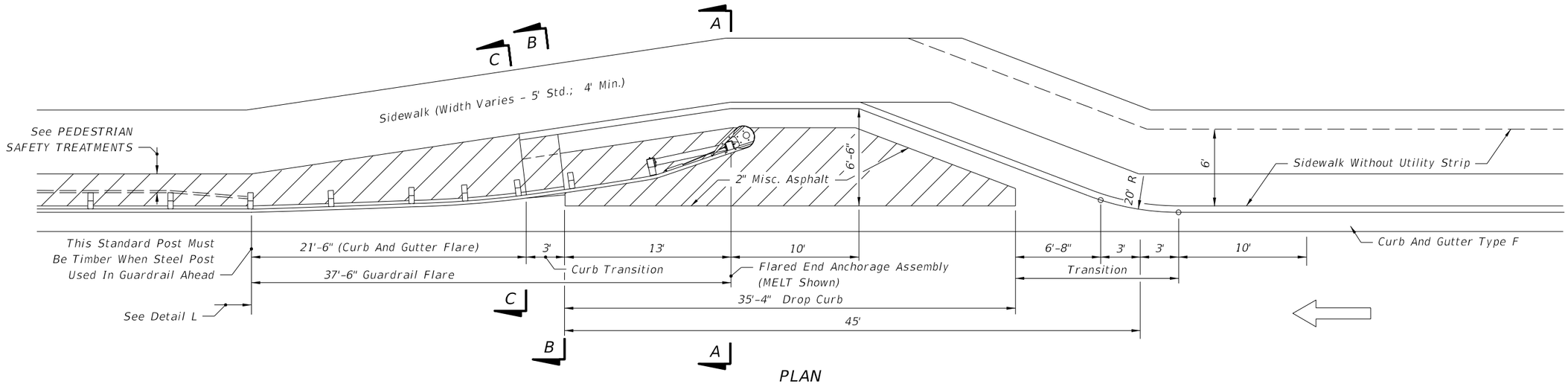
SECTION



PICTORIAL

FOR LOCATIONS USED BY PEDESTRIANS OR BICYCLISTS

PEDESTRIAN SAFETY TREATMENTS

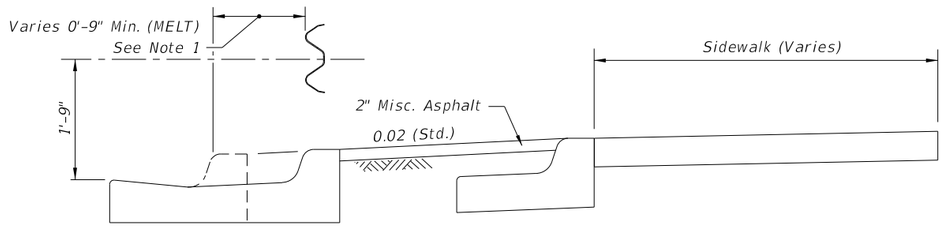


PLAN

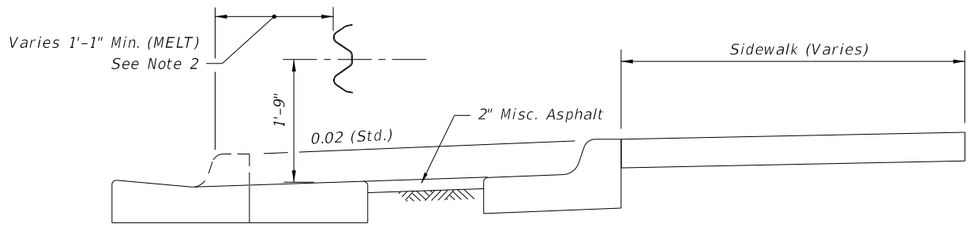
Notes

1. Curb And Gutter Flare shall follow guardrail flare, see elsewhere in this Index for additional guardrail flare information.

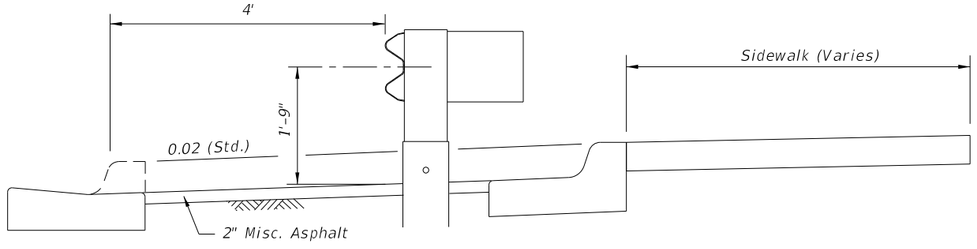
2. For Specific Details, Offset Requirements, and End Treatments of Proprietary End Anchorage Assembly – Flared Systems, see the Qualified Products List (QPL).



SECTION CC



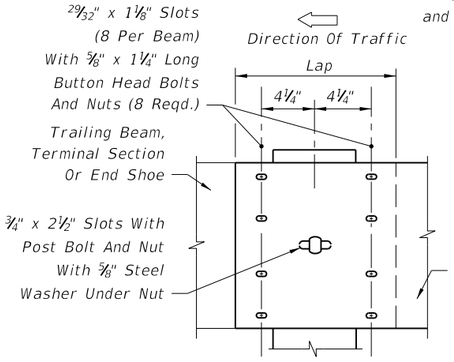
SECTION BB



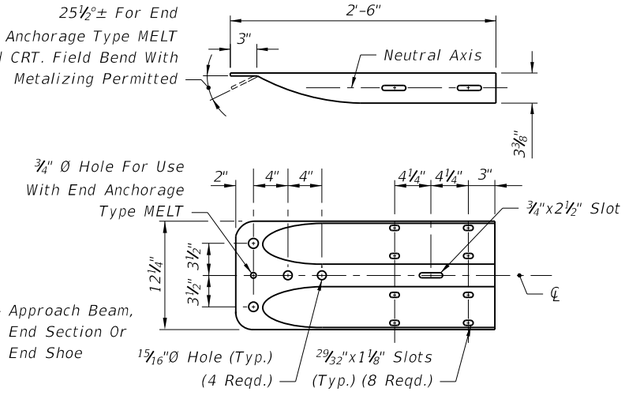
SECTION AA

APPROACH TREATMENT FOR CURB AND GUTTER

DETAIL Q

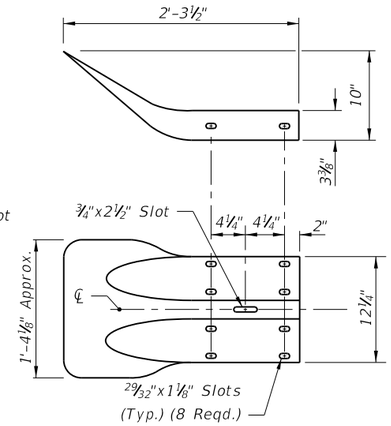


W-BEAM RAIL SPLICE

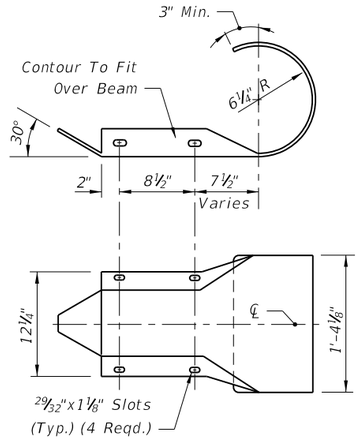


Note: ⅝"Ø Steel washer required with splice bolts

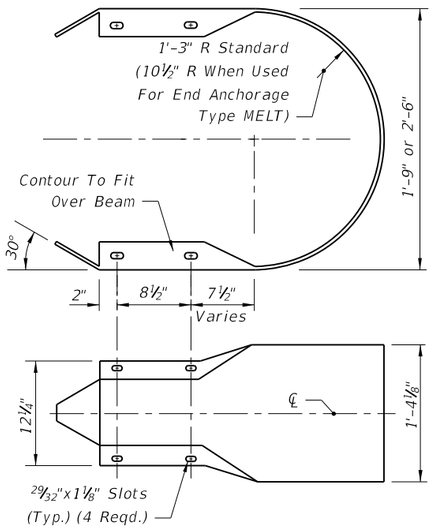
SPECIAL END SHOE



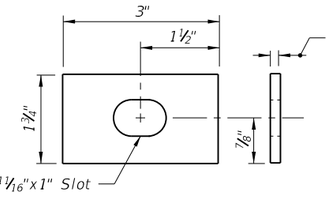
FLARED END SECTION



ROUNDED END SECTION

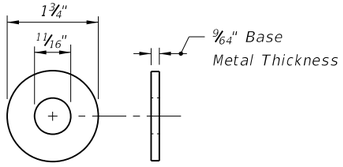


BUFFER END SECTION



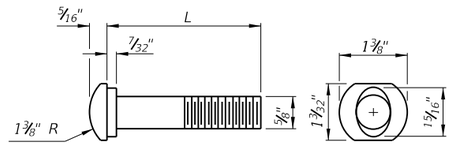
Note:
For beam washer requirements on end terminals, see individual end anchorage assembly details. Washers are to be used where necessary to accomplish alignment or where the posts bolt head shows tendency to pull through the rail slot. Washers installed on guardrail, between end anchorages, prior to July 1, 1990 may remain in place until the guardrail is relocated or until repairs require removal and reinstallment of a post bolt.

