GENERAL NOTES

1. The illustrations for guardrail applications are standard configurations; adjustments are to be made as required by site specific condition 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 Figure 1, 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 spacings shall be 6'-3" except that reduced spacings shall be used for (a) transitions to anchorages at rigid structures such as bridges (See Details E and J) 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 spacings called for in the plans.

4. Guardrail mounting height for the W-beam without rubrail and for thrie-beam is 1'-9" to the center of beam, and for W-beam with rubrail 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).

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.

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 may be applicable; see General Note No. 10 and the minimum offset table on Sheet 18. 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 shall be used unless other shielding is approved by the Engineer of record. See Index No. 410 for safety shape concrete barriers and typical applications, and the plans for special barrier shapes and applications.

8. In addition to use at conventional roadside hazards, guardrail will be required on flush shoulder sections where fill slopes are steeper than 1:3 within the clear zone, and on curbed sections where fill slopes are steeper than 1:3 within 4' of the face of curb. However, when fill heights are less than 6' the guardrail may be omitted, unless in the opinion of the Engineer its use is deemed necessary due to other roadside features.

9. The guardrail to bridge connections contained in this Index are for bridges with Test Level 4 safety shaped traffic rails. For guardrail to concrete barrier wall connections see Index No. 410.

10. Thrie-beam guardrail panels shall be used in guardrail transitions to bridge traffic rail barriers, to concrete and certain water filled safety shaped barriers, certain crash cushion 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. 410, 416 and 435. The use of thrie-beam guardrail with standard offset blocks 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 rubrail considered functionally deficient,
    c. Overriding W-beam is probable,
    d. Drainage will be impeded or blocked by the use of concrete barrier wall,
    e. High frequency of repairs to W-beam,
    f. Spandrel beam with low deflection needed around unrelocatable structure, and,
    g. Accommodating passenger vehicles heavier or larger than the standard passenger car (e.g., passenger vans and small buses)

    The modified thrie-beam guardrail may have application to accommodate large buses.

11. 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.

12. 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.

13. 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.

14. Corrugated sheet steel beams, end shoes, end sections and back-up plates shall conform to the current requirements of AASHTO M180, Class A, Type II (zinc) coating. Aluminum guardrail elements will not be permitted unless specifically called for in the plans. All other metallic components, hardware and accessories shall be in conformance with the appropriate current AASHTO requirements.

    Recycled beams: Used Class A guardrail beams that have been refurbished to condition new (AASHTO M180) may be used for both construction of new guardrail and maintenance of existing guardrail. Refurbishing shall include stripping of the existing galvanizing, restoration of the base metal in section and straightness free of warp and deformation, and, regalvanizing to AASHTO Type II specifications. Refurbished beams that retain ruptured holes, gashes or tears will not be accepted.

15. 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.

16. 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.

17. Guardrail reflector color (white or yellow) shall conform to the color of the near lane edgeline.

18. 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.

19. Substitutions between thrie-beam guardrail and concrete barrier wall are not eligible for VECP consideration.

20. 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.

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

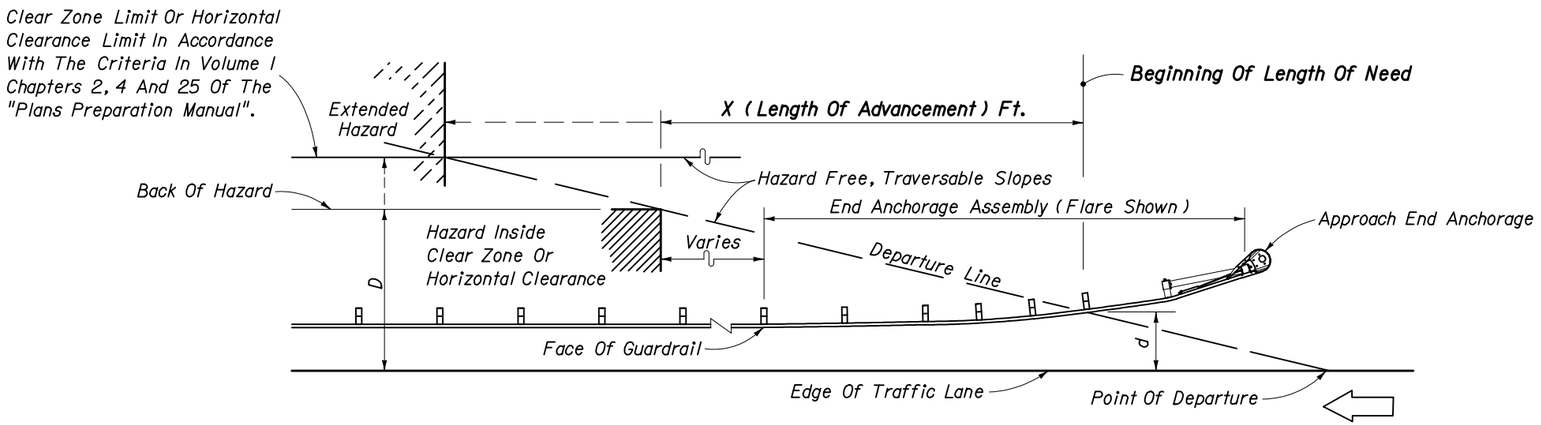
GUARDRAIL

	Names	Dates
Designed By		
Drawn By	HSD	8/83
Checked By	JVG	8/83

Approved By
Roadway Design Engineer

Revision	Sheet No.	Index No.
02	1 of 32	400

$$$$$$SYTIME$$$$$$



Design Speed mph	X (Length Of Advancement) Ft. ◪
≤ 45	= 16 (D-d)
≥ 50	= 13 (D-d)

◪ *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.*

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).

LENGTH OF ADVANCEMENT - FIGURE 1

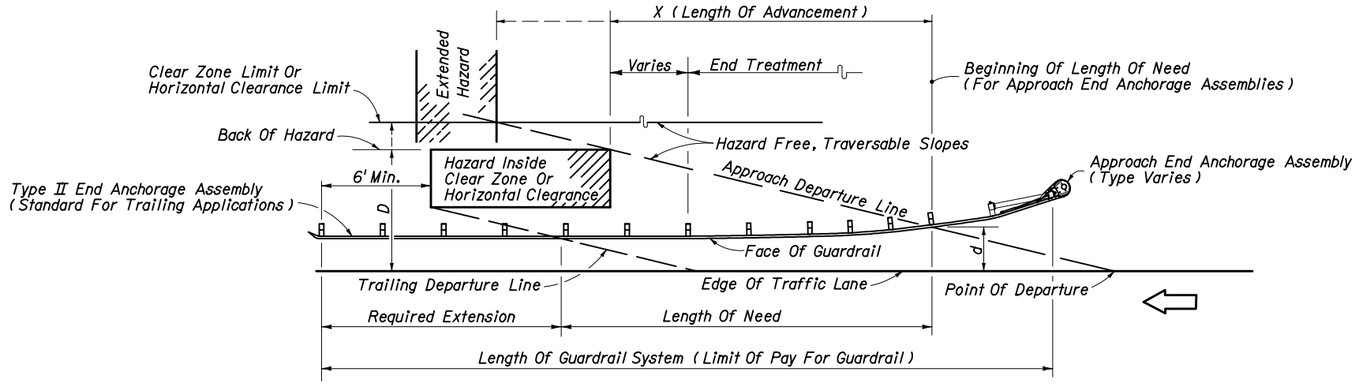
STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

