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TEMPORARY BARRIERS & CRASH CUSHIONS

Florida Department of Transportation

TEMPORARY BARRIERS

Steel

Guardrail

4 Types

**Precast
Concrete**

**Water
Filled**

PRECAST CONCRETE

3 Types
Precast
Concrete

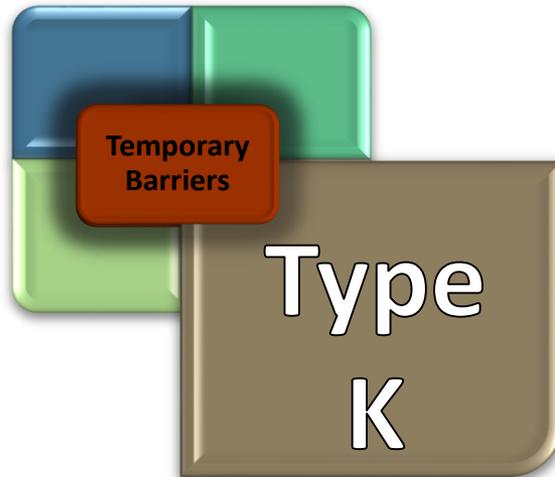
JJ
Hook

Temporary
Barriers

Low
Profile

Type K





**Only Type K barrier is
approved for use on bridges**

Installation

- Bolted
- Staked
- Free Standing
- Backfilled

Surface

- Rigid Pavement (Concrete)
- Flexible Pavement (Asphalt)
- Cross Slope of 1 to 10 or flatter

Transitions

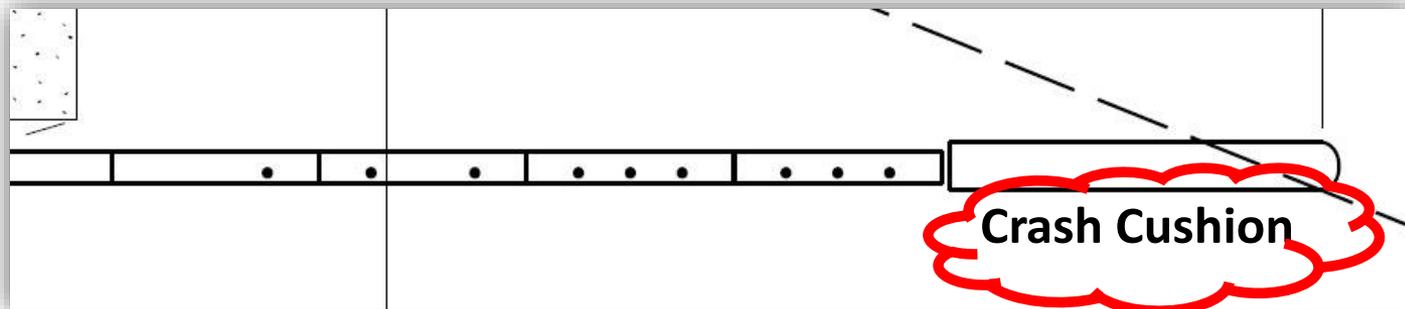
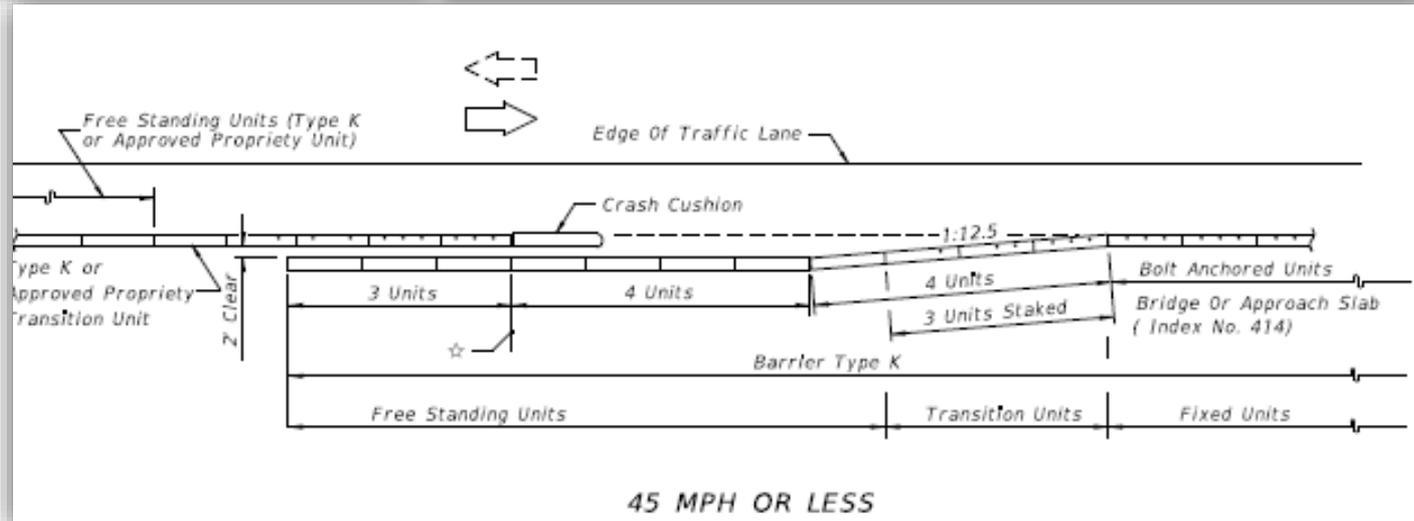
- Required Between Type K Freestanding, Bolted, Staked and Back Filled
- Required Between Other Types of Barriers