(RECTANGULAR PLATE WASHER) BEAM WASHER



Note:
The round washer is not intended for use under the recess nut for the beam to beam rail splice. The washer is required under the recess nut for connecting the beam to the special end shoe; under the post bolt nut for connecting the beam to the timber post and offset blocks; for connecting the beam to steel posts with timber offset blocks; under the hex bolt head for securing the beam anchor plate to the beam; and, for general guardrail connections by ⅝" Ø hex bolts and nuts and under hex nut for connecting rub rail to wood and steel posts. For supplemental information see BEAM ANCHOR PLATE, PERMISSIBLE POST AND OFFSET BLOCK COMBINATIONS, individual end anchorage assembly details, SPECIAL STEEL GUARDRAIL POSTS, SPECIAL END SHOE, W-BEAM RAIL SPLICE, THRIE-BEAM RAIL SPLICE, and THRIE-BEAM TERMINAL CONNECTOR details.

⅝" STEEL WASHER



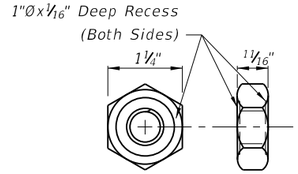
L (In.)	THREAD LENGTH (Min.) (In.)	APPLICATION
1¼"	Full Length	Rail Splice Bolt
10"	4"	Post Bolt – Single Or Double Faced Guardrail Timber Or Recycled Plastic Offset Block(s) On Steel Post As An Option, A Single 25"* Long Post Bolt May Be Used
18"	4"	Post Bolt – Single Faced Guardrail Timber Posts
25"*	4"	Post Bolt – Double Faced Guardrail Timber Posts Double Faced Guardrail Steel Posts

Special bolts having lengths of 10" or greater shall have a thread length of not less than 4".

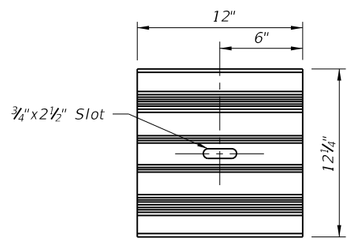
For applications where special bolts having lengths greater than 25" are required, the Contractor may use a 5/8"Ø threaded rod (field cut to length). A hex nut and beam washer shall be used at the guardrail face with no more than ¾" of the threaded rod projecting beyond the top of the nut. The projecting thread on both ends shall be distorted to secure the nuts, and both ends of the threaded rod metalized with organic zinc-rich coating.

*Use of the 25" AASHTO-AGC-ARTBA standard length post bolt on double faced guardrail that results in the bolt projecting more than ¾" beyond the face of the nut after pull-up shall be trimmed to ¾" reveal and metalized with organic zinc-rich coating.

⅝" OVAL SHOULDER BUTTON HEAD BOLT



⅝" MODIFIED HEAVY HEX NUT (RECESSED NUT)



Note: For application information see individual end anchorage assembly details.

W-BEAM BACK-UP PLATE

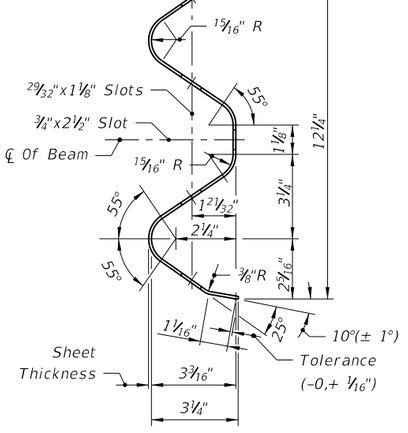
OFFSETS (Ft.) Measured From Face Of Guardrail To Front Of Above Ground Rigid Hazard				
POST SPACING (Ft.)	SINGLE BEAM		NESTED BEAMS	
	W-Beam	Thrie-Beam	W-Beam	Thrie-Beam
6'-3"	4'-0"	3'-4"	N/A	N/A
3'-1½"	3'-0"	2'-8"	2'-8"	2'-4"
1'-6¾"	N/A	N/A	2'-4"	2'-0"

Note:
The values shown should be utilized unless changes are supported by empirical validation. Those desiring to develop offset values from the simulated deflection values shown in Table 5.4 of the AASHTO Roadside Design Guide are cautioned to proceed only if background in the table development is understood.

MINIMUM OFFSET FOR SINGLE FACED GUARDRAIL (Ft.)

HS Hex bolts for THRIE-BEAM TERMINAL CONNECTORS shall conform to the requirements of ASTM A449 (Type 1) with heavy hex nuts and washers. All other hex bolts shall conform to the requirements of ASTM A563. Bolts, nuts and washers shall be hot dip galvanized. Heavy hex nut may be used in lieu of hex nuts and hex nuts used for jam nuts.

HEX BOLTS AND NUTS



W-BEAM

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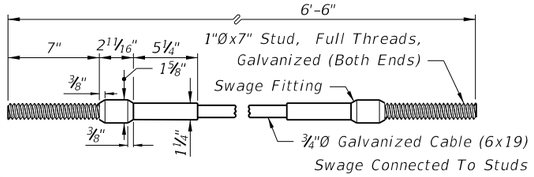
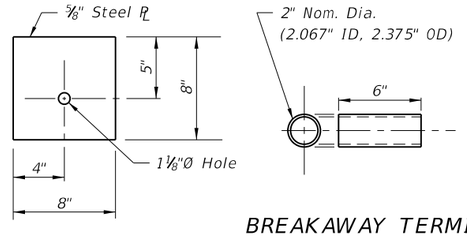


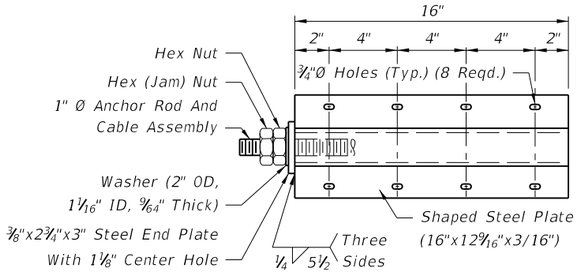
Note:
Cable assemblies shall be in accordance with the specifications of AASHTO-AGC-ARTBA 'A Guide To Standardized Highway Barrier Hardware' Cable Anchor Assembly FCA01. An additional cable assembly 9' in length with a swaged fitting on one (1) end is required for each end anchorage assembly Type CRT.

CABLE ASSEMBLY

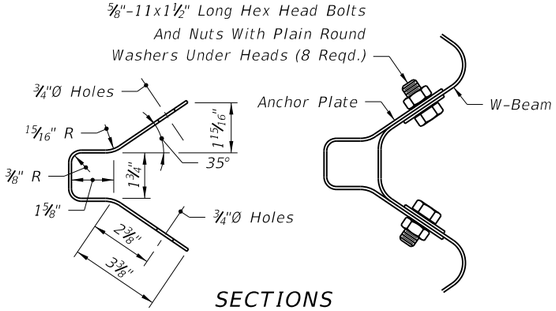


BEARING PLATE

BREAKAWAY TERMINAL POST SLEEVE

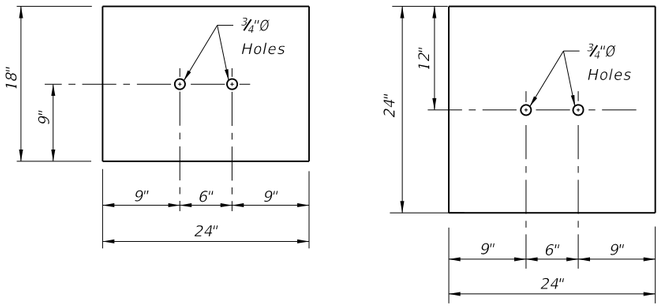


BACK VIEW

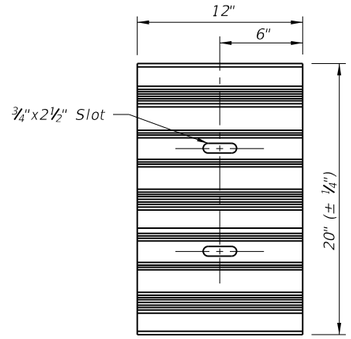


SECTIONS

BEAM ANCHOR PLATE

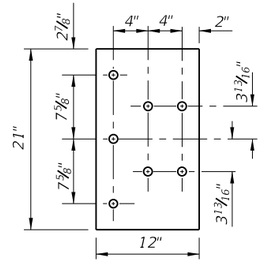


1/4" Steel PL, Galvanized
SOIL PLATES



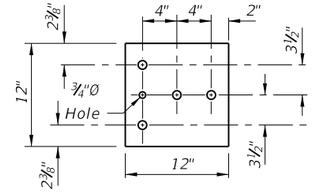
Back-up plate required behind rail elements at intermediate (non-splice) posts when steel offset block used.

