

## GENERAL NOTES

- The energy absorbing system represented on this standard drawing is a proprietary design by Energy Absorption Systems, Inc. and marketed under the trade name QuadGuard. Any infringement on the rights of the designer shall be the sole responsibility of the user.
- 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 QuadGuard System and their incorporation into a whole system.
- This standard drawing is sufficient for plan details for the QuadGuard installed as a free standing system or installed in connection with concrete barrier walls and other fixed barrier systems, and precludes the requirement for shop drawing submittals unless the plans otherwise call for such submittals.  
  
The QuadGuard tension strut backup is the primary backup to be used on Florida Department of Transportation projects. Use of concrete backups will be permitted, but will require call out and detailing in the plans for site specific construction concrete backups must meet manufacturers specifications, installation guidelines and transition hardware requirements.
- The QuadGuard shall be assembled and installed in accordance with the manufacturers detailed drawings, procedures and specifications.
- The QuadGuard is available in 24", 30", and 36" nominal widths for narrow hazards and 69" and 90" nominal widths for wide hazards. The system width will be as called out in the plans, permit or other contract document for each location.
- Only the QuadGuard Type I and Type II cartridges shall be used in bay and nose locations as described in the 'BAY SELECTION GUIDELINES' table.
- Cement concrete foundations and cement concrete backup assemblies shall be constructed with 4000 psi min. compressive strength concrete.
- The QuadGuard shall be constructed on cross slopes 1:10 or flatter.
- All metallic components shall meet the galvanizing requirements for guardrail, Index No. 400.
- A yellow Type I Object Marker shall be centered 3' in front of the nose of the QuadGuard. Mounting hardware shall be in conformance with Index Nos. 11860 and 11865. The cost of the Object Marker shall be included in the cost of the QuadGuard.

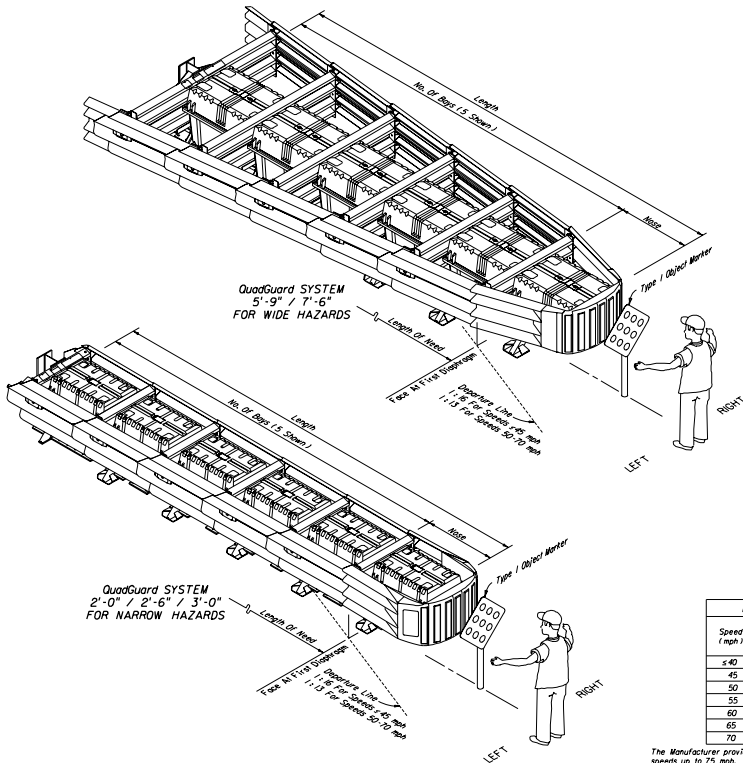
- Quantity for payment is based on each independent location as called for in the plans or as directed by the Engineer. The cost for foundations, upgrade preparation and miscellaneous asphalt shown on this index will be included in the cost for the QuadGuard in a specific unit will be determined by the design speed, except where the Engineer determines that another speed is more applicable. The unit width will be determined by the width of the object to be shielded or by the connecting barrier system. The backup assembly for a specific unit will be determined by either (a) the unit standing free of the object to be shielded or (b) the barrier system(s) to which it is connected.
- The QuadGuard is a restorable system that is particularly suited to shielding hazards subject to high speed traffic, high volume traffic, and/or traffic with a history of frequent errant vehicle departures from the roadway or the potential exists for such departures. The QuadGuard is particularly suited to shielding hazards where the approach space is limited, and, is particularly suited to conditions where the terminal must be located close to the traffic lane.
- Currently the Department does not recognize other proprietary items as being equally suitable alternatives to the QuadGuard, and until such alternatives are available, the QuadGuard need not be bid against other proprietary items. However, for temporary use where the QuadGuard and other approved retroactive crash cushions meet or exceed the minimum requirements for a specific location, the approved crash cushions will be considered optional systems and paid for as described in General Note # above.