GUARDRAIL

	Names	Dates
Designed By		
Drawn By	HSD	8/83
Checked By	JVG	8/83

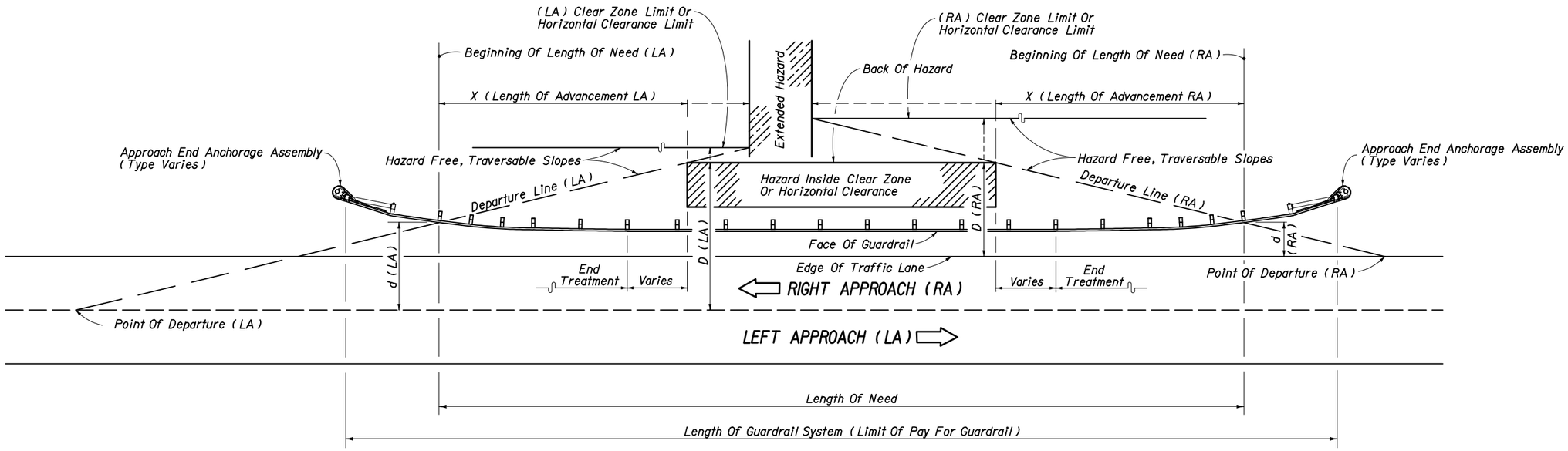
Approved By
Roadway Design Engineer

Revision	Sheet No.	Index No.
00	2 of 32	400



(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

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

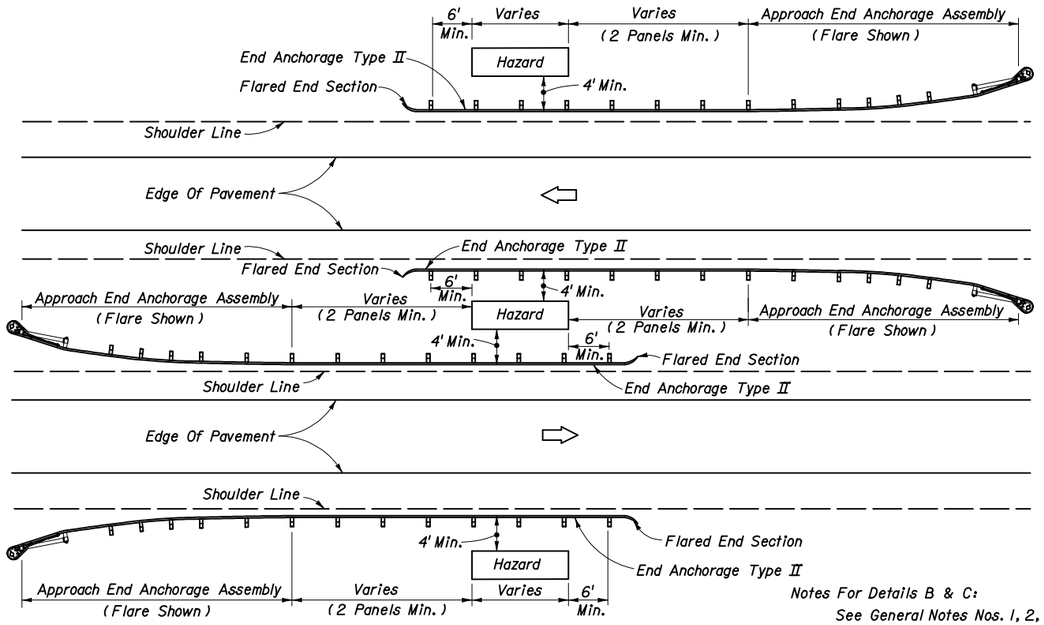
GUARDRAIL

	Names	Dates
Designed By		
Drawn By	HSD	8/83
Checked By	JVG	8/83

Approved By _____
Roadway Design Engineer

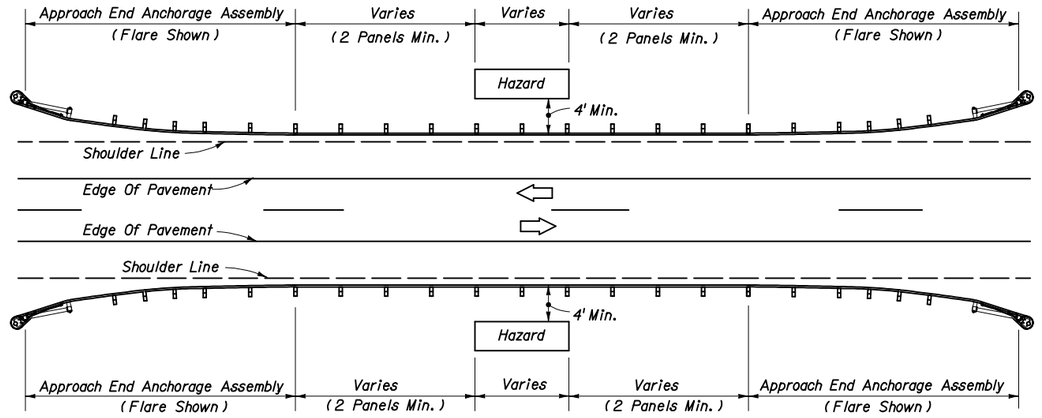
Revision	Sheet No.	Index No.
00	3 of 32	400

$$$$$$SYTIME$$$$$$



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:

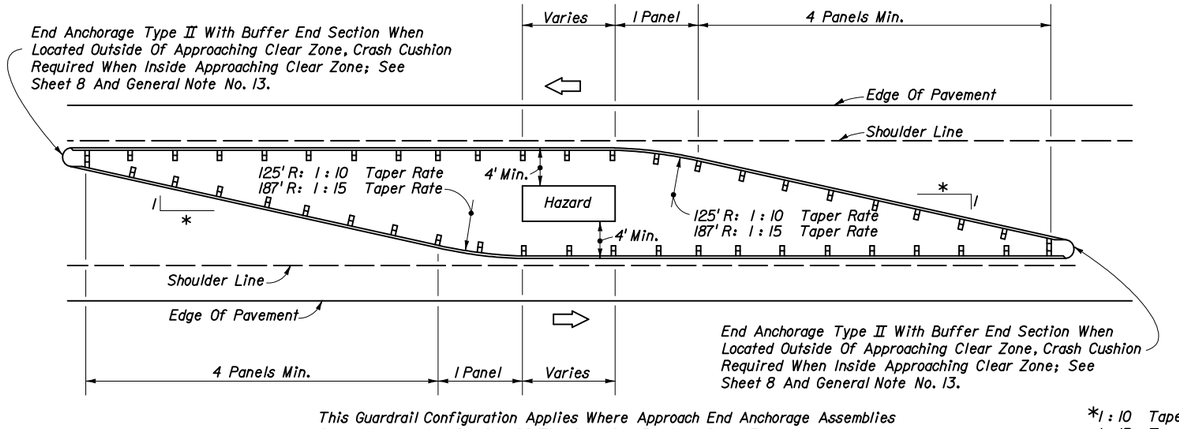
See General Notes Nos. 1, 2, 3, 4, 5, 6, 7 and 8.

See Details K and L for guardrail offsets.

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

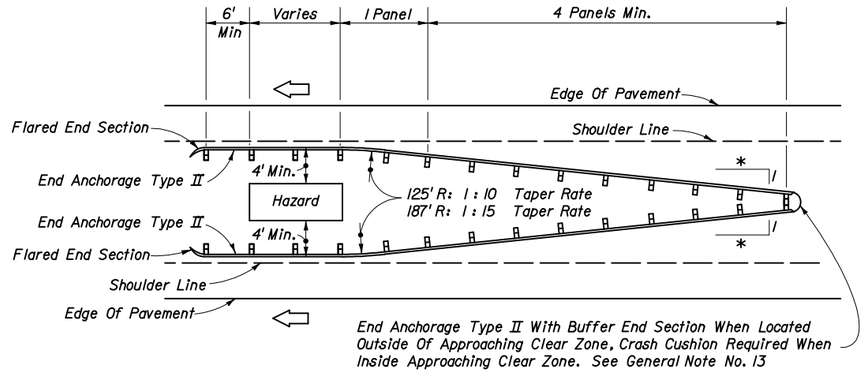
For hazards that require shielding and are located back of curb see other sheets of this index, and where rigid barrier is required see Index No. 410.

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 12.

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

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

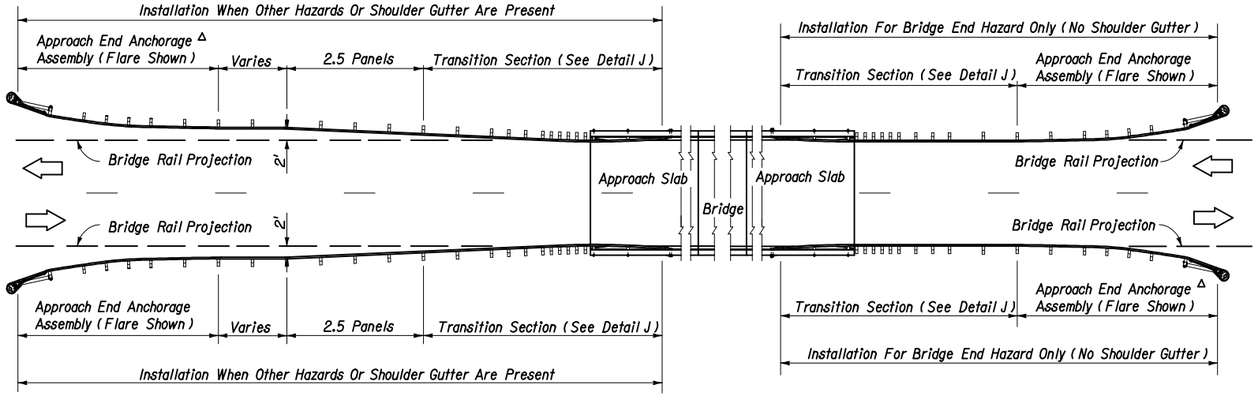
GUARDRAIL

	Names	Dates
Designed By		
Drawn By	HSD	09/81
Checked By	JBW/JVG	09/81

Approved By
Roadway Design Engineer

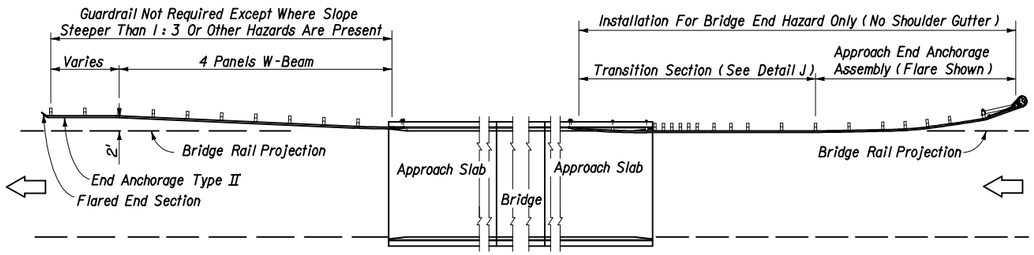
Revision	Sheet No.	Index No.
02	4 of 32	400

$$$$$$SYTIME$$$$$$

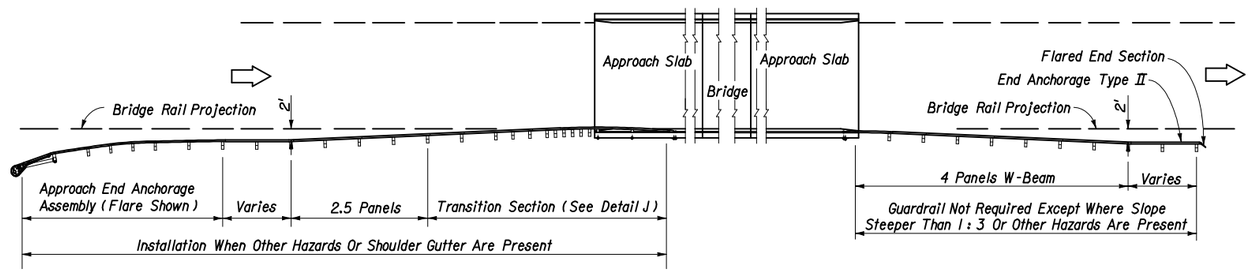


△With Four Or More Lanes Trailing Guardrail Anchorages May Be As Shown In Detail P Unless Other Anchorage Called Out In The Plans

UNDIVIDED ROADWAY - DETAIL O



For Median Guardrail See Sheets 7 & 8 And General Note 11.



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 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