THRIE-BEAM BACK-UP PLATE



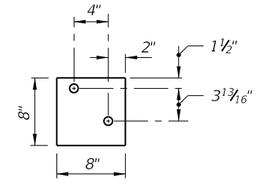
5/8" Plate For Bridge Traffic Railing Barrier
1/4" Plate For Barrier Walls

THRIE-BEAM TERMINAL CONNECTOR



1/4" Plate For All Applications

SPECIAL END SHOE

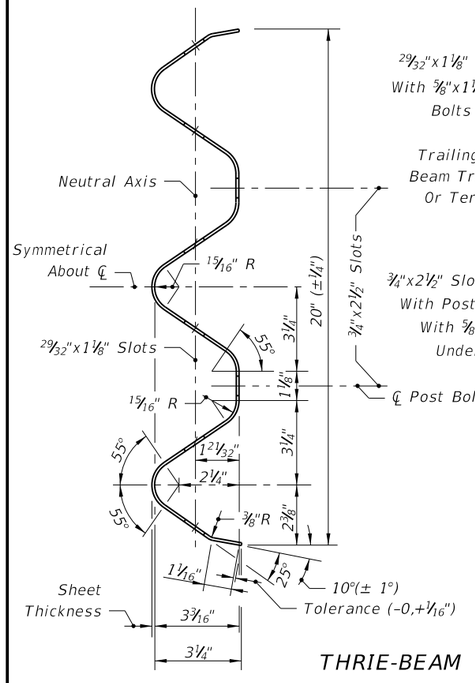


1 1/4" Plate
See Detail J For Application

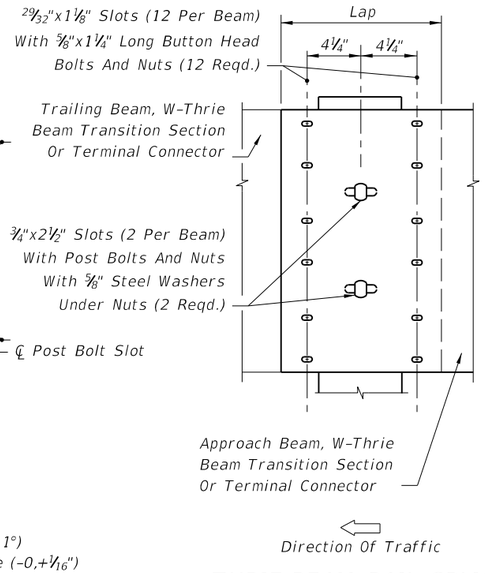
FILLER PLATE

All Holes 1" Ø Except As Shown

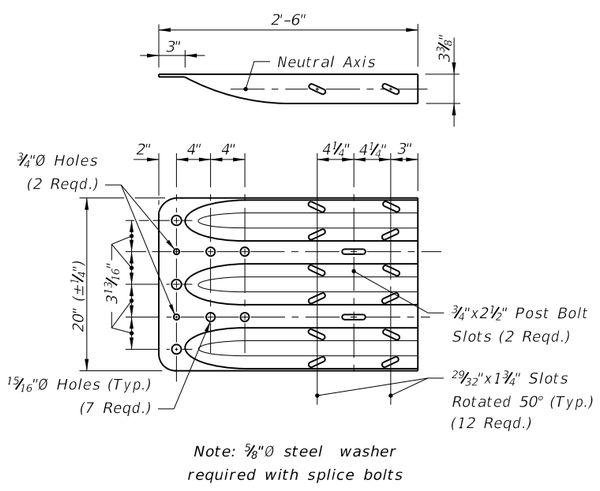
GALVANIZED STEEL BACK-UP PLATES FOR CONNECTING SPECIAL END SHOES AND TERMINAL CONNECTORS TO CONCRETE BRIDGE TRAFFIC RAILING BARRIERS AND CONCRETE BARRIER WALLS



THRIE-BEAM

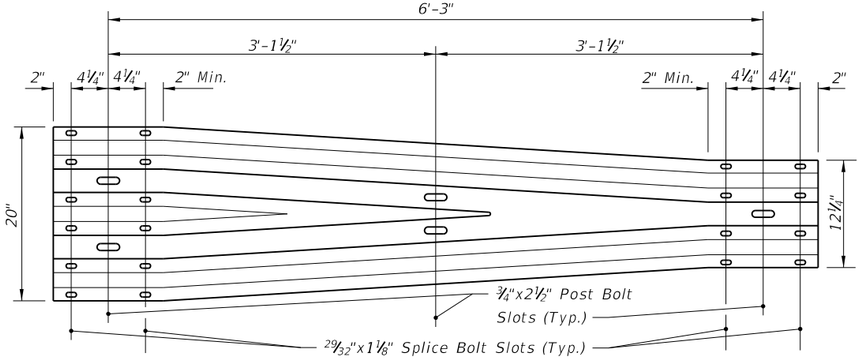


THRIE-BEAM RAIL SPLICE



Note: 5/8"Ø steel washer required with splice bolts

THRIE-BEAM TERMINAL CONNECTOR



W-THRIE BEAM TRANSITION SECTION

LAST REVISION	REVISION	DESCRIPTION:		INDEX NO.	SHEET NO.
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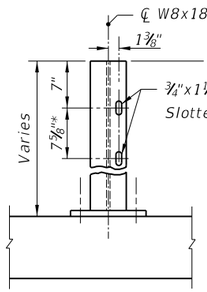
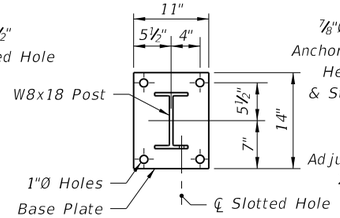
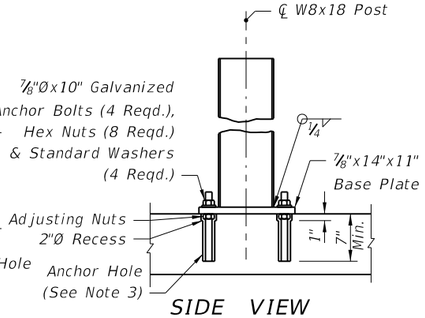
GUARDRAIL



FRONT VIEW



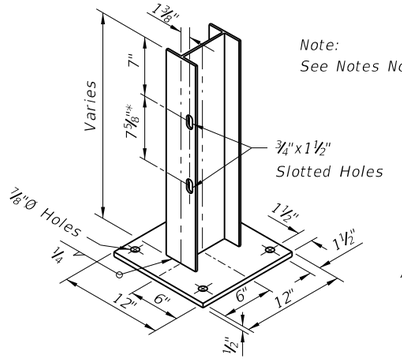
TOP VIEW



SIDE VIEW

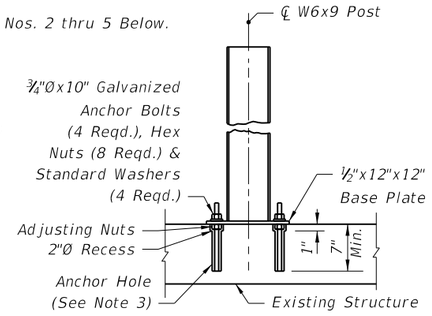
FOR REPLACEMENT OF EXISTING W8x18 GUARDRAIL POSTS ON APPROACH SLABS AND BRIDGES

* Additional slotted hole required when mounting thrie-beam guardrail



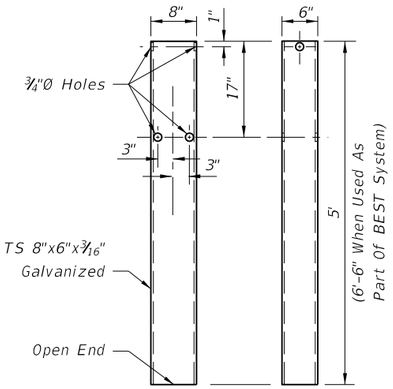
PROJECTION

Note:
See Notes Nos. 2 thru 5 Below.



SIDE VIEW

FOR CONSTRUCTION OF GUARDRAIL WHERE CULVERT, PIER FOOTING OR OTHER STRUCTURE PRECLUDES DRIVEN POST INSTALLATION



SIDE VIEW FRONT VIEW

For Use In Combination With
Short Timber Breakaway Post

STEEL TUBE

NOTES: (SPECIAL STEEL POST)

1. See Index No. 402 for special steel posts required for construction and repair of guardrail transitions to bridge traffic railing barrier retrofits on existing bridges. See Structures Index Nos. 470 through 476 for steel posts required to construct traffic railing barrier retrofits on existing bridges.

2. Either anchor bolts, concrete wedge anchors or approved Adhesive-Bonded Anchors for Structural Applications may be used. Anchor bolts, wedge anchors and adhesive anchors shall have a minimum tensile strength of 60,000 psi and galvanized in accordance with ASTM A153 (stainless steel components may be substituted but components plated in accordance with ASTM B-633 are not acceptable). Adhesive anchor rods shall be equal in diameter to that detailed for anchor bolts. Wedge anchors are to be installed in accordance with the manufacturer's recommendations, assuming 3,000 psi compressive strength for concrete. Wedge anchors shall also meet the following requirements:

   a. tensile load each anchor: approach slabs 14,000 lbs.; other structures 8,000 lbs.
   b. shear load each anchor: approach slabs 15,000 lbs.; other structures 7,800 lbs.