## DESIGN NOTES AND GUIDELINES

- The QuadGuard System is designed to cushion automobile end-on hits and to redirect automobiles from side hits. The QuadGuard is designed to shield fixed hazards at the ends of other temporary and permanent barrier systems. The number of bays to be used in a specific unit will be determined by the design speed, except where the Engineer determines that another speed is more applicable. The unit width will be determined by the width of the object to be shielded or by the connecting barrier system. The backup assembly for a specific unit will be determined by either (a) the unit standing free of the object to be shielded or (b) the barrier system(s) to which it is connected.
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BAY SELECTION GUIDELINES				
Speed (mph)	No. Of Bays	Number Of Cartridges		Length
		Type I (Front)	Type II (Rear)	
≤40	2	2	1	8'-8"
45	3	3	1	11'-8"
50	4	3	2	14'-8"
55	5	4	2	17'-8"
60	6	4	3	20'-8"
65	7	4	4	23'-8"
70	9	4	6	29'-8"

The Manufacturer provides QuadGuard units with up to 12 bays designed for use with speeds up to 75 mph. These larger units may be utilized when called for in the plans or as directed by the Engineer.

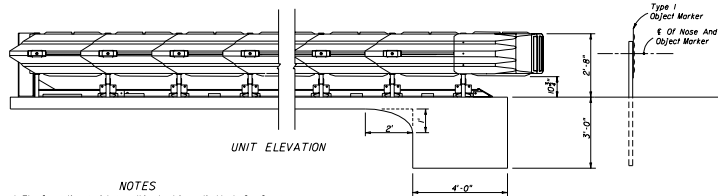
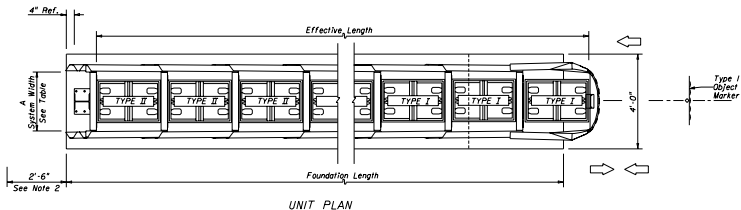
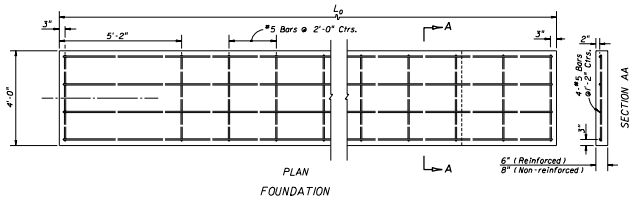


## GENERAL SYSTEM FEATURES AND BAY SELECTION GUIDELINES

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION  
ROAD DESIGN

QuadGuard

Drawn By	DATE	Approved By	
MS/SJT			
Drawn By	SCALE	Sheet No.	OF
MS		106	435
Checked By	NO	00	



Nominal System Width	A (Backup Width)
2'-0"	2'-0"
2'-6"	2'-6"
3'-0"	3'-0"
5'-9"	5'-3 $\frac{1}{2}$ "
7'-6"	6'-10 $\frac{1}{2}$ "

ESTIMATED FOUNDATION QUANTITIES For Informational Purposes Only				
No. Of Bays	L <sub>0</sub>	REINFORCED		NON-REINFORCED
		Rebar Required (CY)	Concrete Required (CY)	Concrete Required (CY)
2	9'-0"	48'-8"	2.1	2.3
3	12'-0"	68'-0"	2.4	2.7
4	15'-0"	83'-8"	2.6	3.0
5	18'-0"	103'-0"	2.8	3.3
6	21'-0"	118'-8"	3.1	3.6
7	24'-0"	138'-0"	3.3	3.9
9	30'-0"	173'-0"	3.7	4.5

Note: Monorail anchorage bolt spacing to be in accordance with the manufacturer's installation drawings and specifications.