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

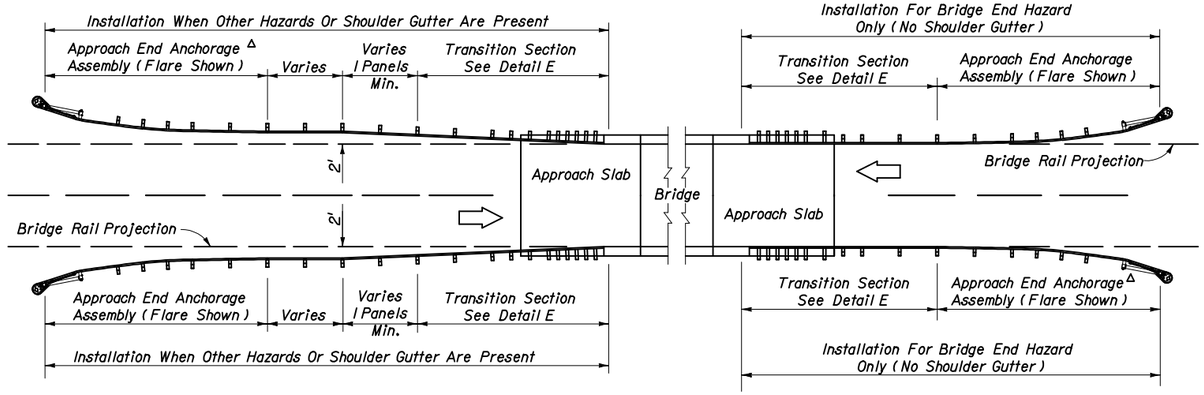
GUARDRAIL

	Names	Dates
Designed By		
Drawn By	HSD	08/83
Checked By	JBW/JVG	08/83

Approved By
Roadway Design Engineer

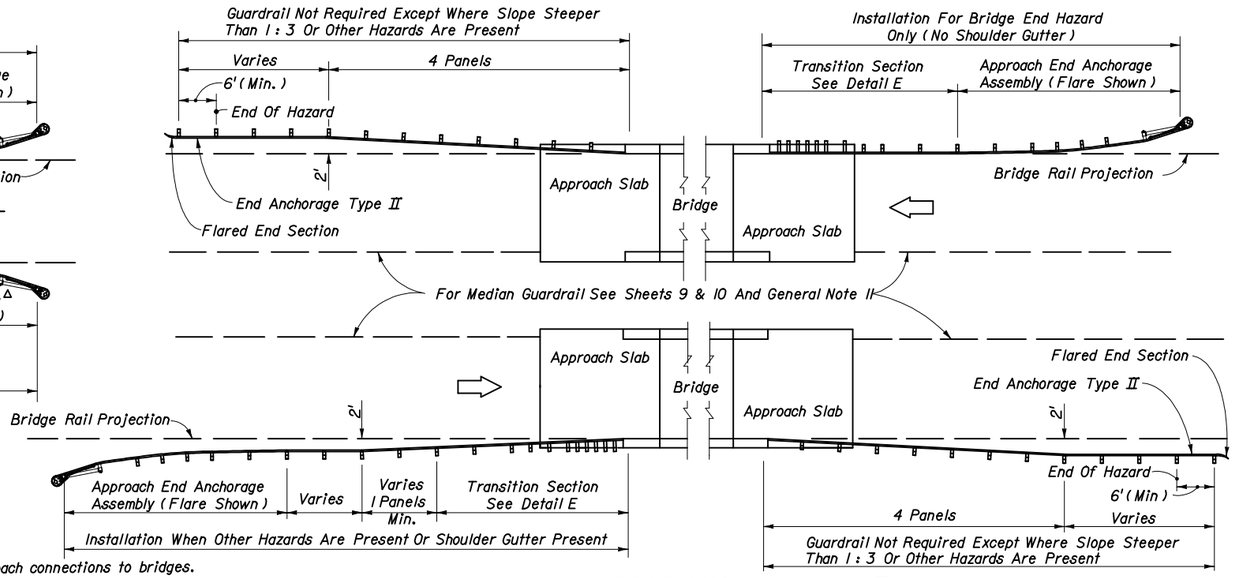
Revision	Sheet No.	Index No.
02	5 of 32	400

$$$$$$SYTIME$$$$$$



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

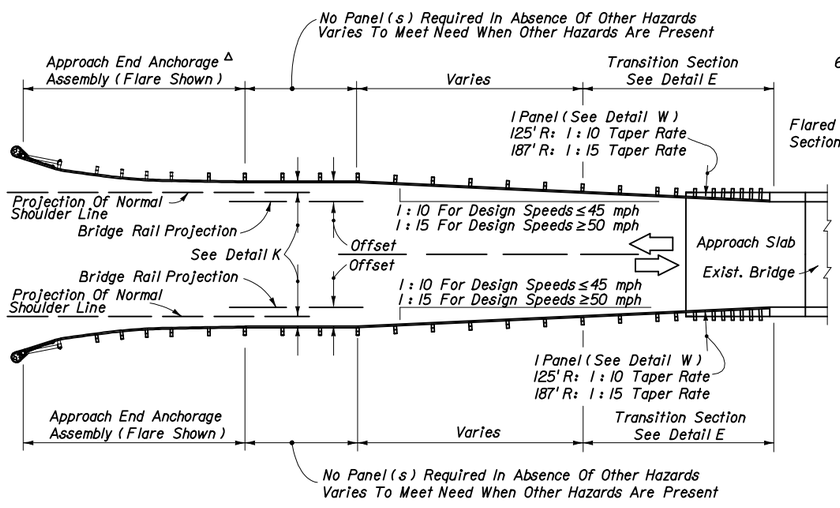
UNDIVIDED ROADWAY - DETAIL H



DIVIDED ROADWAY - DETAIL I

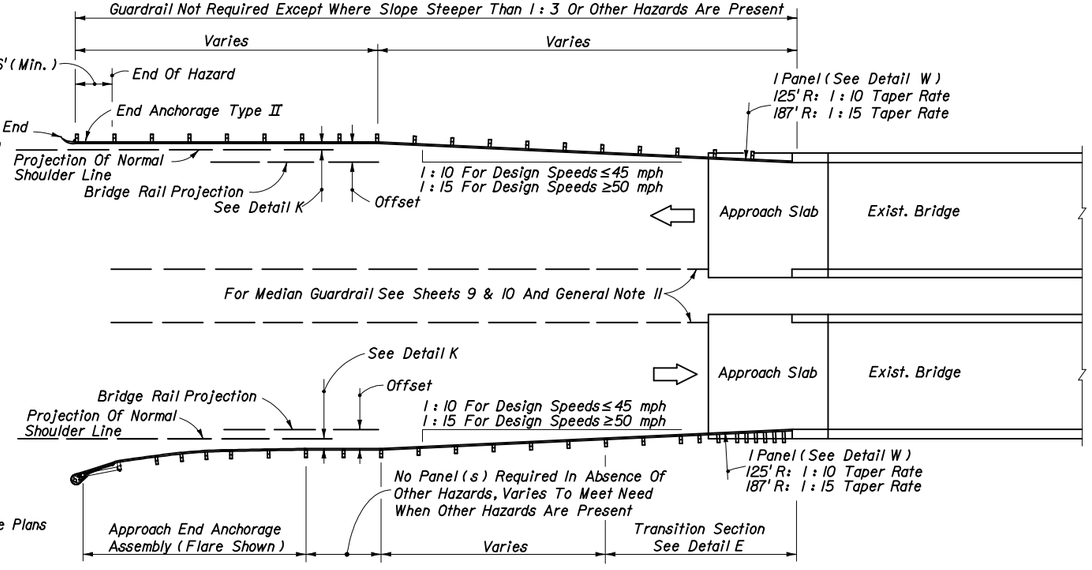
Notes For Details H & I:
See General Notes Nos. 1, 2, 3, 4, 5, 6, 8, and 9. See Details E and N for approach connections to bridges.
For end anchorage assemblies see sheets elsewhere in this Index and in the plans.
Shoulder gutter in itself does not require the installation of guardrail.

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



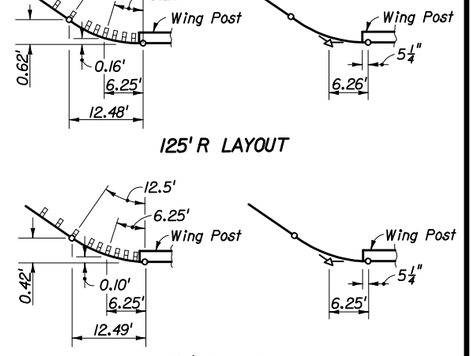
△With Four Or More Lanes Trailing Guardrail Anchorages May Be As Shown In Detail I Unless Other Anchorage Called Out In The Plans

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 Details E and N for approach connections to bridges.
For end anchorage assemblies see sheets elsewhere in this Index and the plans.



See General Note No. 12

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

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

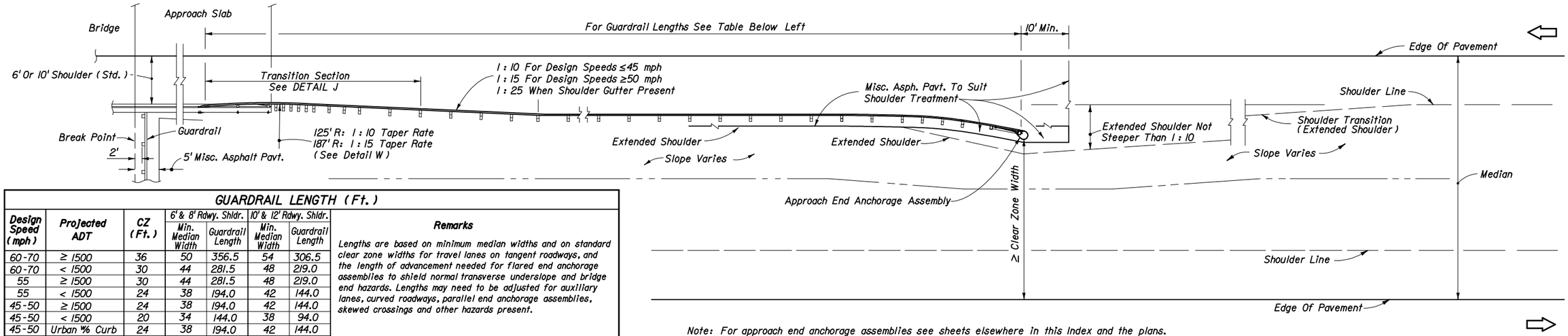
GUARDRAIL

	Names	Dates
Designed By		
Drawn By	HSD	08/83
Checked By	JBW/JVG	08/83

Approved By
Roadway Design Engineer

Revision	Sheet No.	Index No.
02	6 of 32	400

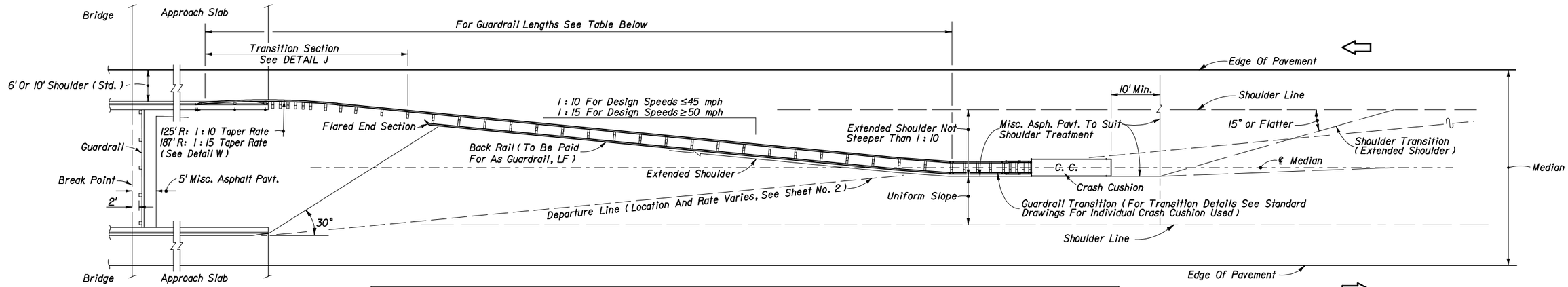
$$$$$$SYTIME$$$$$$



GUARDRAIL LENGTH (Ft.)							
Design Speed (mph)	Projected ADT	CZ (Ft.)	6' & 8' Rdwy. Shldr.		10' & 12' Rdwy. Shldr.		Remarks
			Min. Median Width	Guardrail Length	Min. Median Width	Guardrail Length	
60-70	≥ 1500	36	50	356.5	54	306.5	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.
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 "% Curb	24	38	194.0	42	144.0	
35-40	Urban "% Curb	18	32	144.0	36	81.5	