3. Posts are to be plumbed by adjusting nuts or mortar seating. Posts installed using anchor bolts and adhesive anchors are to be set with adjusting nuts as detailed, unless the Engineer approves the use of mortar seating in lieu of adjusting nuts. Posts installed using wedge anchors are to be set with mortar seating. Base plates shall be grouted with neat finish.

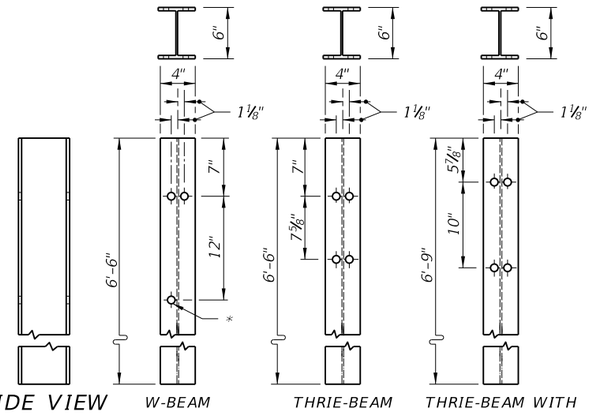
4. Adhesive-Bonded Anchors for Structural Applications shall comply with Section 937 and be installed in accordance with Section 416. Drilled hole diameter shall be in accordance with the manufacturer's instructions.

5. Anchor holes and recesses shall be drilled; wedge anchor holes are to be drilled in accordance with the manufacturer's specifications. Encountered reinforcing steel shall be drilled through. Holes shall be thoroughly cleaned when setting bolts and anchors and dry when setting wedge anchors.

6. Steel post and base units shall be galvanized in accordance with ASTM A123. Any damaged galvanized areas are to be metalized in accordance with Section 562 of the Standard Specifications.

7. Special steel posts are not to be substituted for any post in a guardrail approach end treatment system.

SPECIAL STEEL GUARDRAIL POSTS



SIDE VIEW W-BEAM

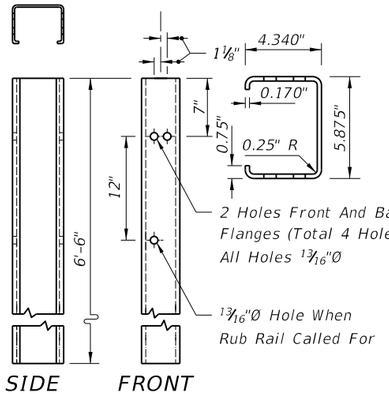
THRIE-BEAM WITH STANDARD OFFSET BLOCKS

THRIE-BEAM WITH STEEL MODIFIED THRIE-BEAM OFFSET BLOCKS

*1³⁄₁₆"Ø Hole When Rub Rail Called For

FRONT VIEW FRONT VIEW FRONT VIEW

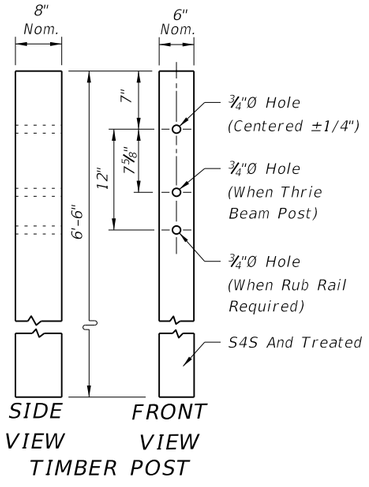
All Holes Shall Be 1³⁄₁₆"Ø Identical Front And Back Flanges



SIDE VIEW FRONT VIEW

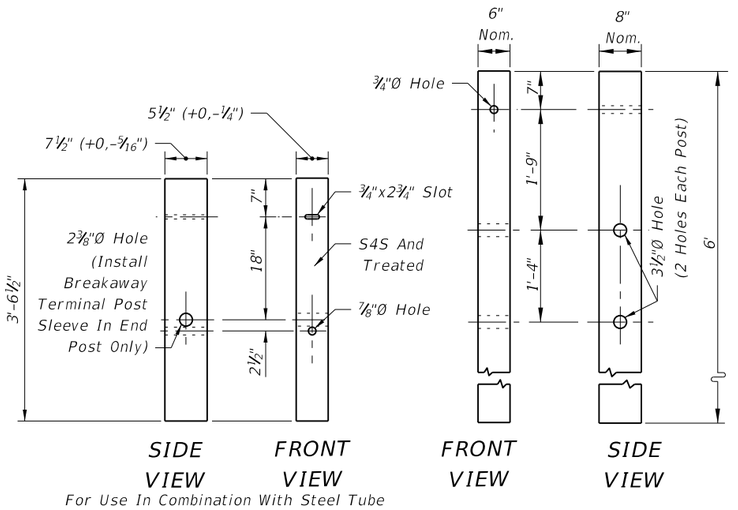
Note: 6"-C steel posts are to face the same direction in any continuous run of guardrail. Posts to be galvanized in accordance with ASTM A123.

6"-C STEEL POST



SIDE VIEW FRONT VIEW

TIMBER POST



SIDE VIEW FRONT VIEW FRONT VIEW SIDE VIEW

For Use In Combination With Steel Tube

SHORT TIMBER BREAKAWAY POST CRT TIMBER POST

SPECIAL TIMBER GUARDRAIL POSTS

Note:
W6x8.5 or W6x9 steel posts may be either rolled or welded structural shapes conforming to or exceeding the design properties of ASTM A6/A6M. Welding shall be in accordance with the requirements of ASTM A769/A769M. Posts shall be cut to length and the ends seal welded between web and flange before galvanizing. Posts to be galvanized in accordance with ASTM A123.

W6x8.5 OR W6x9 STEEL POST

STANDARD TIMBER AND STEEL GUARDRAIL POSTS

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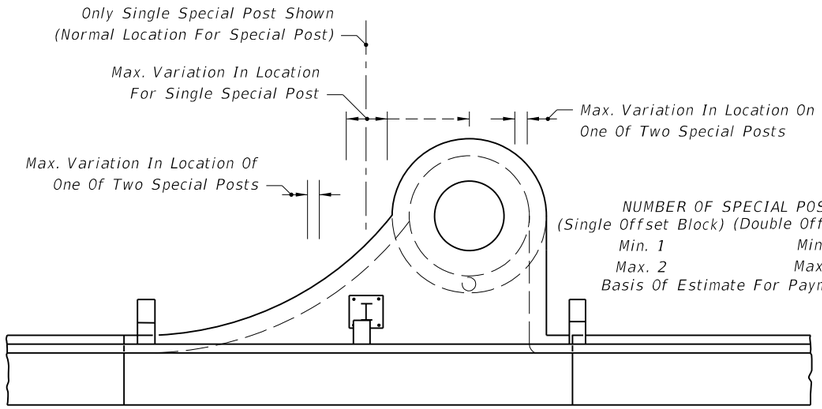
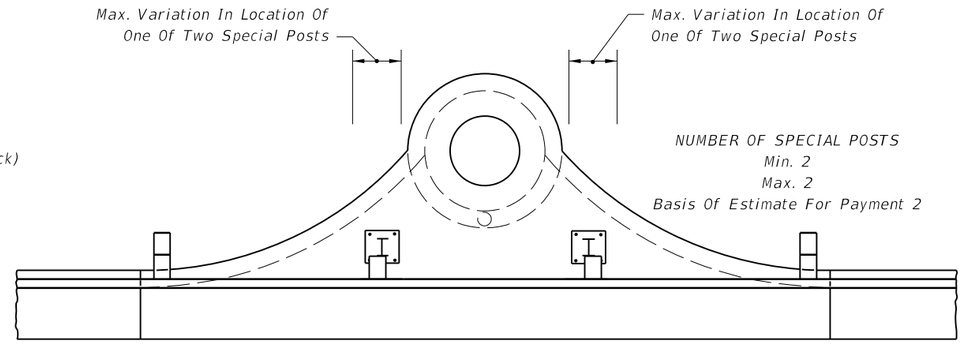
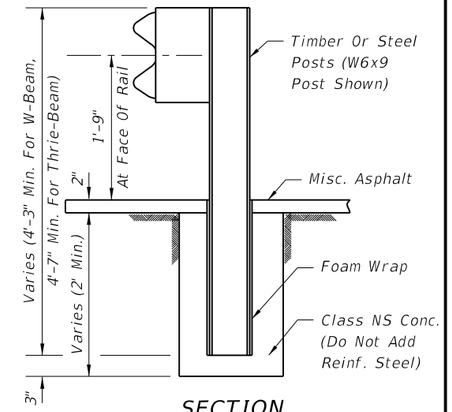