Deflection Distance

- Varies on Type of Installation (above), Use, Location and Speed

Transitions

- Gradually Stiffen the Barrier from freestanding Barrier to Rigid Barrier.



Transition Stakes/Anchors

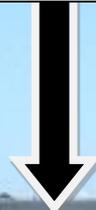
1
Stake
per unit

2
Stakes
per unit

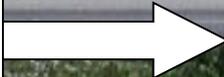
3
Stakes
per unit

3
Stakes
per unit

Existing Stakes



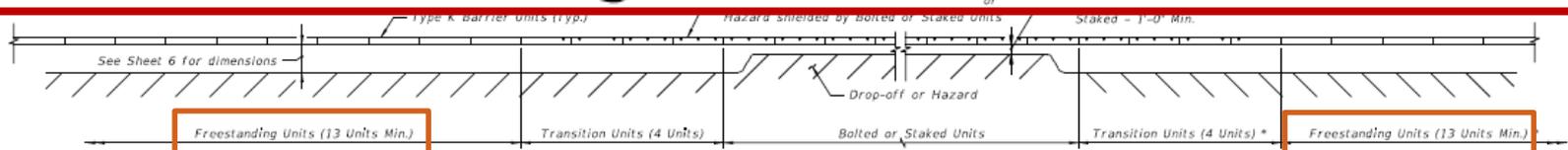
Direction of Traffic



Transitions

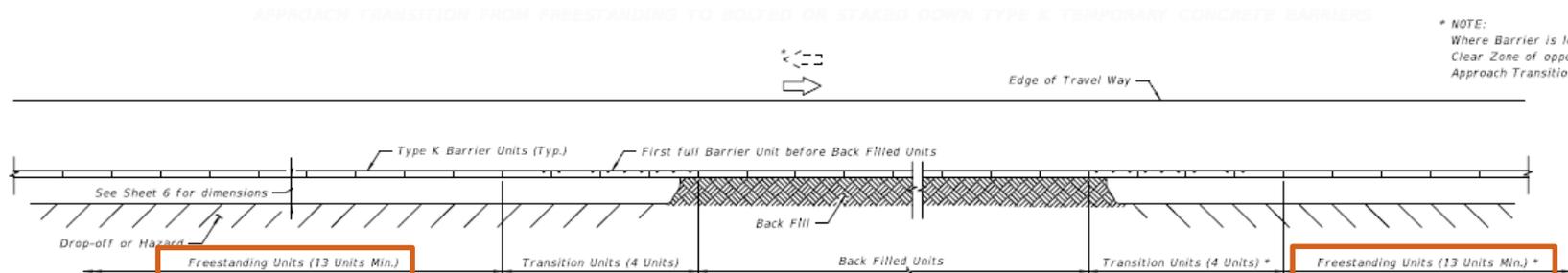
- Required Between Type K Freestanding, Bolted, Staked and Back Filled
- Required Between Other Types of Barriers

Freestanding Units (13 Units Min.)