#### NOTES

- The Foundation depicted on this sheet is applicable to QuadGuard systems for both narrow and wide hazards, 2'-6" system shown.
- For the number of bays required see table, Sheet 1.
- Provision shall be made for rear fender panels to slide rearward upon Impact 2'-6" min.
- For barrier connections see "TRANSITIONS", Sheet Nos. 4 and 5.

## PERMANENT FOUNDATION FOR TENSION STRUT BACKUP ASSEMBLY

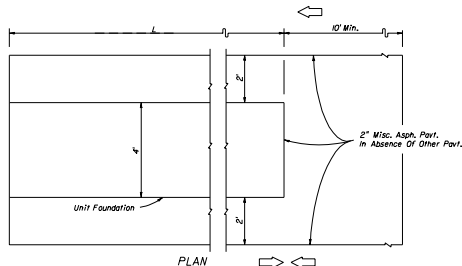
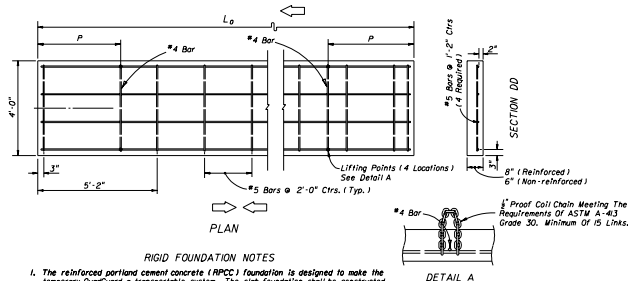
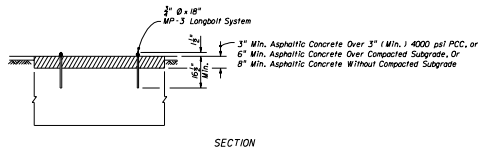
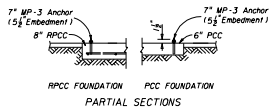
STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION  
ROAD DESIGN

QuadGuard

DESIGNED BY	DATE	APPROVED BY
MS/STP		<i>[Signature]</i>
MS/STP		STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
CHECKED BY	DATE	SCALE
JMG	00	2 of 6

435

ESTIMATED FOUNDATION QUANTITIES For Informational Purposes Only						
No. Of Bays	L <sub>0</sub>	P	REINFORCED Rebar Required (CY)	Concrete Required (CY)	NON-REINFORCED Concrete Required (CY)	
3	12'-0"	3'-0"	68'-0"	1.2	0.9	
4	15'-0"	3'-9"	83'-8"	1.5	1.1	
5	18'-0"	4'-6"	103'-0"	1.8	1.3	
6	21'-0"	5'-3"	118'-8"	2.1	1.6	
7	24'-0"	6'-0"	138'-0"	2.4	1.8	
9	30'-0"	7'-6"	173'-0"	3.0	2.2	



MP-3 LONGBOLT ANCHOR SYSTEM  
ASPHALTIC CONCRETE FOUNDATIONS

RIGID FOUNDATION NOTES

- The reinforced portland cement concrete (RPCC) foundation is designed to make the temporary QuadGuard a transportable system. The slab foundation shall be constructed with 4000 psi min. compressive strength concrete. The slab shall be seated to the top of the slab is flush with the surface intended for approaching vehicles. In absence of other pavement the surrounding surface shall be paved with 2" of miscellaneous asphalt pavement as depicted in "ASPHALTIC CONCRETE FOUNDATIONS". The QuadGuard shall be anchored exclusively with the 7" MP-3 anchor system supplied with the QuadGuard unit, unless another anchor is supplied or approved by the QuadGuard manufacturer.
- The nonreinforced portland cement concrete (PCC) foundation shall be Class I concrete, having depth equal to or greater than 6". The PCC foundation utilization options are as follows: (a) Poured in place as an expendable slab, having a thickness of not less than 6"; disposal of the slab will be as approved by the Engineer, (b) Project constructed roadway PCC pavement, or, (c) Existing 9" PCC roadway pavement.  
The utilization option applied shall be as approved by the Engineer on a site specific basis. The top of the foundation shall be flush with the surface intended for approaching vehicles. In absence of surrounding pavement the surrounding surface shall be paved as shown on this sheet in "ASPHALTIC CONCRETE FOUNDATIONS".  
The QuadGuard installed on PCC pavement shall be anchored only with the MP-3 anchor system supplied with the QuadGuard unit. Holes for the 7" anchors shall be drilled in both existing and new pavements. When the QuadGuard is removed from the project pavement or from existing pavement that is to remain in place, the anchor shall be cut off flush with the top of the pavement, unless the plans call for other treatment.