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

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

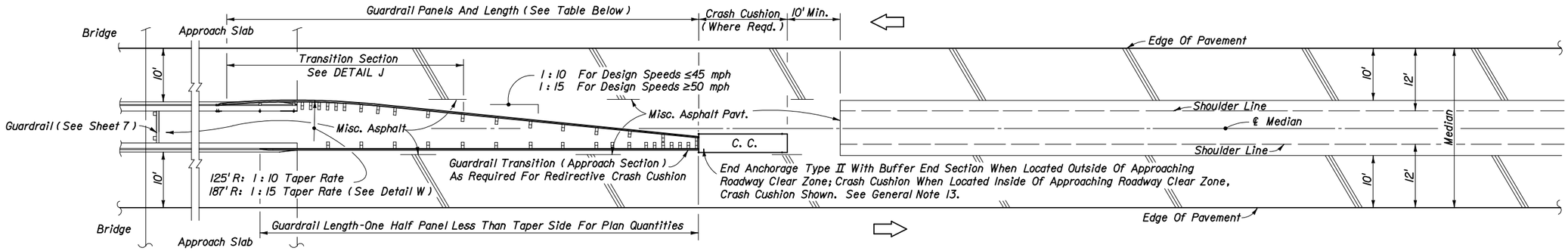
GUARDRAIL

	Names	Dates
Designed By		
Drawn By	HSD	09/81
Checked By	JBM/JVG	09/81

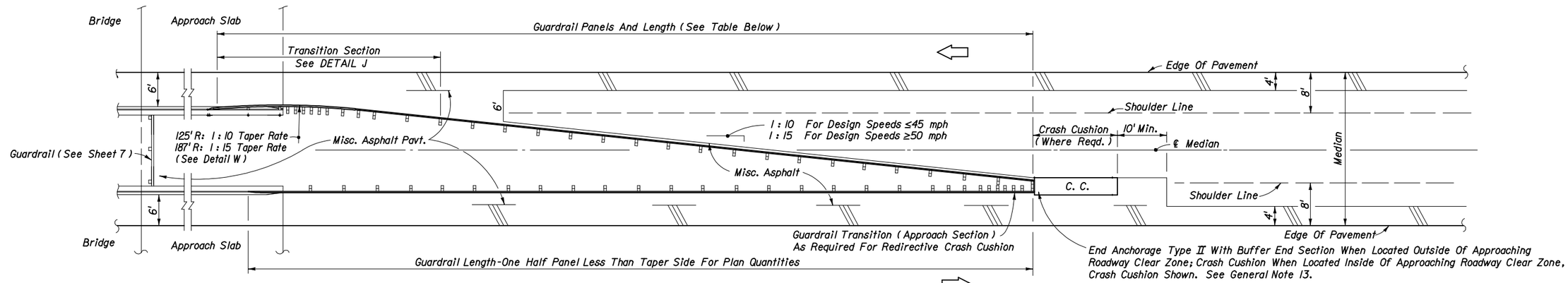
Approved By
Roadway Design Engineer

Revision	Sheet No.	Index No.
00	7 of 32	400

$$$$$$SYTIME$$$$$$



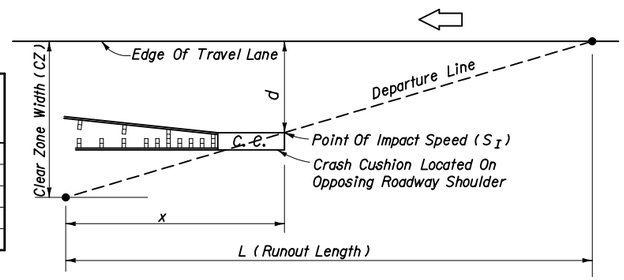
MEDIANS WITH 10' BRIDGE SHOULDERS



MEDIANS WITH 6' BRIDGE SHOULDERS

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

Design Speed (mph)	CZ (Ft.)
< 45	18
45	24
50	24
55	30
> 55	36



Speed (S_I) For Determining Crash Cushion Size:

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

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

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

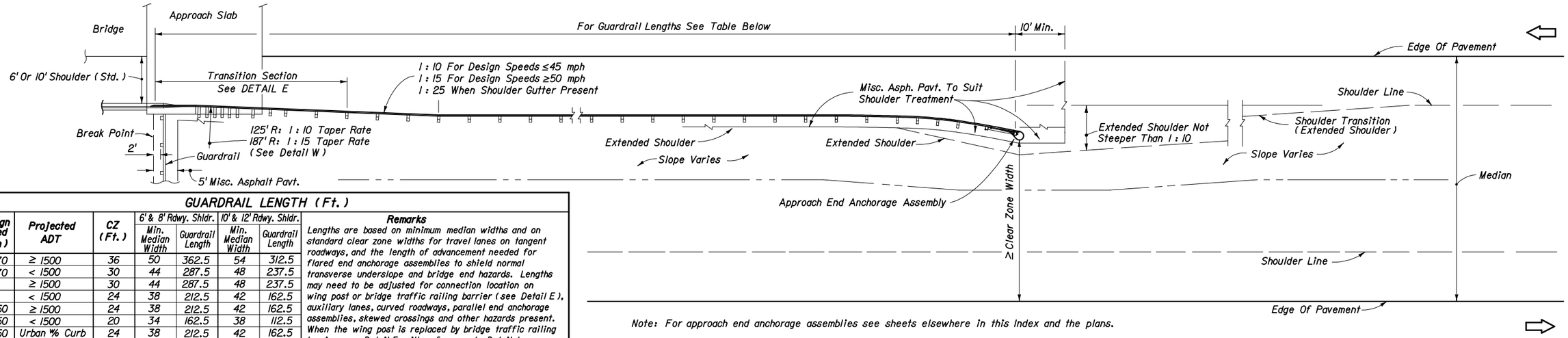
GUARDRAIL

	Names	Dates
Designed By		
Drawn By	RWR	08/82
Checked By	JVG/JBW	08/82

Approved By
Roadway Design Engineer

Revision	Sheet No.	Index No.
00	8 of 32	400

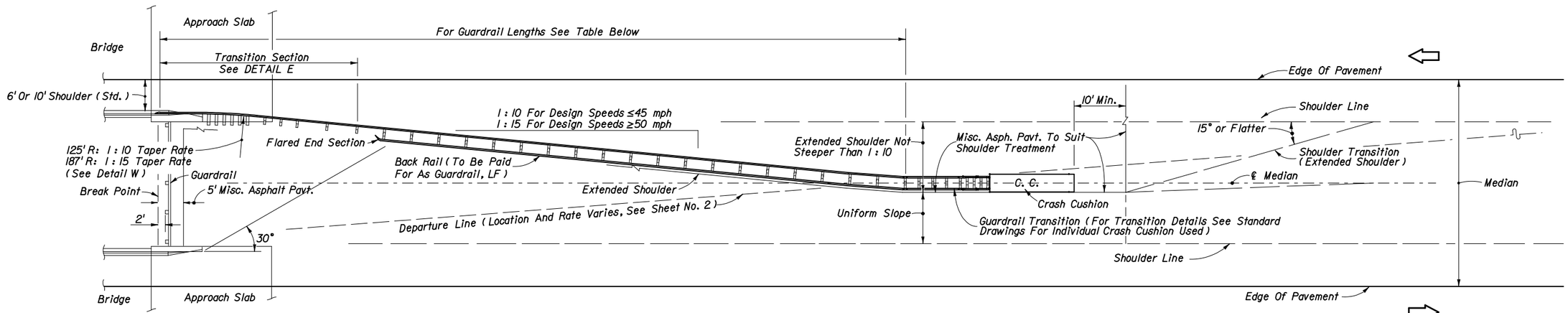
$$$$$$$SYTIME$$$$$$$



GUARDRAIL LENGTH (Ft.)							
Design Speed (mph)	Projected ADT	CZ (Ft.)	6' & 8' Rdwy. Shldr.		10' & 12' Rdwy. Shldr.		Remarks
			Min. Median Width	Guardrail Length	Min. Median Width	Guardrail Length	
60-70	≥ 1500	36	50	362.5	54	312.5	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 Detail E), 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, see Detail E with reference to Detail J.
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 ⅝ Curb	24	38	212.5	42	162.5	
30-40	Urban ⅝ Curb	18	32	162.5	36	100.0	

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, see Detail E with reference to Detail J. 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

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

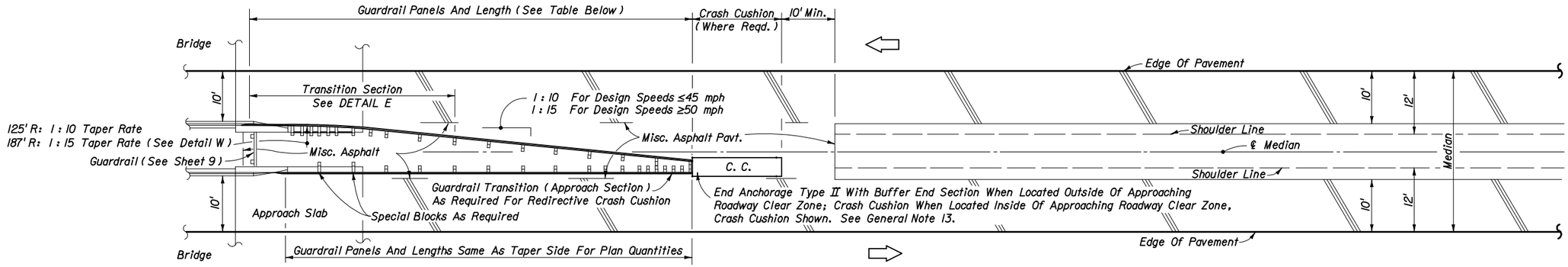
GUARDRAIL

	Names	Dates
Designed By		
Drawn By	HSD	09/81
Checked By	JBM/JVG	09/81

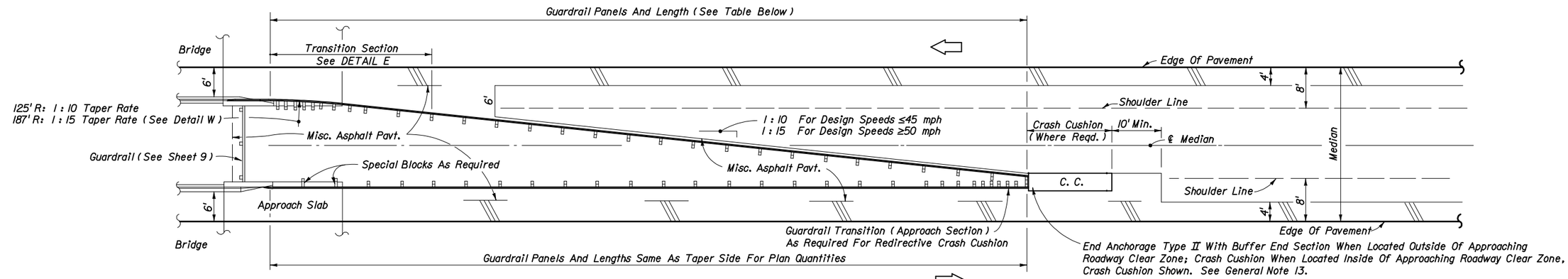
Approved By
Roadway Design Engineer

Revision	Sheet No.	Index No.
00	9 of 32	400

$$$$$$$SYTIME$$$$$$$

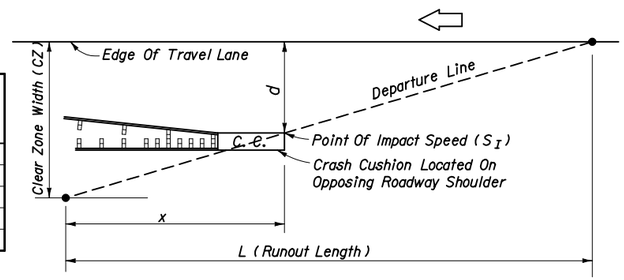


MEDIANS WITH 10' BRIDGE SHOULDERS



MEDIANS WITH 6' BRIDGE SHOULDERS

Design Speed (mph)	CZ (Ft.)
<45	18
45	24
50	24
55	30
>55	36



Speed (S_I) For Determining Crash Cushion Size:

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

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

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

GUARDRAIL

	Names	Dates
Designed By		
Drawn By	RWR	08/82
Checked By	JVG/JBW	08/82

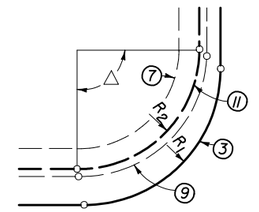
Approved By
Roadway Design Engineer

Revision	Sheet No.	Index No.
00	10 of 32	400

$$$$$$$SYTIME$$$$$$$

LEGEND

1. Edge of roadway pavement.
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.

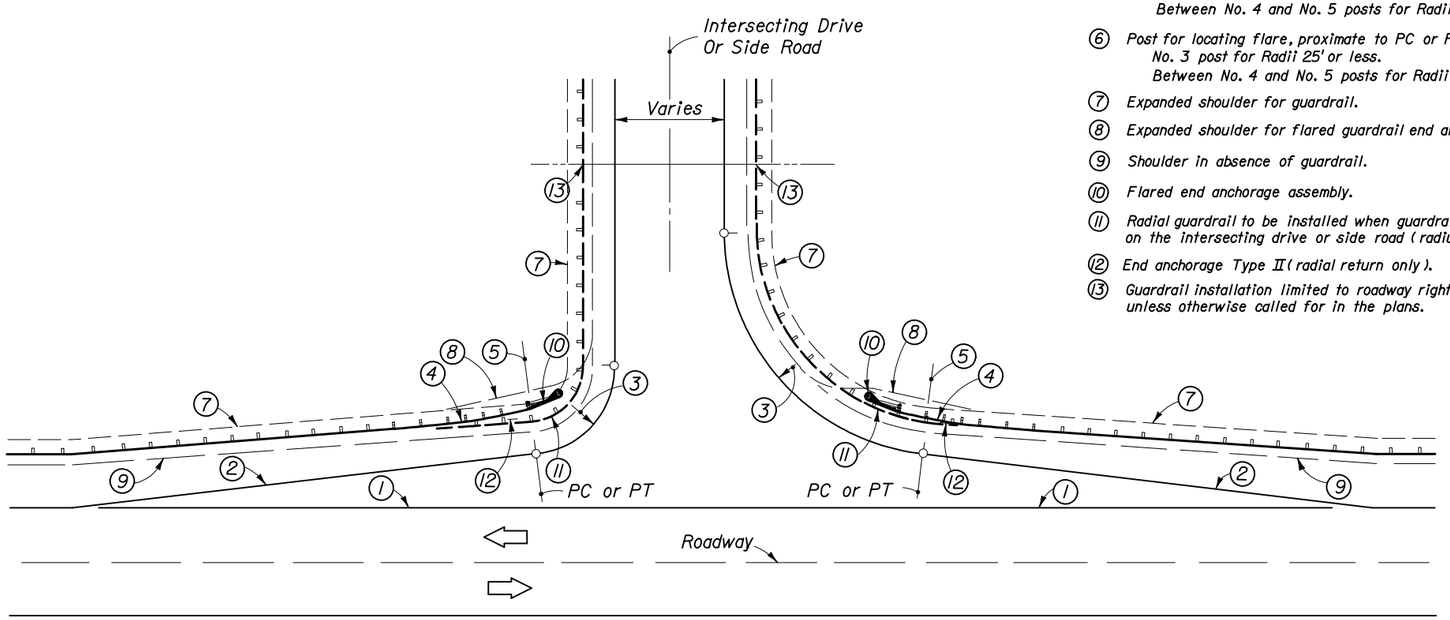


RADIAL GUARDRAIL

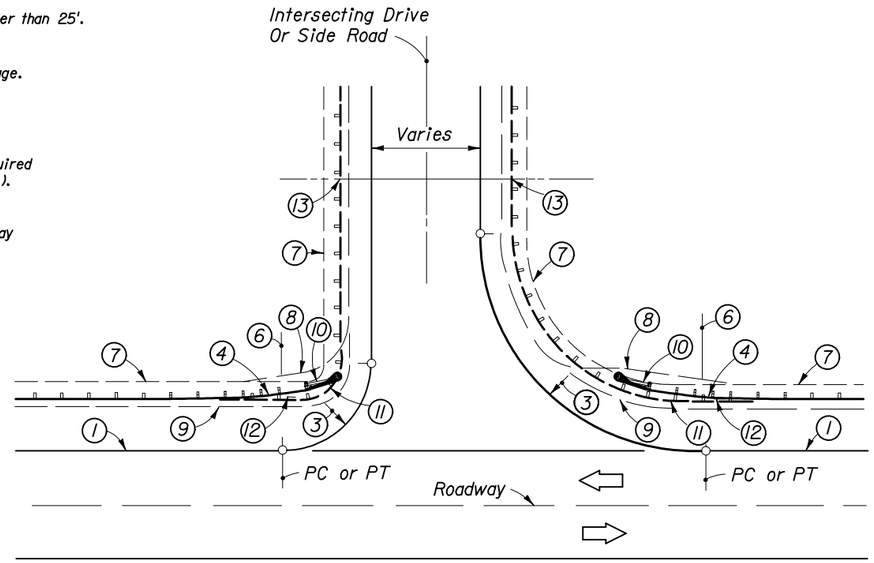
RADIAL GUARDRAIL

	Normal Turnouts					
	Taper			Simple Curve		
R_1	R_2	Panels Required	Δ	R_2	Panels Required	Δ
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

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

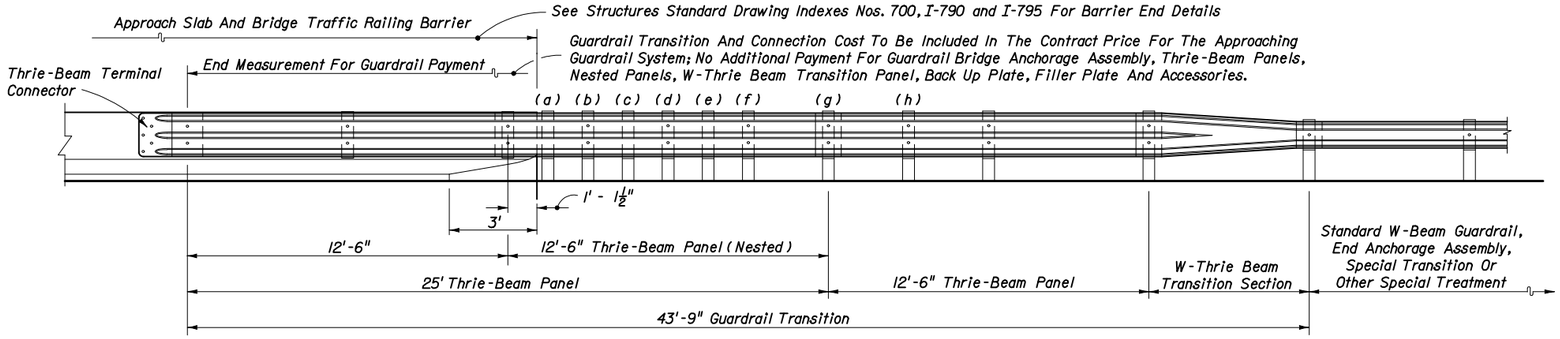
GUARDRAIL

	Names	Dates
Designed By		
Drawn By	HSD	09/83
Checked By	JVG	09/83

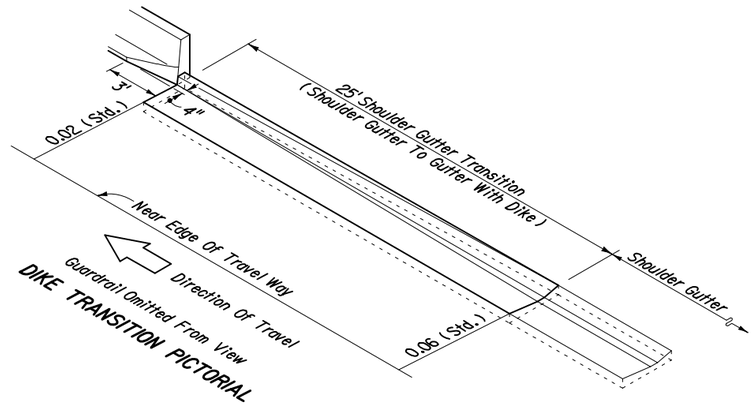
Approved By
Roadway Design Engineer

Revision	Sheet No.	Index No.
00	11 of 32	400

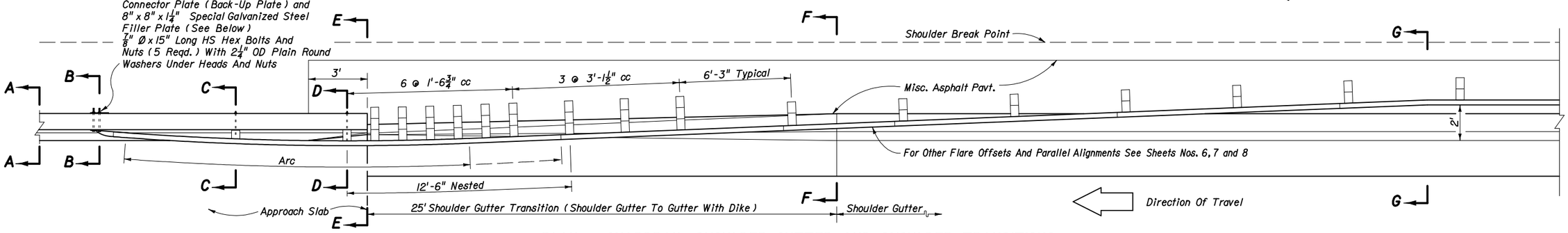
$$$$$$$SYTIME$$$$$$$



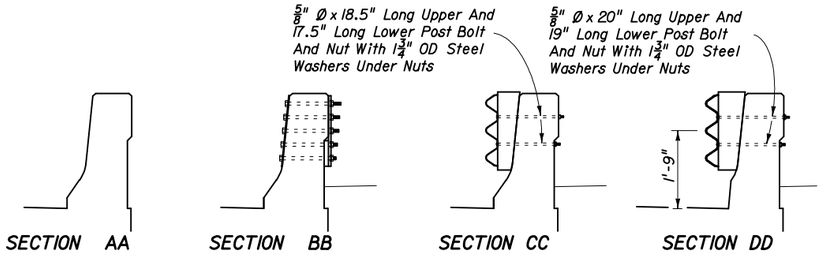
ELEVATION

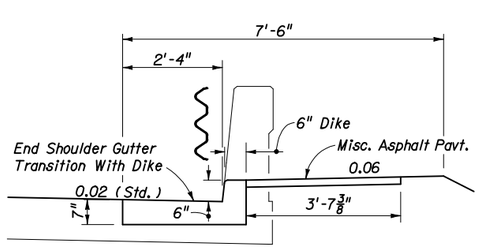


DIKE TRANSITION PICTORIAL

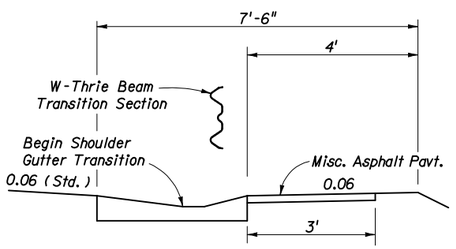


PLAN - GUARDRAIL, SHOULDER GUTTER AND SHOULDER TRANSITIONS

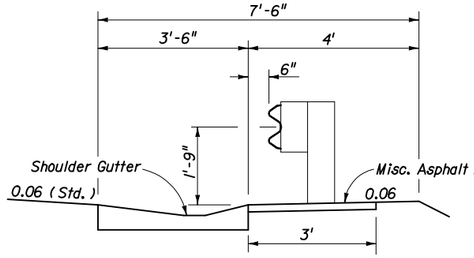




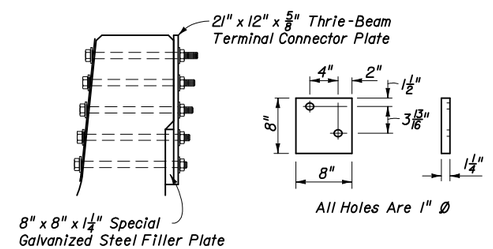
SECTION EE



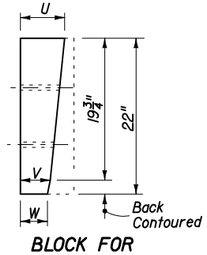
SECTION FF



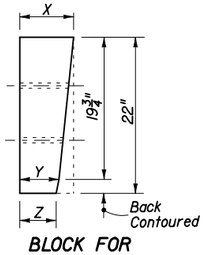
SECTION GG



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	4⅝"	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