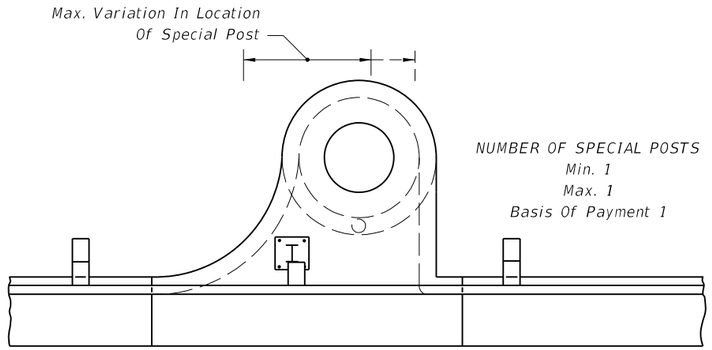
CURB INLET TYPE 1



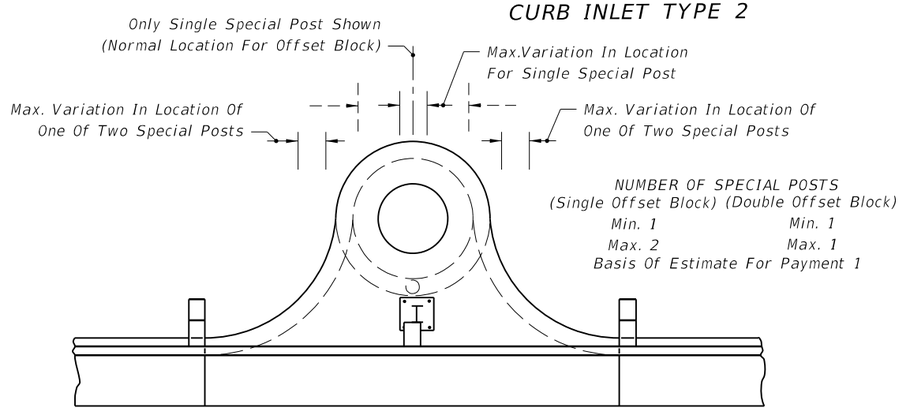
CURB INLET TYPE 2



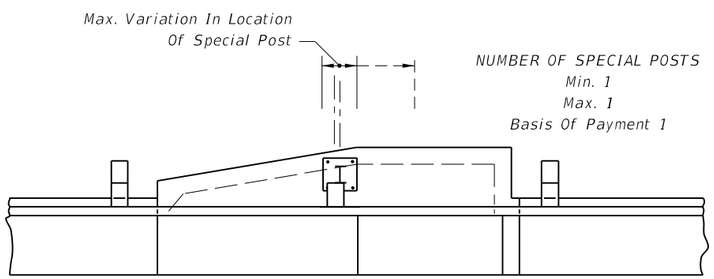
SECTION



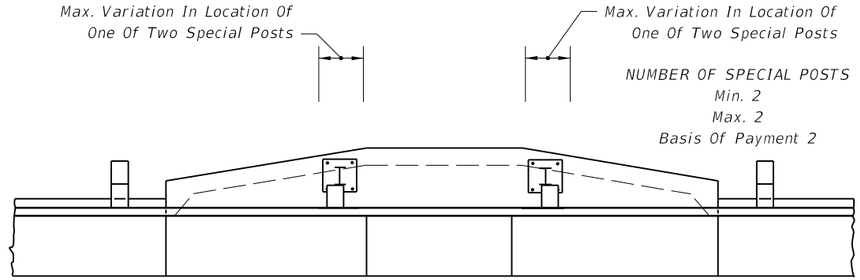
CURB INLET TYPE 3



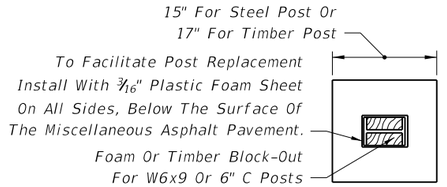
CURB INLET TYPE 4



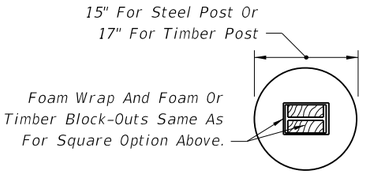
CURB INLET TYPE 5



CURB INLET TYPE 6



PLAN
(SQUARE OPTION)



PLAN
(ROUND OPTION)

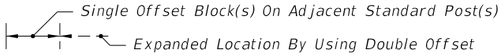
Note: For line post applications only, i.e., not to be used with breakaway post applications nor be used to modify End Anchorage Assemblies Type II.

TO BE USED PRINCIPALLY OVER SHALLOW UTILITIES

ENCASED GUARDRAIL POST

LEGEND

Variation In Location Of Special Post:



Notes:

1. The locations shown for special posts mounted on inlets are to be used as guidelines for positioning the posts and for estimating the number of required posts.
2. Special posts and their anchorages mounted on curb inlets shall be in accordance with special steel guardrail posts Sheet 21, and paid for under the contract unit price for Special Guardrail Post, EA.
3. Variations shown for the locations of special posts mounted on inlets are established from standard post spacing (6'-3"); clearance of standard posts from inlets (4" min.); use of single and double offset blocks on standard posts adjacent to the inlets; optional flange mountings; and, concrete anchor edge distances (2" for grouted and 3¾" for expansion anchors). The number of posts and their locations may vary by reducing post spacing and adjusting the length of rail panel (s).
4. Encased guardrail posts shall conform in section to standard timber and steel posts, and be paid for under the contract unit price for Special Guardrail Post, EA. Payment shall include cost of foam wrap and concrete encasement.

SPECIAL POST LOCATIONS ON CURB INLETS

LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
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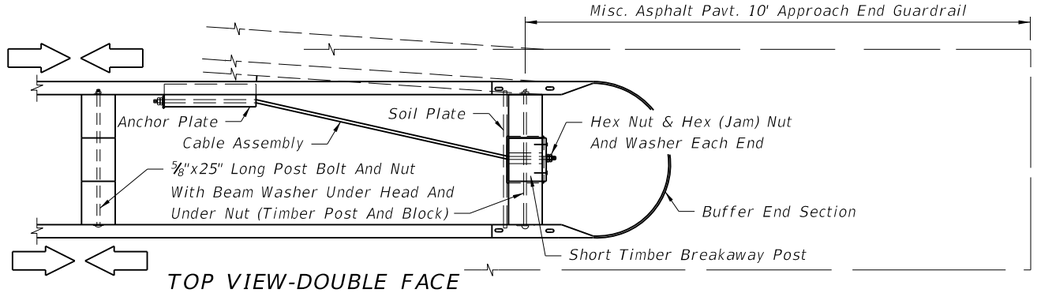
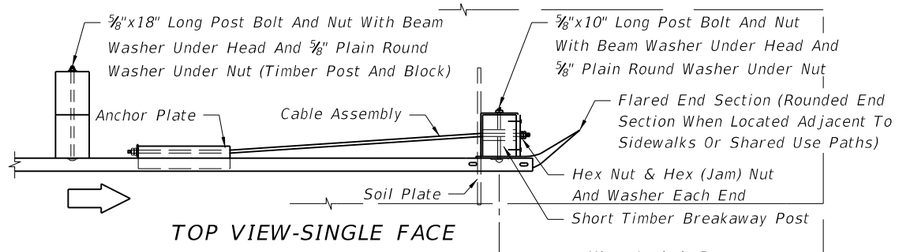
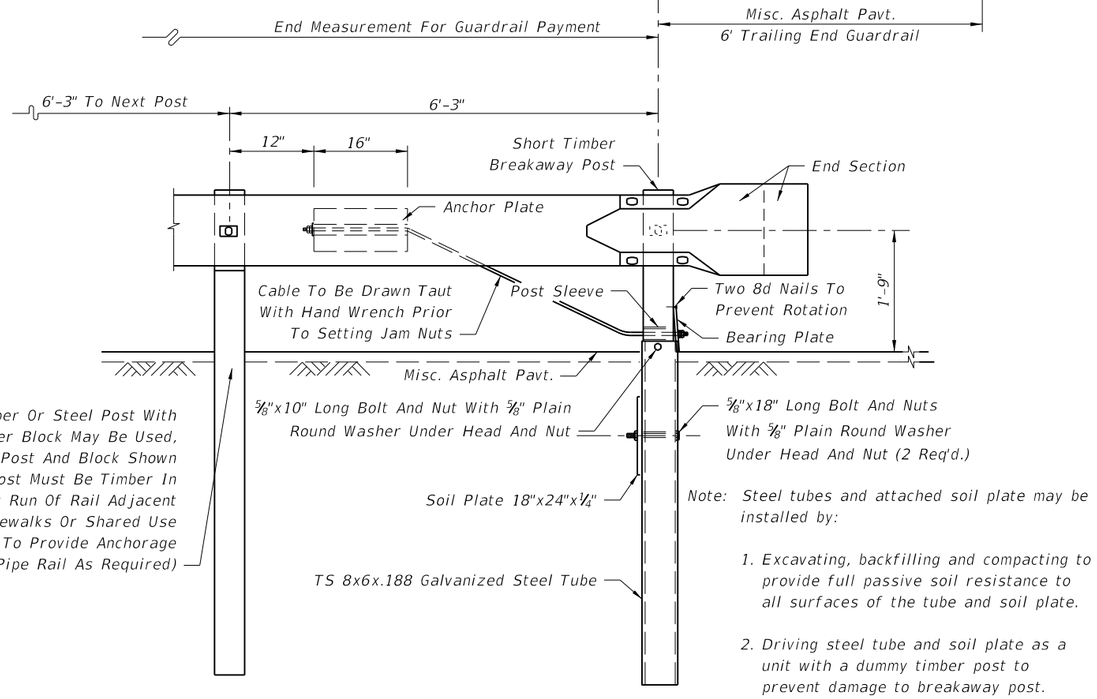