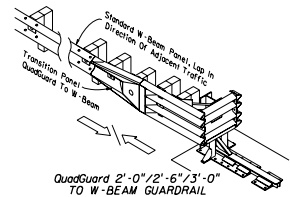
3. For additional information see the General Notes.  
REINFORCED AND NONREINFORCED CONCRETE PAD SYSTEMS  
CEMENT CONCRETE FOUNDATIONS

NOTES

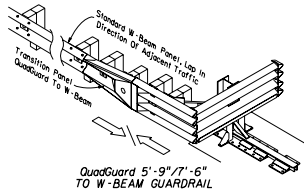
- For the number of bays required see table, Sheet 1.
- For barrier connections see "TRANSITIONS", Sheet Nos. 4 and 5.

TEMPORARY FOUNDATIONS

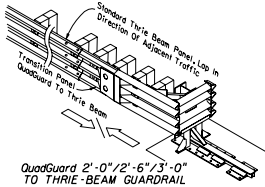
STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION ROAD DESIGN			
<b>QuadGuard</b>			
DESIGNED BY	DATE	APPROVED BY	
MP		<i>[Signature]</i>	
DRAWN BY	DATE	CHECKED BY	DATE
JHG	8/17	JHG	8/17
CHECKED BY	DATE	NO. OF SHEETS	TOTAL SHEETS
JHG	08	3	6



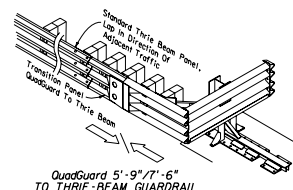
QuadGuard 2'-0"/2'-6"/3'-0"  
TO W-BEAM GUARDRAIL



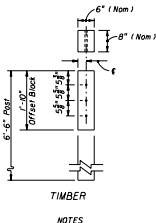
QuadGuard 5'-9"/7'-6"  
TO W-BEAM GUARDRAIL



QuadGuard 2'-0"/2'-6"/3'-0"  
TO THRIE-BEAM GUARDRAIL



QuadGuard 5'-9"/7'-6"  
TO THRIE-BEAM GUARDRAIL



TIMBER

NOTES

1. All Holes  $\frac{3}{8}$ "  $\phi$ .
2. When using a special steel post with a timber offset block at location #2, field drill matching attachment holes in block and in post flange.  
When drilling special steel posts metalize holes in accordance with Index No. 400.
3. For double face guardrail applications with special steel posts and 2'-0" or 2'-6" system widths, and with timber posts and 2'-6" system widths, turning wide side of standard offset block to post or field trimming will be required, see Sections Right.

POSTS AND OFFSET BLOCKS  
FOR LOCATIONS #1 AND #2

Steel Or Timber Post  
And Std. Block, Mirror  
For Right Side



SINGLE BEAM  
ALL SYSTEM WIDTHS

Std. Offset Block,  
Turn Wide Side  
To Post.



2'-0"  
SYSTEM WIDTH

Std. Offset Block,  
Turn Wide Side  
To Post.



2'-6"  
SYSTEM WIDTH  
TIMBER POST

Std. Offset Block,  
Turn Wide Side  
To Post.



≥ 3'-0"  
SYSTEM WIDTH

Std. Offset Block,  
Turn Wide Side  
To Post.



2'-0"  
SYSTEM WIDTH  
SPECIAL STEEL POST Δ  
WITH TIMBER OFFSET BLOCKS

Std. Offset Block,  
Turn Wide Side  
To Post.



2'-6"  
SYSTEM WIDTH

Std. Offset Block,  
Turn Wide Side  
To Post.



≥ 3'-0"  
SYSTEM WIDTH

See Post And Offset Block Details Left  
SECTION AA (POSTS #1 AND #2)

Steel Or Timber Post  
And Std. Block, Mirror  
For Right Side



SINGLE BEAM  
ALL SYSTEM WIDTHS

Std. Offset Block,  
Turn Wide Side  
To Post.



2'-0"  
SYSTEM WIDTH

Std. Offset Block,  
Turn Wide Side  
To Post.



2'-6"  
SYSTEM WIDTH  
TIMBER POST

Std. Offset Block,  
Turn Wide Side  
To Post.



≥ 3'-0"  
SYSTEM WIDTH

Std. Offset Block,  
Turn Wide Side  
To Post.