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

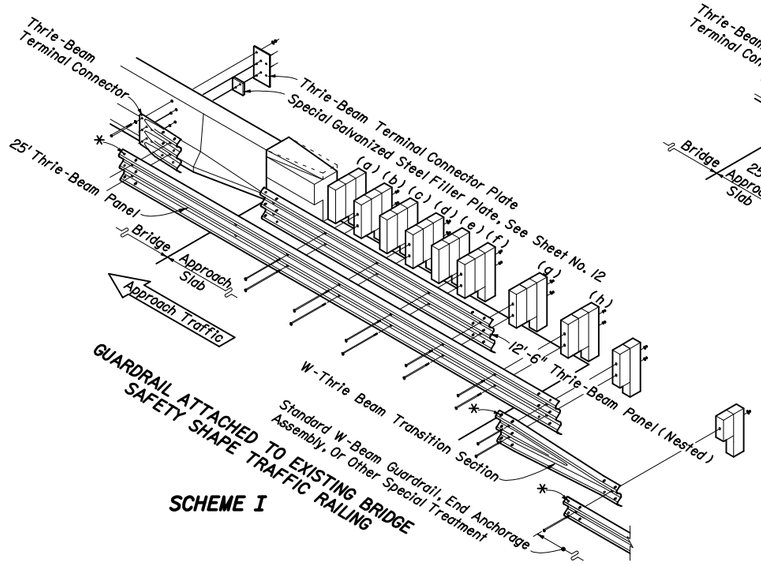
GUARDRAIL

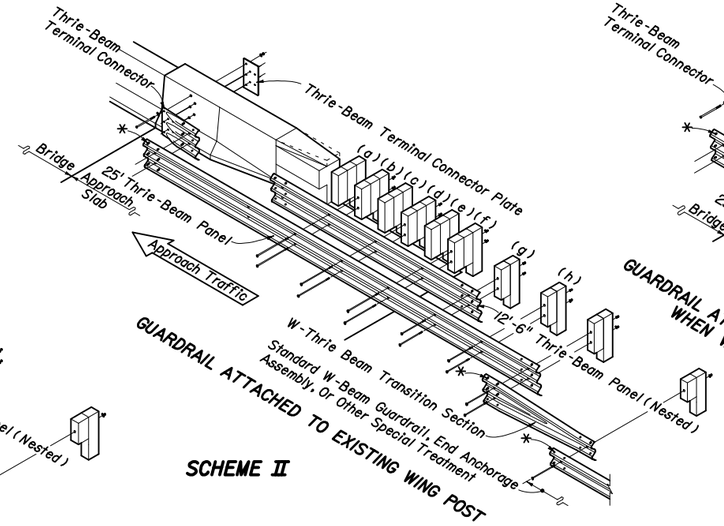
	Names	Dates
Designed By		
Drawn By	HKH	9-98
Checked By	JVG	9-98

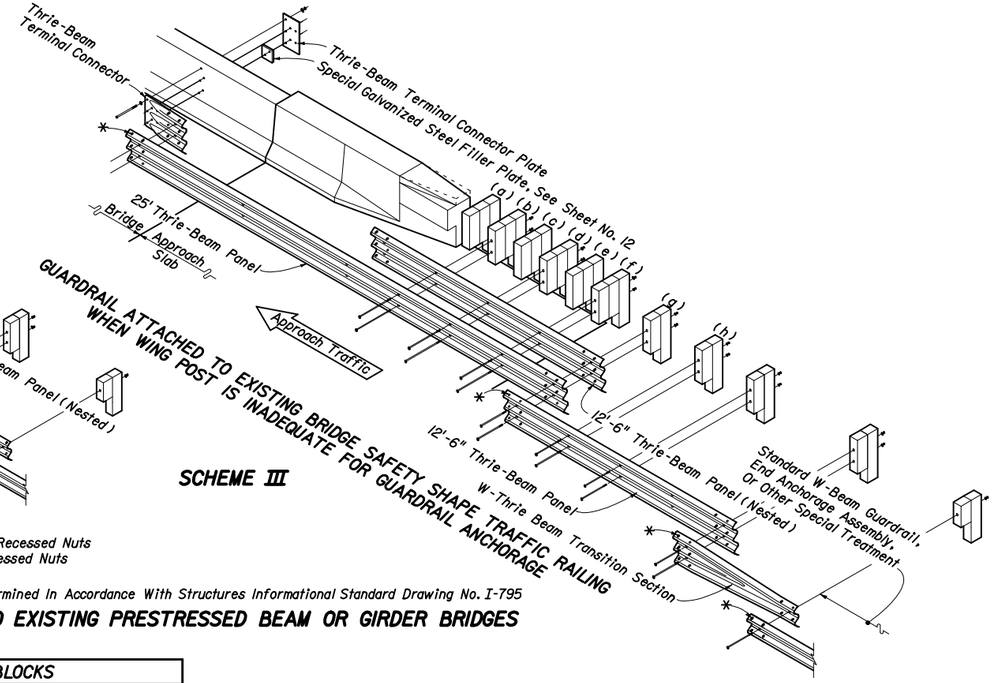
Approved By
Roadway Design Engineer

Revision	Sheet No.	Index No.
00	12 of 32	400

$$$$$$SYTIME$$$$$$







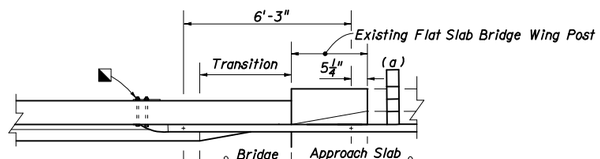
* Splice Locations: Thrie-Beam - 12 Guardrail Splice Bolts And Recessed Nuts
W-Beam - 8 Guardrail Splice Bolts And Recessed Nuts

Use Of Scheme I Shall Be Determined
In Accordance With Structures Informational Standard Drawing No. I-790

GUARDRAIL TRANSITION TO EXISTING FLAT SLAB BRIDGES

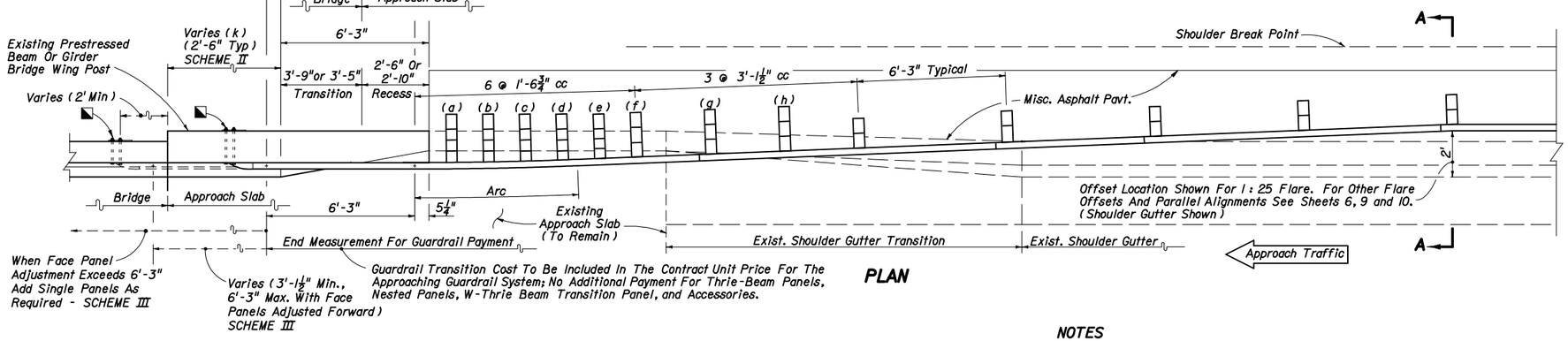
Use Of Schemes II And III Shall Be Determined In Accordance With Structures Informational Standard Drawing No. I-795

GUARDRAIL TRANSITIONS TO EXISTING PRESTRESSED BEAM OR GIRDER BRIDGES

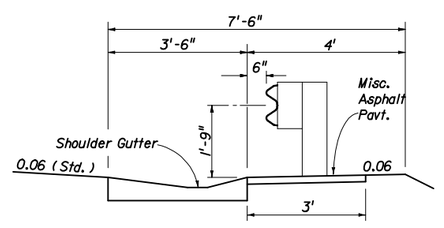


APPROACH POSTS AND SPECIAL OFFSET BLOCKS

Block assemblies for special offsets can be made up of one special block plus one standard size block or of three standard size blocks field dressed to approximately equal size, with the pieces secured for relative position by 16d galvanized nails, see '16d NAIL FOR PREVENTION OF OFFSET BLOCK ROTATION'. The nested rails shall not be bolted to the blocks and posts at posts (a), (c) and (e). The details shown are for approach slabs with internal edge dike extending beyond parapet type traffic railing termini.



PLAN



SECTION AA

◥ 21" x 12" x 5/8" Thrie-Beam Terminal Connector Plate (Back-Up Plate), And 7/8"Ø x 18" Long (15" Long For Bridge Safety Shape Railing) HS Hex Bolts And Nuts (5 Reqd.) With 2 1/4" OD Plain Round Washers Under Heads And Nuts. (When Attaching Guardrail To Existing Wing Posts Or Bridge Rails, Care Should Be Exercised To Avoid Damaging Conduits And Their Utilities That May Be Routed Through Wing Posts Or Bridge Rails. When Conduits And Their Utilities Are Encountered, At Least Five 7/8" HS Hex Bolts Shall Be Installed In Any Of The Seven Holes Provided In The Thrie-Beam Terminal Connector.)

NOTES

1. When the existing wing post is to be replaced with a bridge traffic railing barrier in accordance with Structure Standard Drawings No. I-790 or No. I-795, the thrie-beam guardrail connection shall be in accordance with Detail J.
2. When retrofitting thrie-beam guardrail to existing wing posts or existing bridge safety shape traffic railing, attachment construction to be paid for under the contract unit price for Bridge Anchorage Assembly, EA., and shall be full compensation for bolt hole construction, terminal connector, terminal connector plate(s) and bolts, nuts and washers.

GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR EXISTING FLAT SLAB, PRESTRESSED BEAM AND GIRDER BRIDGES WITH SAFETY SHAPE TRAFFIC RAILING BARRIER EXTENDING LESS THAN FULL APPROACH SLAB LENGTH

DETAIL E

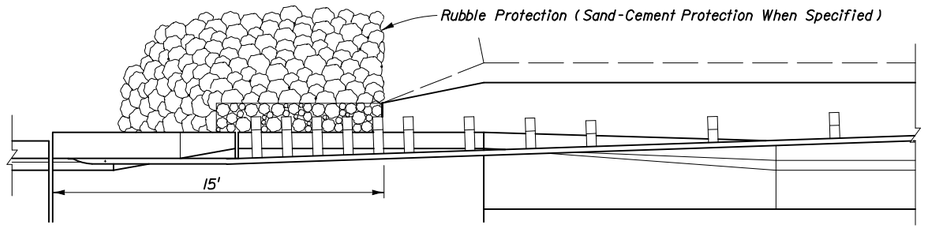
STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

GUARDRAIL

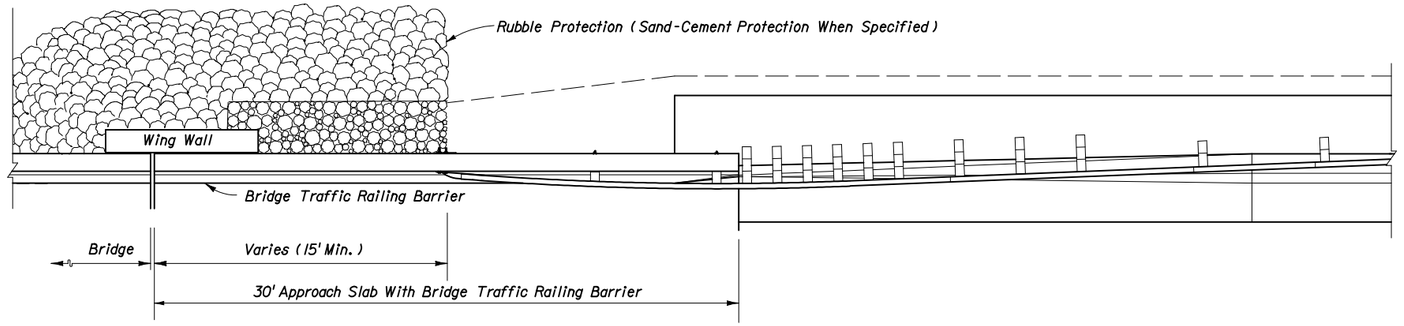
	Names	Dates
Designed By		
Drawn By	HKH	9-98
Checked By	JVG	9-98

Approved By
Roadway Design Engineer

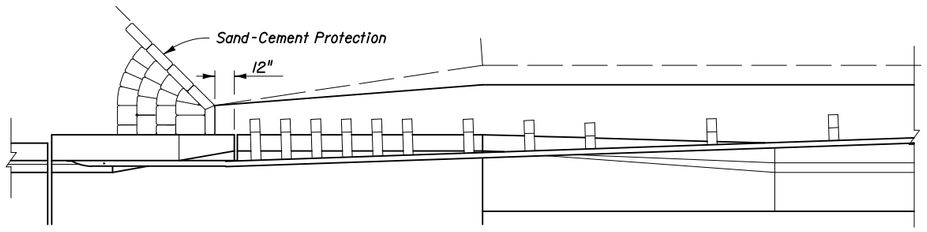
Revision	Sheet No.	Index No.
00	13 of 32	400



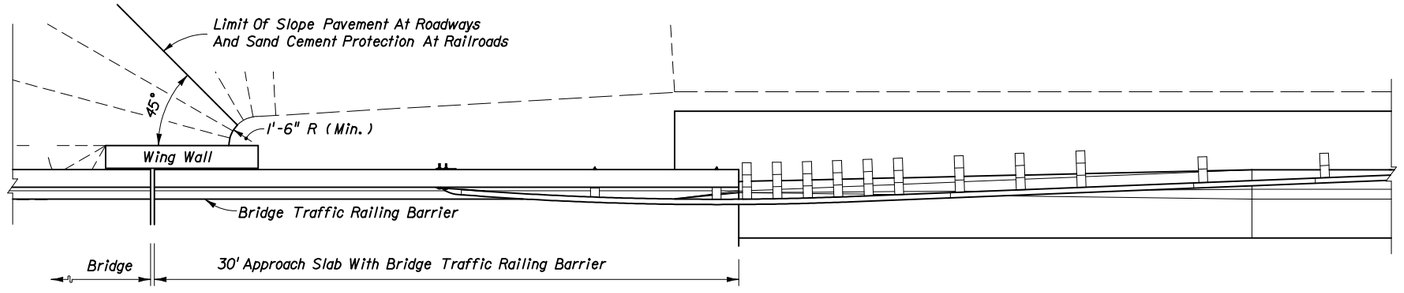
BRIDGES OVER STREAMS



BRIDGES OVER STREAMS



BRIDGES OVER RAILROADS



BRIDGES OVER ROADWAYS OR RAILROADS

For Additional Information See Sheet 13

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

For Additional Guardrail Information See Sheet 12

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

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

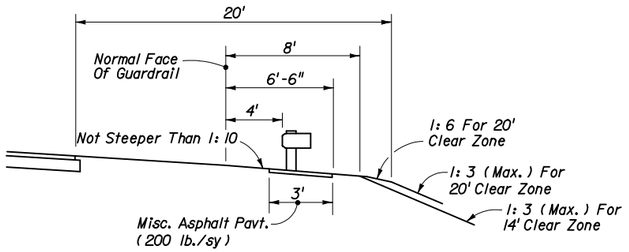
GUARDRAIL

	Names	Dates
Designed By		
Drawn By		
Checked By		

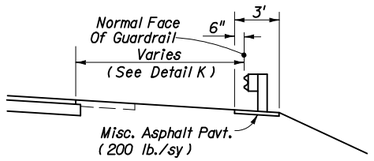
Approved By
Roadway Design Engineer

Revision	Sheet No.	Index No.
00	14 of 32	400

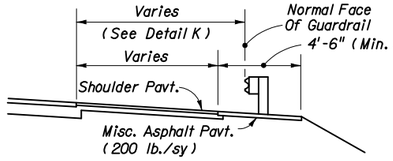
$$$$$$SYTIME$$$$$$



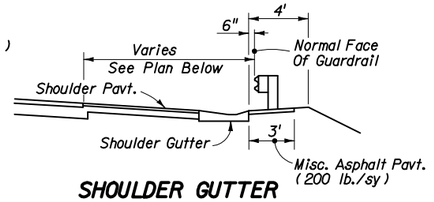
SECTION AA (EXAMPLE FOR 20' CLEAR ZONE)



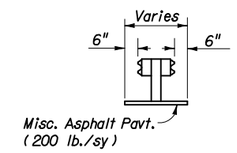
SHOULDER WITH OR WITHOUT 5' PAVEMENT



PAVED SHOULDERS

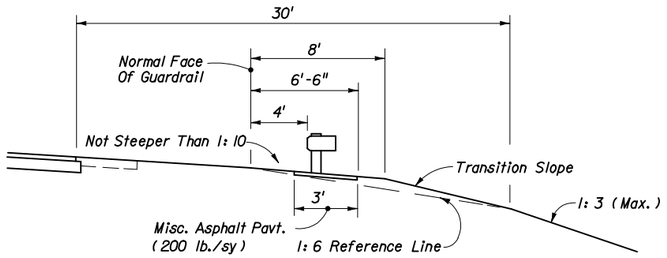


SHOULDER GUTTER

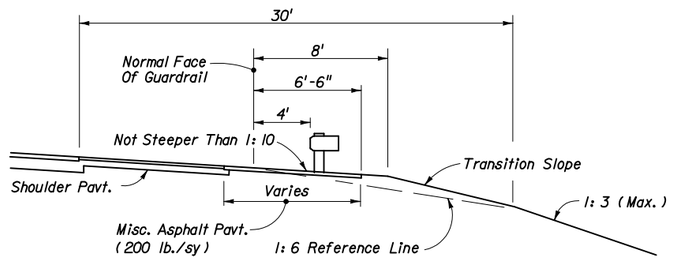


DOUBLE FACE RAIL

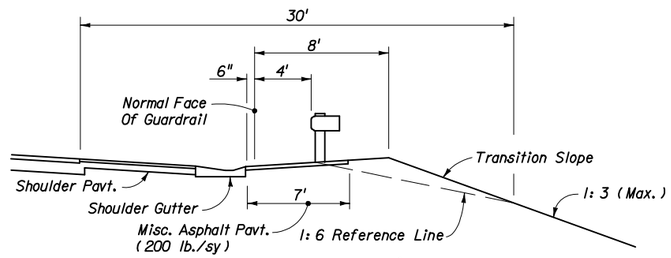
MISCELLANEOUS PAVING FOR STANDARD GUARDRAIL SECTIONS



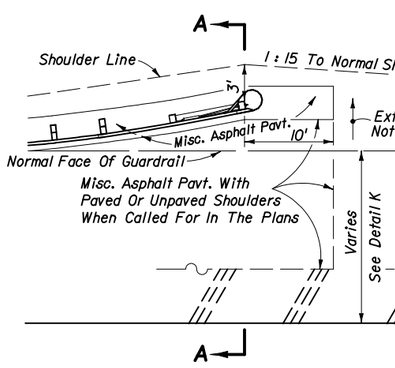
SECTION AA (EXAMPLE FOR 30' CLEAR ZONE)



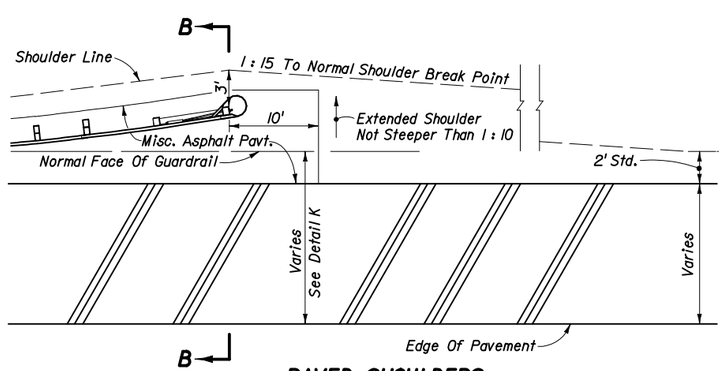
SECTION BB (EXAMPLE FOR 30' CLEAR ZONE)



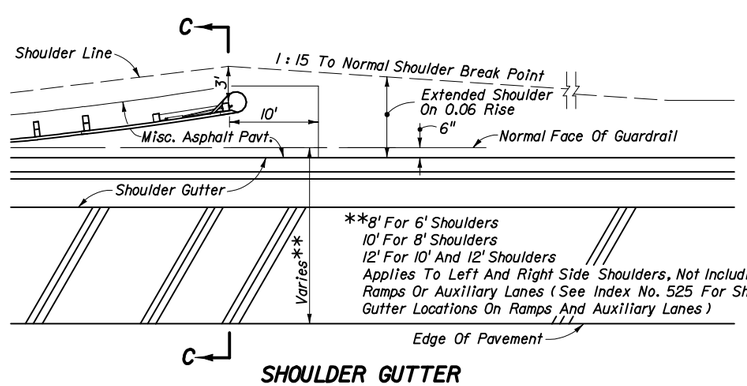
SECTION CC (EXAMPLE FOR 30' CLEAR ZONE)



SHOULDER WITH OR WITHOUT 5' PAVEMENT

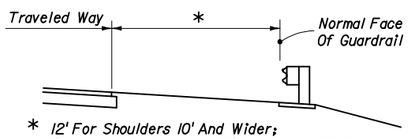


PAVED SHOULDERS



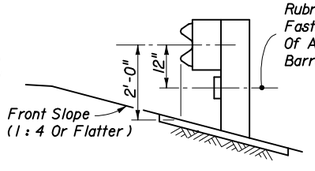
SHOULDER GUTTER

SHOULDERS, SLOPES AND MISCELLANEOUS PAVING FOR FLARED END ANCHORAGE ASSEMBLIES

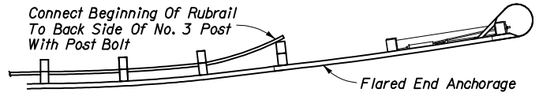


* 12' For Shoulders 10' And Wider;
8' For Median Shoulders 8' Or Less In Width; and,
Shoulder Width Plus 2' For All Others Shoulders.