TOP VIEW-DOUBLE FACE



TOP VIEW-SINGLE FACE



FRONT VIEW

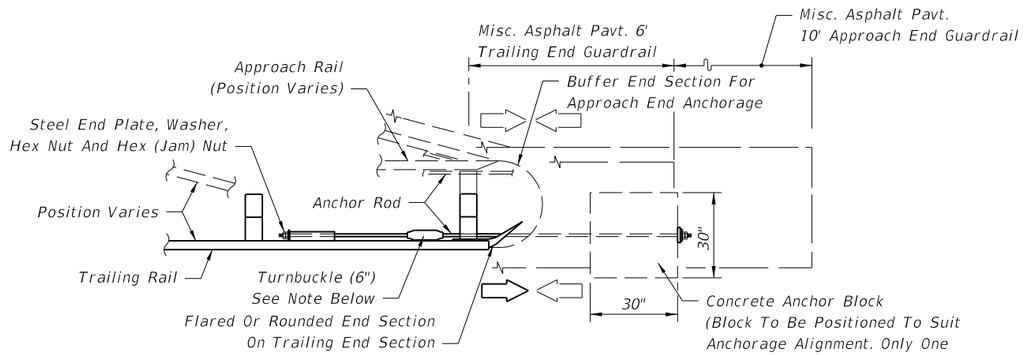
Note: Steel tubes and attached soil plate may be installed by:

1. Excavating, backfilling and compacting to provide full passive soil resistance to all surfaces of the tube and soil plate.
2. Driving steel tube and soil plate as a unit with a dummy timber post to prevent damage to breakaway post.

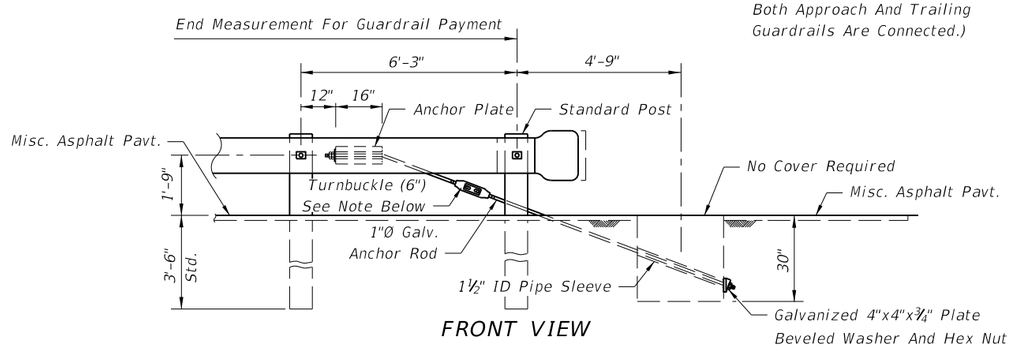
The payment for the items of End Anchorage Assembly Type II shall be full compensation for furnishing and installing either the Round or the Buffer End Section, the Beam Anchor Plate, Cable Assembly, Pipe Sleeve, Soil Plate, Steel Tube, Bearing Plate, Short Timber Breakaway Post, Offset Blocks and the necessary hardware.

CABLE ANCHOR OPTION

END ANCHORAGE ASSEMBLY TYPE II



TOP VIEW



FRONT VIEW

Turnbuckle shall be field cut, threaded 4" on each end, and, metalized in accordance with Sections 562 and 975 of the Standard Specifications. The cost for cutting, threading, metalizing and the turnbuckle shall be included in the contract unit price for Reset Guardrail, LF.

The payment for the items of End Anchorage Assembly Type II shall be full compensation for furnishing and installing the Beam Anchor Plate, Anchor Rod, Pipe Sleeve, Anchor Block, either Flared, Rounded or Buffer End Section, and the necessary hardware.

CONCRETE ANCHOR BLOCK OPTION

TYPE II NOTES

1. Unless specified in the plans, the contractor can supply either the cable anchor option or the concrete anchor block option.

2. Type II end anchorage assemblies are approved for all speeds and are intended for use as:

   a. trailing end anchorages for single face free standing guardrail systems;
   b. approach end anchorages for single face free standing guardrail systems when end anchorage is located outside of the clear zone; and,
   c. both approach and trailing ends of double face guardrail systems.

   Crash cushions shall be constructed at or in lieu of approach Type II end anchorages located inside the clear zone.

   End anchorage for thrie beam guardrail shall be constructed the same as detailed for W-beam, except use thrie beam rail and end section; and the Anchor Plate is to be attached to the bottom corrugation of the thrie beam.

3. These end anchors are to be paid for under the contract unit price for Guardrail, End Anchorage Assembly (Type II), EA as called for in the plans or by permit.

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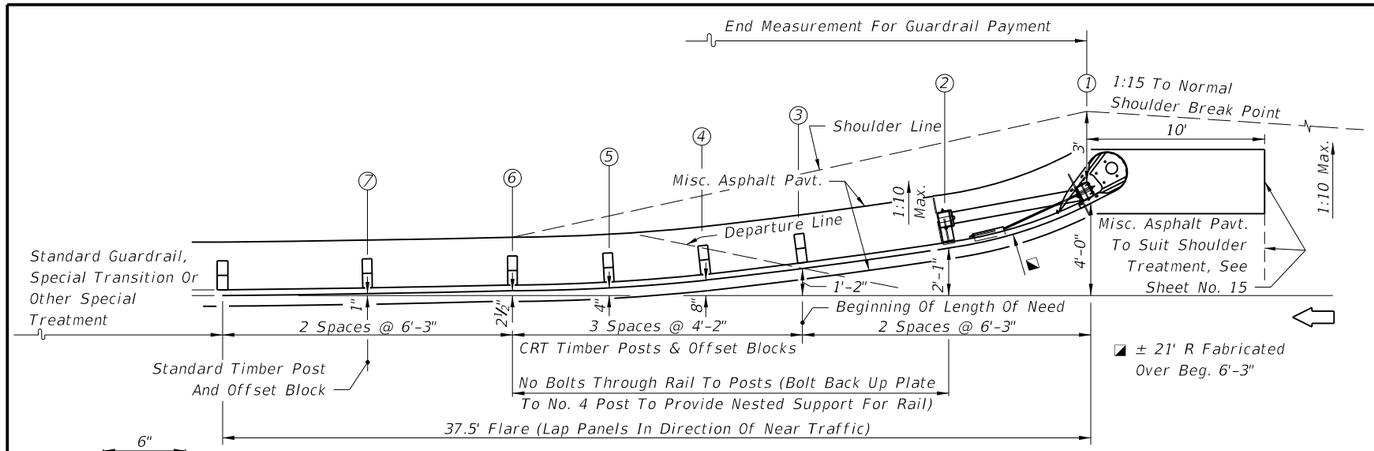
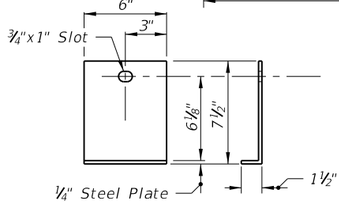
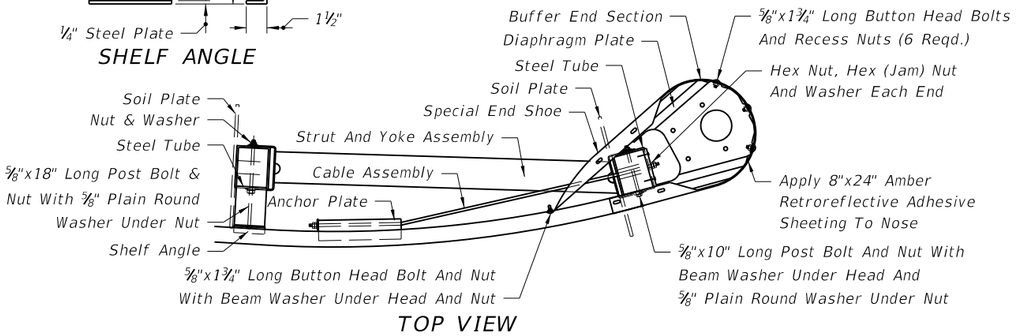


PLAN

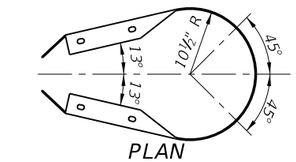
MODIFIED ECCENTRIC LOADER TERMINAL (MELT)



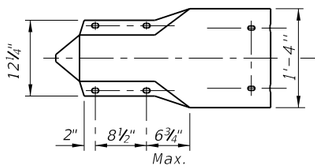
SHELF ANGLE



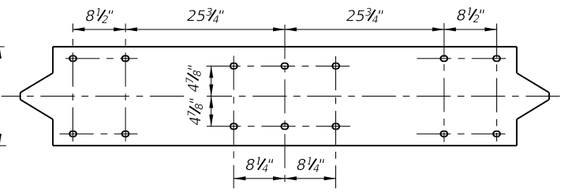
TOP VIEW



PLAN



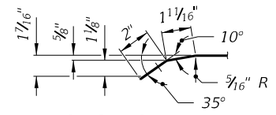
ELEVATION



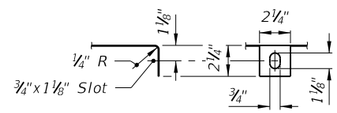
FLAT PLATE LAYOUT

All Slots Shall Be $^{29}/_{32}$"x1⅛"

BUFFERED END SECTION



SECTION AA

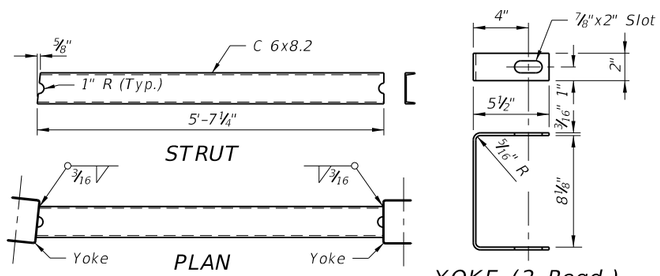


SECTION BB

Note:
Steel tubes and attached soil plate may be installed by:
1. Excavating, backfilling and compacting to provide full passive soil resistance to all surfaces of the tube and soil plate.
2. Driving steel tube and soil plate as a unit with a dummy timber post to prevent damage to breakaway post.