2'-0"  
SYSTEM WIDTH  
SPECIAL STEEL POST Δ  
WITH TIMBER OFFSET BLOCKS

Std. Offset Block,  
Turn Wide Side  
To Post.

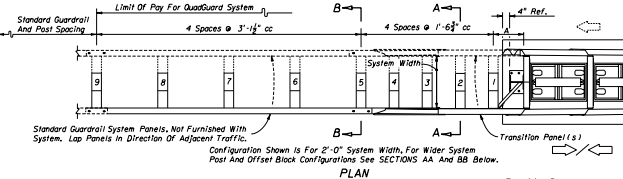


2'-6"  
SYSTEM WIDTH

Std. Offset Block,  
Turn Wide Side  
To Post.



≥ 3'-0"  
SYSTEM WIDTH



Standard Guardrail System Panels, Not Furnished With System. Lap Panels in Direction Of Adjacent Traffic.

Standard Guardrail System Panels, Not Furnished With System (W-beam Shown). Lap Panels in Direction Of Adjacent Traffic.

Configuration Shown is For 2'-0" System Width, For Water System Post And Offset Block Configurations See SECTIONS AA And BB Below.

PLAN

ELEVATION

NOTES

1. Transitions are required when connecting the QuadGuard to any guardrail system.
  2. Post spacing identical for W-beam or three-beam, W-beam shown.
  3. Post #1 is not bolted directly to transition panel(s).
  4. Install beam washers on post bolts on posts #2 thru #9, with supplementary bar washers at post #2.
  5. W-Beam Transition:  
Posts #1 and #2 - Posts and offset blocks as shown below.  
Posts #3 thru #9 - Standard W-beam posts and offset blocks, see index no. 400.
  - Thrie Beam Transition:  
Posts #1 and #2 - Posts and offset blocks as shown below.  
Posts #3 thru #9 - Standard thrie beam posts and offset blocks, see index no. 400.
- Transitions using steel posts Use limited to rigid surface mounting (decks and slabs). See index no. 400 for special steel guardrail posts. See section below, Δ.

System Width	A
2'-0"/2'-6"/3'-0"	18.7"
5'-9"/7'-6"	21.93"

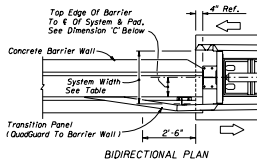
STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION  
ROAD DESIGN

QuadGuard

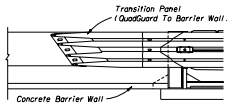
Revised	Drawn	Approved By
Developed By	08/20/01	
Drawn By	08/29/01	
Checked By	08/29/01	

Post And Offset Block Configurations Are Identical  
For W-beam Or Thrie-beam, W-beam Shown  
SECTION BB (POSTS #3 THRU #9)

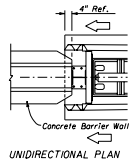
QuadGuard TO GUARDRAIL  
TRANSITIONS



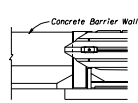
BIDIRECTIONAL PLAN



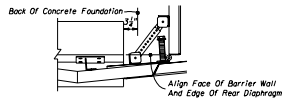
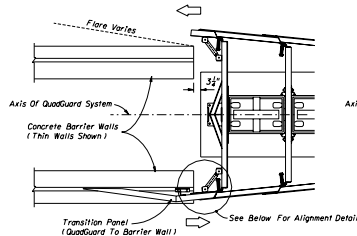
BIDIRECTIONAL ELEVATION



UNIDIRECTIONAL PLAN



UNIDIRECTIONAL ELEVATION

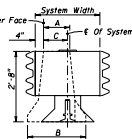


ALIGNMENT DETAIL  
BIDIRECTIONAL PLAN

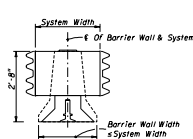
Edge Of Barrier Face

System Width	System Width		
	A	B	C
24"	6"-16"	24"-34"	8"
30"	12"-22"	30"-40"	11"
36"	18"-28"	36"-46"	14"

DIMENSIONAL VALUES FOR BIDIRECTIONAL APPLICATIONS WITH CONCRETE BARRIER WALL



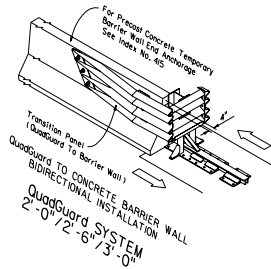
BIDIRECTIONAL SECTION



UNIDIRECTIONAL SECTION

The axis of the QuadGuard relative to concrete barriers will be established on site specific basis. The QuadGuard supplier shall furnish dimensional data for setback between the barrier wall and the system foundation, and for the alignment between the face of the barrier wall and the rear diaphragm where dimensions other than those above apply.