STANDARD LOCATIONS



Rubrail (C6 x 8.2, Plates And Fastners or Bent Plate And Fastners In Accordance With Standards RLR01 And RER01 Of AASHTO-AGC-ARTBA "A Guide To Standardized Highway Barrier Hardware")



LOCATIONS ON FRONT SLOPES

LATERAL PLACEMENT ON FRONTSLOPES (FROM EDGE OF TRAVELED WAY)			
SLOPE	NOT RECOMMENDED	ACCEPTABLE WITH RUBRAIL	Notes:
4:1	14' to 27'	28' to 45'	For shoulders less than 12' in width the tabulated values will be reduced by the difference between 12' and the shoulder width.
5:1	15' to 25'	26' to 45'	
6:1	17' to 22'	23' to 45'	
7:1	21' to 24'	25' to 45'	Placement of guardrail on frontslopes steeper than 4:1 not recommended.
8:1	Acceptable to 25'	26' to 45'	
9:1	Acceptable to 26'	27' to 45'	Cost of rubrail to be included in the contract unit price for guardrail.
10:1	Acceptable to 27'	28' to 45'	

GUARDRAIL LOCATION-DETAIL K

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

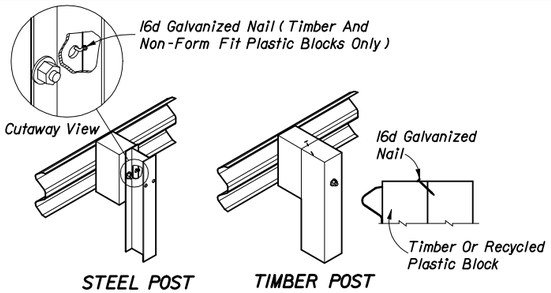
GUARDRAIL

	Names	Dates
Designed By		
Drawn By	JM	07/81
Checked By	JBW/JVG	07/81

Approved By
Roadway Design Engineer

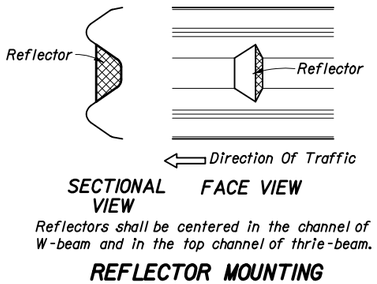
Revision	Sheet No.	Index No.
00	15 of 32	400

$$$$$$SYTIME$$$$$$



16d Galvanized Nail Driven After Post Bolt Pull-Up, Single And Double Face Guardrail, Single Face Guardrail Shown (16d Nail Between Blocks For Multiple Offset Blocks).

16d NAIL FOR PREVENTION OF OFFSET BLOCK ROTATION

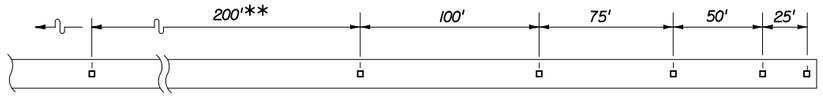


Reflectors shall be centered in the channel of W-beam and in the top channel of thrie-beam.

REFLECTOR MOUNTING

REFLECTOR NOTES

1. Reflectors shall conform to Section 993 of the Standard Specifications.
2. Reflector color (white or yellow) shall conform to the color of the near lane edgeline.
3. Face of rail bolt, screw, rivet or bracket mounted reflectors shall not be used in lieu of adhesive mounted reflectors.
4. Post mounted reflectors approved on the 'Qualified Products List' may be used by FDOT Maintenance to replace damaged or missing reflector in a continuous run of existing post mounted reflectors. Adhesive and post mounted reflectors shall not be intermixed in a continuous run of guardrail.
5. The cost for reflectors shall be included in the contract unit price for Guardrail.



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 reflector at each end and at approximate center.

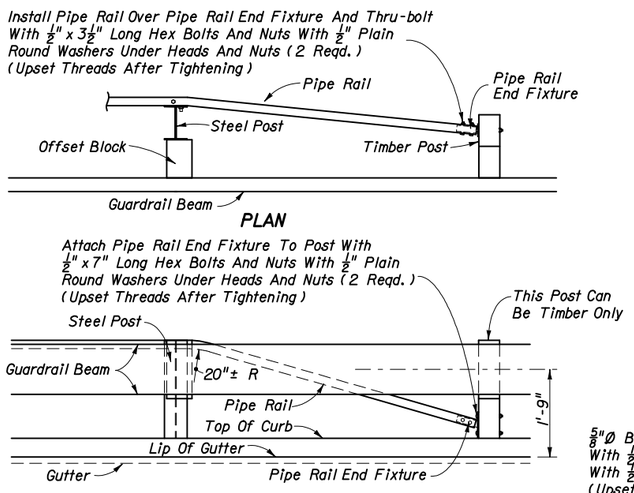
**For curves greater than 2° the spacing shall be reduced to 100' through the curve.

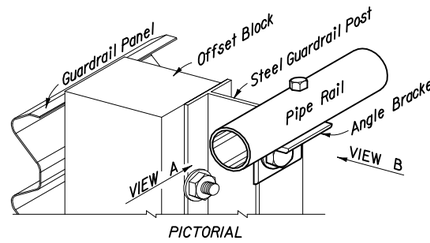
REFLECTOR SPACING
ADHESIVE REFLECTORS-DETAIL M

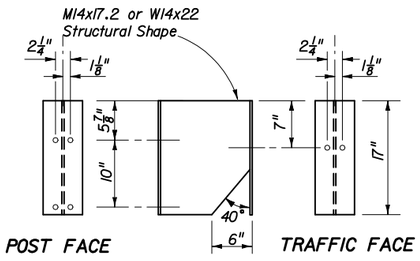
POSTS	OFFSET BLOCKS	REMARKS
Timber	6" x 8" x 14" Timber (Nominal) Or 6" x 8" x 14" Recycled Plastic	Post bolt hole in timber and plastic blocks to be centered (±¼"). All timber offset blocks shall be dressed on all four sides (S4S). See Note 1 below. One 16d galvanized nail per block is to be used to prevent rotation of block (see detail left).
Steel W6 x 9 Or 6" C	6" x 8" x 14" Timber (Nominal) Or 6" x 8" x 14" Recycled Plastic	Same as above for timber and plastic blocks. Form fit plastic block holes align with holes in steel posts and do not require nails.
Steel W6 x 9 Or 6" C	W14 x 18 x 17" Or W14 x 22 x 17" (Steel Modified Thrie-Beam)	⅝"Ø x 1½" long hex head bolts with full length thread and nuts (2 Reqd.) and ⅝" plain round washers (4 Reqd.) for mounting steel block to post. Bolts are to be installed in opposite holes, top and bottom.

Notes: 1. Thrie-beam timber and recycled plastic offset blocks are 22" in length.
2. Timber and recycled plastic offset blocks of equal size can be intermixed within a run of rail.
3. Rubber offset blocks are not to be used on moderate or high volume facilities and used only on low volume facilities when specifically called for in the plans.

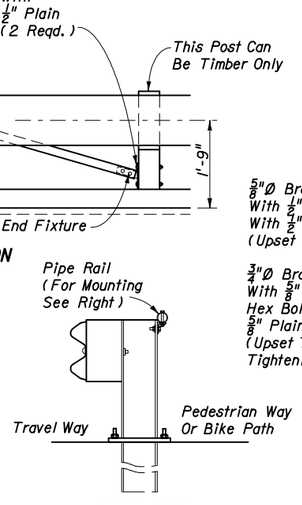
PERMISSIBLE POST AND OFFSET BLOCK COMBINATIONS







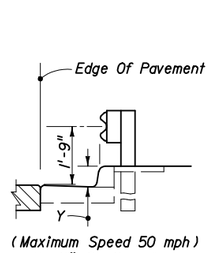
STEEL MODIFIED THRIE-BEAM OFFSET BLOCK

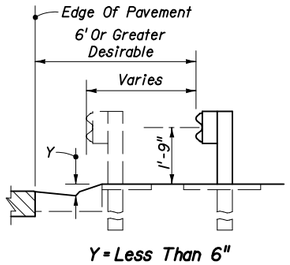


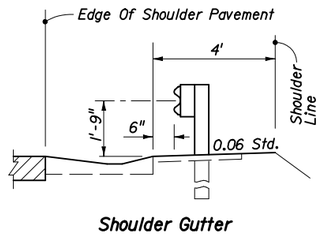
NOTES

1. Pipe Rail required on steel guardrail posts when pedestrian ways and bikeways are located 4' or less from back of the posts. Begin and end the pipe rail in accordance with this detail.
2. When guardrails with timber posts are located with the back of posts 4' or less from the near edge of the pedestrian way or bikeway, the bolt ends will require one of the following treatments:
   (a) Trimming back flush with the face of nut and metalizing or
   (b) Use of post bolts 15" in length with the washers and nuts counter sunk into sinks 1" to 1½" deep or
   (c) Use of post bolts 15" in length with sleeve nuts and washers.
3. The cost for Pipe Rail, mounting components and installation shall be included in the contract unit price for guardrail. Bolt end treatment for timber post shall be included in the contract unit price for guardrail.

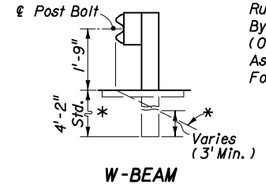
FOR LOCATIONS USED BY PEDESTRIANS OR CYCLISTS
PEDESTRIAN SAFETY TREATMENTS

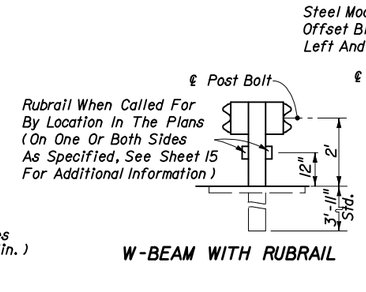


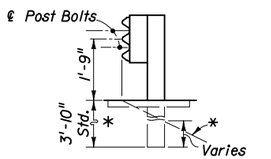




LOCATION AT CURB & GUTTER SECTIONS-DETAIL L

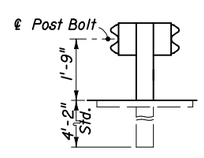


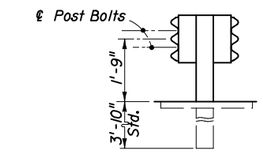




*Front Slope When Right Of Way, Environmental Or Other Restrictions Prohibit Normal Shoulder Extension

SINGLE FACED GUARDRAIL





DOUBLE FACED GUARDRAIL

MOUNTING HEIGHTS ON SHOULDERS AND IN MEDIANS

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

GUARDRAIL

	Names	Dates
Designed By		
Drawn By	HSD	09/81
Checked By	JBW/JVG	09/81

Approved By
Roadway Design Engineer

Revision	Sheet No.	Index No.
02	16 of 32	400

$$$$$$SYTIME$$$$$$