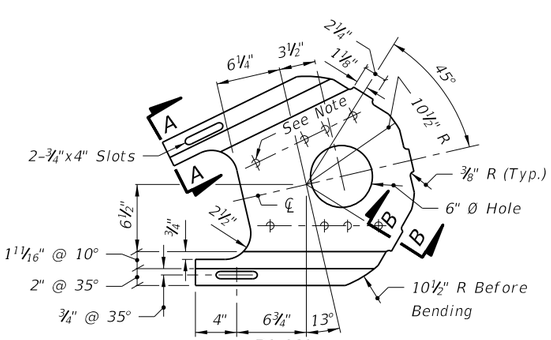
FRONT VIEW

END ANCHORAGE ASSEMBLY TYPE MELT



Note: Assembly installed with channel turned down for right side guardrail and turned up for left side guardrail.

STEEL STRUT AND YOKE ASSEMBLY



PLAN

Note: Bolt holes are not required, but, diaphragms with either manufacturer produced two or three hole in line patterns are acceptable.

DIAPHRAGM PLATE (2 Reqd.)

MODIFIED ECCENTRIC LOADER TERMINAL NOTES

1. The MELT is applicable for design speeds up to 45 mph. The MELT is intended for use as an approach end guardrail anchorage for shoulder guardrail. Its alignment is a flare from the normal guardrail alignment with an effective length of 37.5' including three standard W-beam panel outside of any standard guardrail, guardrail transitions or other special treatments.
2. This standard drawing is produced by the Florida Department Of Transportation solely for use by the Department and its assignees. This standard drawing provides the general graphics and information necessary to field identify component parts of the MELT and their incorporation into a whole system.
3. This standard drawing is sufficient for plan details for the MELT when installed in connection with shoulder guardrail and precludes the requirement for shop drawing submittals unless the plans otherwise call for such submittals. The MELT shall be assembled in accordance with the distributor's detailed drawings, procedures and specifications.
4. The first two post must be short timber breakaway posts with steel foundation tubes and soil plates, post Nos. 3 thru 6 must be CRT timber posts and post No. 7 must be a standard timber post.
5. The MELT can not be used in medians where horizontal clearance requires the use of a backrail.
6. See the General Notes for galvanizing requirements of metallic components.
7. If the plans call for the MELT at a specific location, substitutions with other end anchorage assemblies will not be permitted unless approved by the Engineer. If the plans call for end anchorage assembly 'flared' at a specific location, the contractor has the option to construct any FDOT approved flared assembly that meet the applications for that location. Where a flared end anchorage is called for in the plans, any approved substitution with a parallel end anchorage will not be eligible for CSIP consideration.
8. The MELT shall be paid for under the contract unit price for Guardrail, End Anchorage Assembly (Flared), EA and shall be full compensation for furnishing and installing all components in accordance with the plans; the distributor's detailed drawings, procedures and specifications and this Index.

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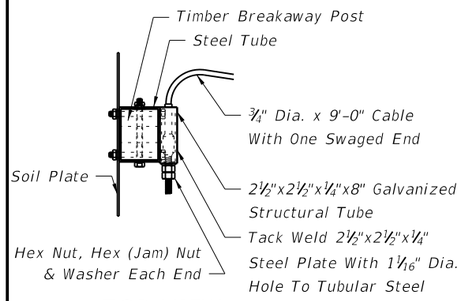
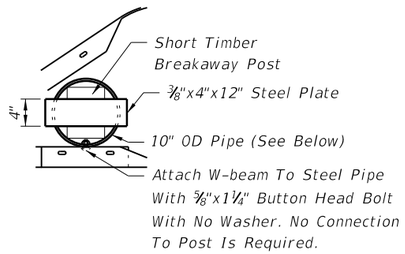
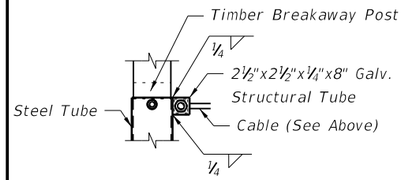
LAST REVISION	REVISION	DESCRIPTION:				
07/01/02			FDOT 2014 DESIGN STANDARDS	GUARDRAIL	INDEX NO. 400	SHEET NO. 24 of 26