QuadGuard SYSTEM  
5'-9" / 7'-6"



QuadGuard SYSTEM  
2'-0" / 2'-6" / 3'-0"

**BARRIER WALL TRANSITION NOTE**

Barrier wall free end must be reinforced in accordance with index No. 40 and temporary walls must be adequately anchored for proper impact performance in accordance with index No. 45.

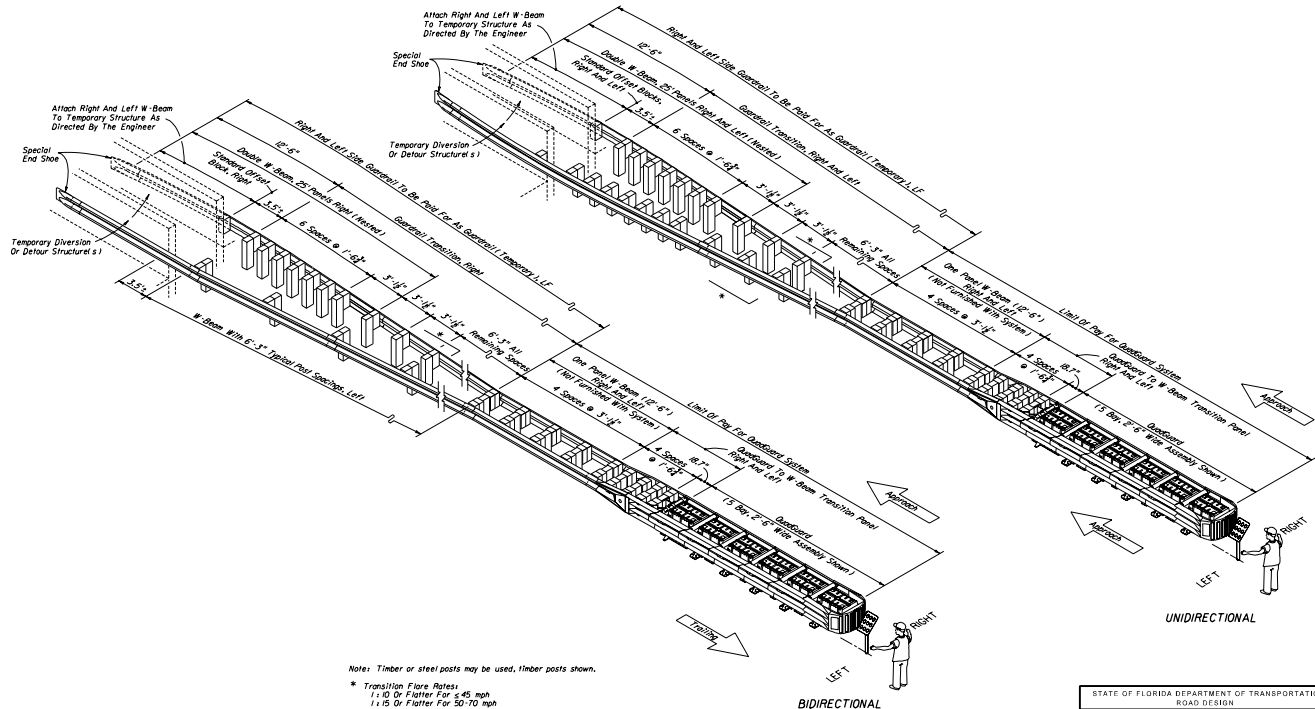
QuadGuard TO CONCRETE BARRIER WALL  
TRANSITIONS

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION  
ROAD DESIGN

QuadGuard

Revised	Date	Approved By
Designed By	05/20/97	
Drawn By	08/19/97	
Checked By	08/19/97	

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Note: Timber or steel posts may be used, timber posts shown.

\* Transition Flare Rates:  
 1 : 10 Or Flatter For ≤ 45 mph  
 1 : 15 Or Flatter For 50-70 mph

# GUARDRAIL TRANSITION TO TEMPORARY DIVERSION OR DETOUR STRUCTURES

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION ROAD DESIGN			
<b>QuadGuard</b>			
Issued	Date	Approved By:	
Designed By	100-270	STATE HIGHWAY DESIGN SYSTEM	
Drawn By	MM	REVISION	REVISED
Checked By	JRC	00	6 of 6 435