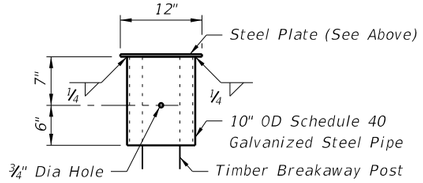
TOP VIEW



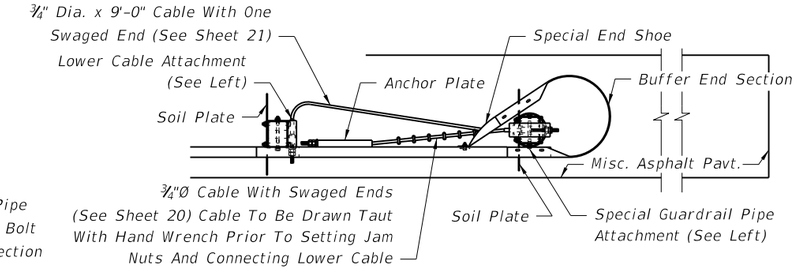
TOP VIEW



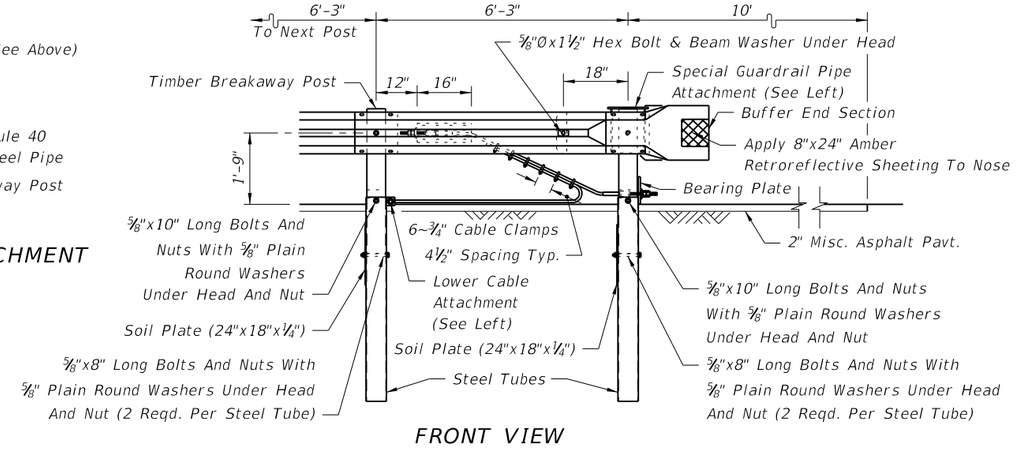
FRONT VIEW
LOWER CABLE ATTACHMENT



FRONT VIEW
SPECIAL GUARDRAIL PIPE ATTACHMENT

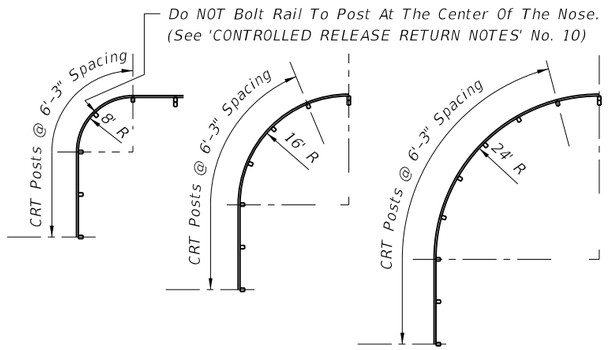


TOP VIEW

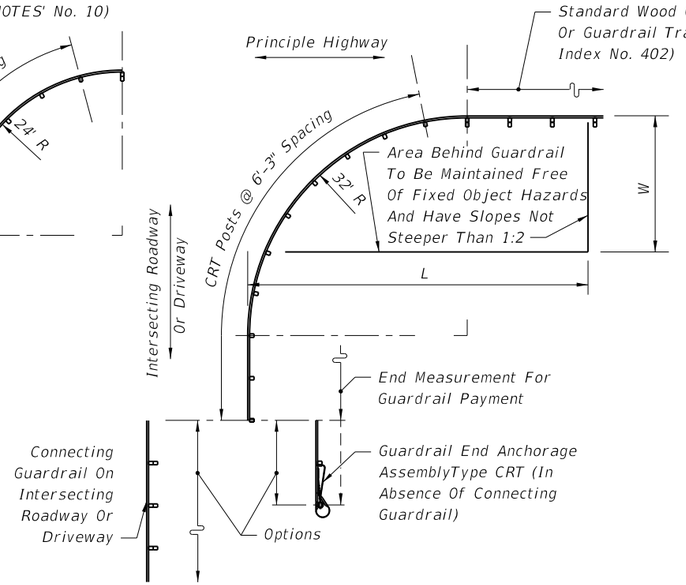


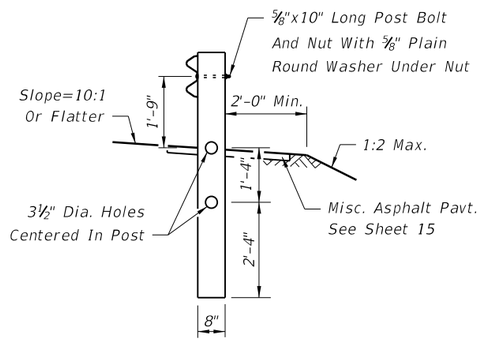
FRONT VIEW

GUARDRAIL END ANCHORAGE ASSEMBLY TYPE CRT



Return Nom. R	Length Of Shop Bent Panels	No. Of CRT Posts	Required Area Free Of Hazards L x W
8'	12.5'	5	25' x 15'
16'	25'	6	30' x 15'
24'	37.5'	8	40' x 20'
32'	50'	11	50' x 20'





Note: To be constructed when flares and transitions or standard radial returns can not be applied. See Sheet 12.

CRT TIMBER POST

CONTROLLED RELEASE RETURN FOR SIDE ROAD AND DRIVEWAY ACCESS

CONTROLLED RELEASE RETURN NOTES

1. Controlled release returns are intended for use (a) in openings in continuous guardrail for driveway and side road access when flares and transitions or standard radial returns can not be applied (Sheet 12); and, (b) for shielding the ends of bridge traffic rails and barrier walls where the driveway and side road access is in close proximity to the structure and space does not permit the proper use of approved flared and parallel types of Guardrail End Anchorage Assemblies.
2. Controlled release returns are not intended as a substitute or replacement for the appropriate use of approved vehicle impact attenuators.
3. Controlled release returns with either 8', 16' or 24' radii are designed for highway speeds of 60 mph or less.
4. The controlled release returns shown are designed as full returns based on an intersection angle of 90°. The return can be terminated with the Guardrail End Anchorage Assembly Type CRT or connected to standard guardrail as shown or as otherwise detailed in the plans.
5. The Guardrail End Anchorage Assembly Type CRT is to be used only for the controlled release returns with 8', 16', 24' and 32' radii as shown; the assembly is not to be used in any tangent rail or flared rail applications. Other types of end anchorage assemblies are not to be used in the controlled release returns.
6. The area immediately behind the control release return shall have slopes not steeper than 1:2 and be maintained free of fixed objects in accordance with the area limits tabulated in the plan below.
7. The surface approaching the controlled release return shall have a transverse slope not exceeding 1:10. The effective width of the transverse surface is to be based on standard vehicle departure, return radii and preceding shielding; the width (beyond shoulder) shall be not greater than the corresponding 15' and 20', 'W' values tabulated below.
8. The curved guardrail portion of the controlled release return shall be full section shop bent panels (12.5' or 25' panels).
9. Washers are not to be used between the guardrail beam and the head of the button head post bolts at any controlled release terminal (CRT) post or at any Guardrail End Anchorage Assembly Type CRT breakaway timber post.
10. The guardrail beam of the 8' radius return is not bolted to the center control release post.
11. See the General Notes for galvanizing requirements of metallic components.
12. Controlled release return systems shall be paid for under the contract unit prices for Guardrail (Roadway), LF, Guardrail (Shop-bent Panels), LF, and Guardrail, End Anchorage Assembly (Type CRT), EA as called for in the plans or by permit and shall be full compensation for furnishing and installing all components in accordance with the plans and with this index. CRT posts are included in the cost for guardrail.

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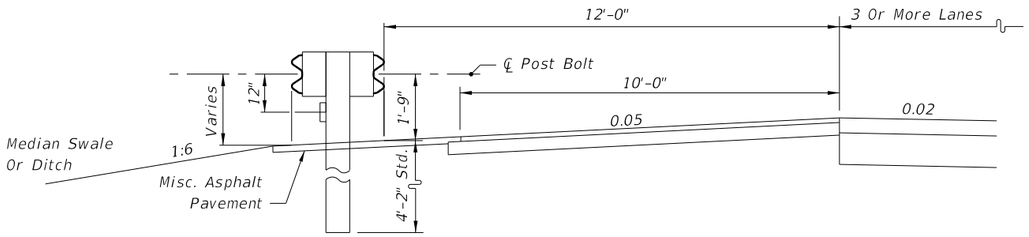
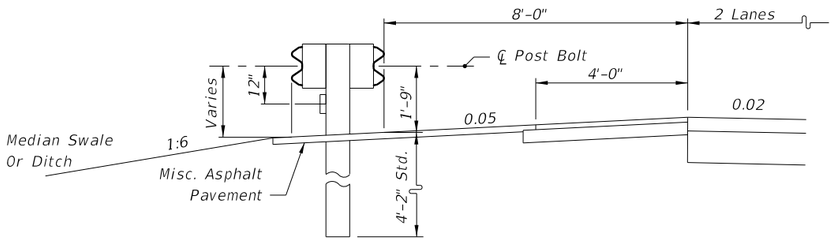
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/04			FDOT 2014 DESIGN STANDARDS	GUARDRAIL	400	25 of 26





Notes:

1. Typical placement shown. May be constructed at other locations as called for in the plans.

2. Rub Rail is required on the median side or ditch side of the barrier.

MOUNTING HEIGHT FOR DOUBLE FACED GUARDRAIL ON MEDIAN SHOULDERS (FREEWAYS)

LATERAL PLACEMENT ON SLOPES (FROM EDGE OF NEAR TRAFFIC LANE)[1]

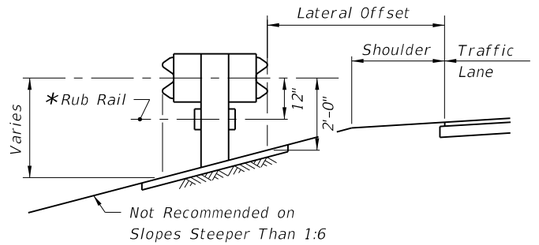
Slope	Standard Guardrail[2]	Guardrail Not Recommended	Guardrail With Rub Rail[3]
1:4	to 13'	14' to 27'	28' to 45'
1:5	to 14'	15' to 25'	26' to 45'
1:6	to 16'	17' to 22'	23' to 45'
1:7	to 20'	21' to 24'	25' to 45'
1:8	to 25'		26' to 45'
1:9	to 26'		27' to 45'
1:10	to 27'		28' to 45'

Notes:

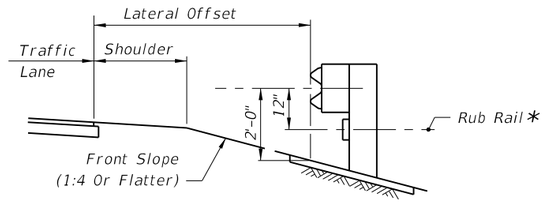
1. For shoulders less than 12' in width the tabulated values will be reduced by the difference between 12' and the shoulder width. Placement of guardrail on front slopes steeper than 1:4 not recommended.

2. Standard guardrail; 1'-9" to ℄ post bolt. Rub Rail is required on the median side when double face guardrail is used.

3. Guardrail with Rub Rail; 2'-0" to ℄ post bolt.



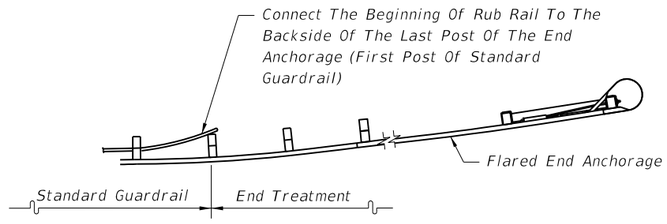
GUARDRAIL ON MEDIAN SLOPES



GUARDRAIL ON OUTSIDE SLOPES

∗ C6x8.2, Plates And Fasteners or Bent Plate And Fasteners In Accordance With Standards RLR01 And RER01 Of AASHTO-AGC-ARTBA "A Guide To Standardized Highway Barrier Hardware"

GUARDRAIL ON SLOPES



RUB RAIL TERMINATION