APPROACH TRANSITION FROM FREESTANDING TO BOLTED OR STAKED DOWN TYPE K TEMPORARY CONCRETE BARRIERS

* NOTE:
Where Barrier is located within
Clear Zone of opposing traffic,
Approach Transition is required.



APPROACH TRANSITION FROM FREESTANDING TO BACK FILLED TYPE K TEMPORARY CONCRETE BARRIERS

* NOTE:
Where Barrier is located within
Clear Zone of opposing traffic,
Approach Transition is required.

Installation

- Bolted
- Staked
- Free Standing
- Backfilled

Surface

- Rigid Pavement (Concrete)
- Flexible Pavement (Asphalt)
- Cross Slope of 1 to 10 or flatter

Transitions

- Required Between Type K Freestanding, Bolted, Staked and Back Filled
- Required Between Other Types of Barriers

Deflection Distance

- Varies on Type of Installation (above), Use, Location and Speed

Deflection Distance

Bolted

- See Index 414 - Sheet 5

Staked

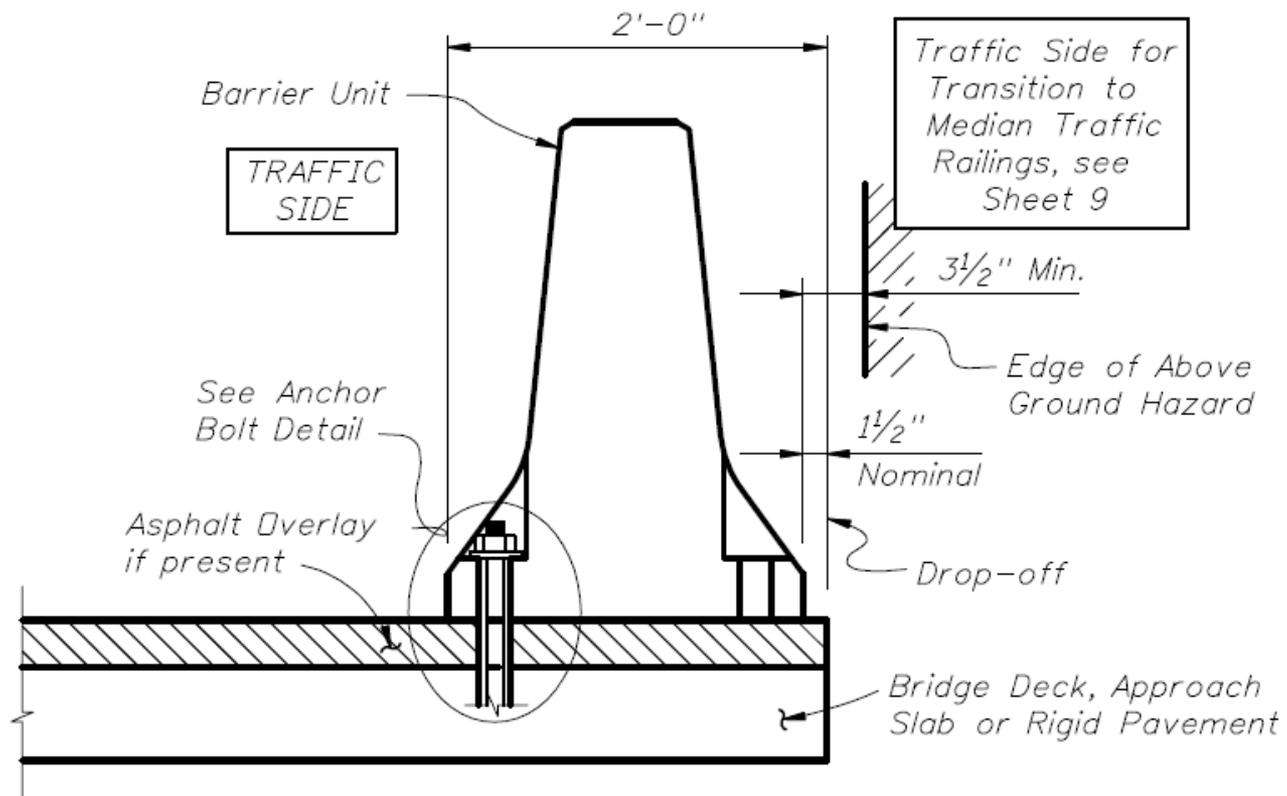
- See Index 414 - Sheet 6

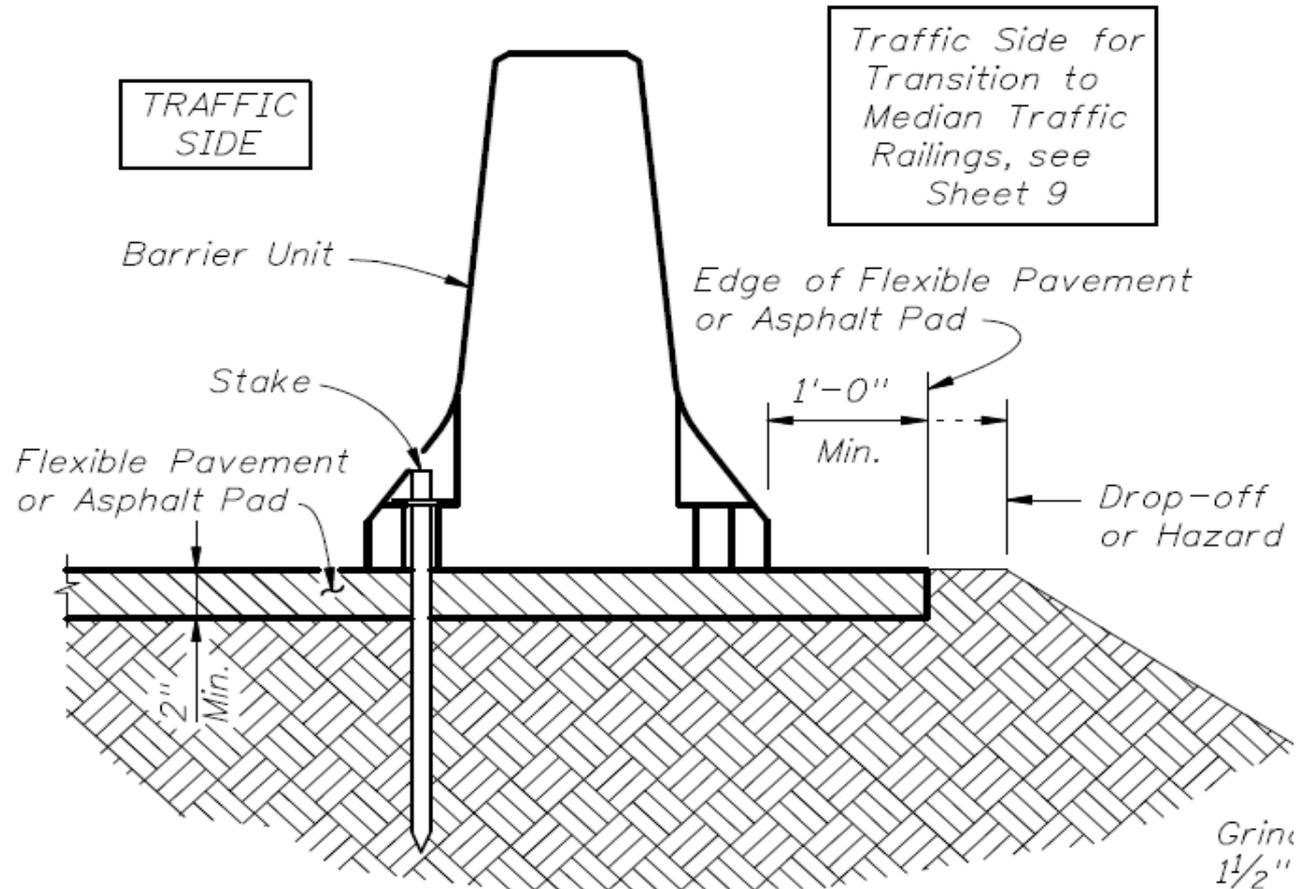
**Free
Standing**

- See Index 414 - Sheet 6 & 7

Back Filled

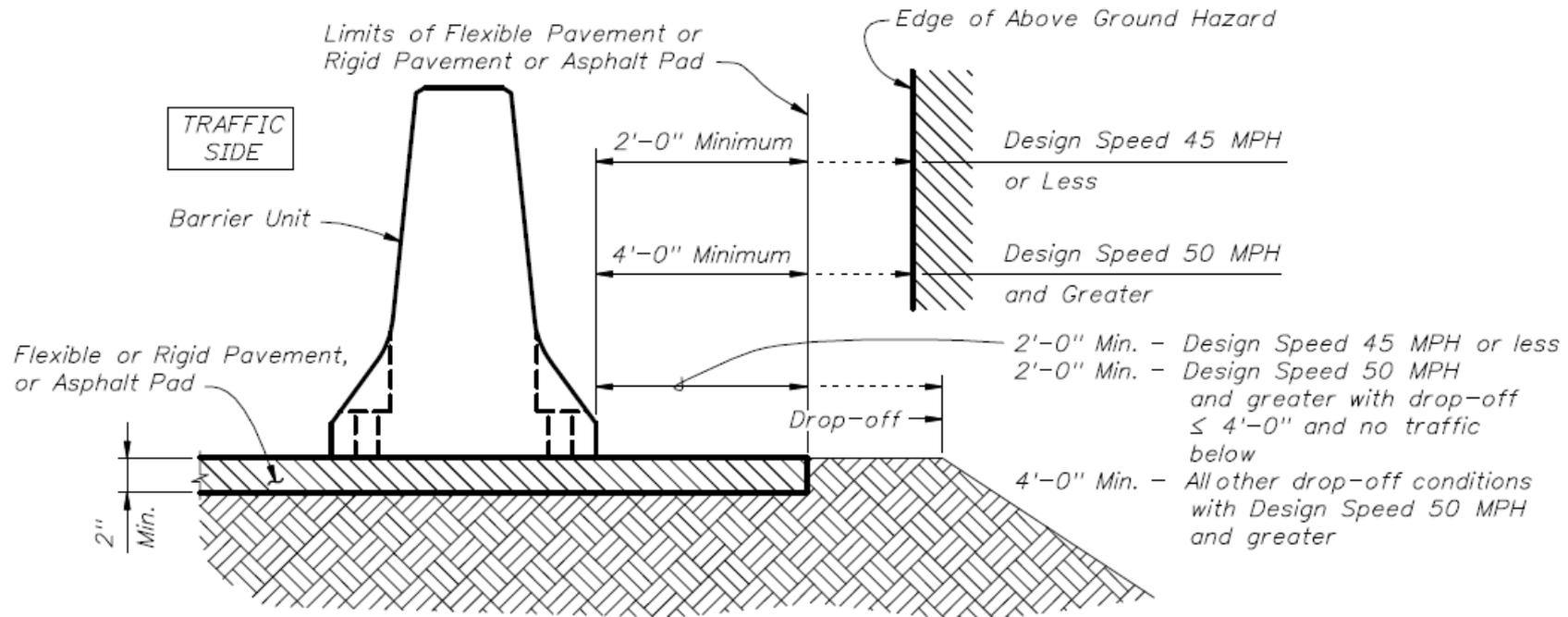
- See Index 414 - Sheet 7

Bolted**• See Index 414 - Sheet 5**

Staked**• See Index 414 - Sheet 6**

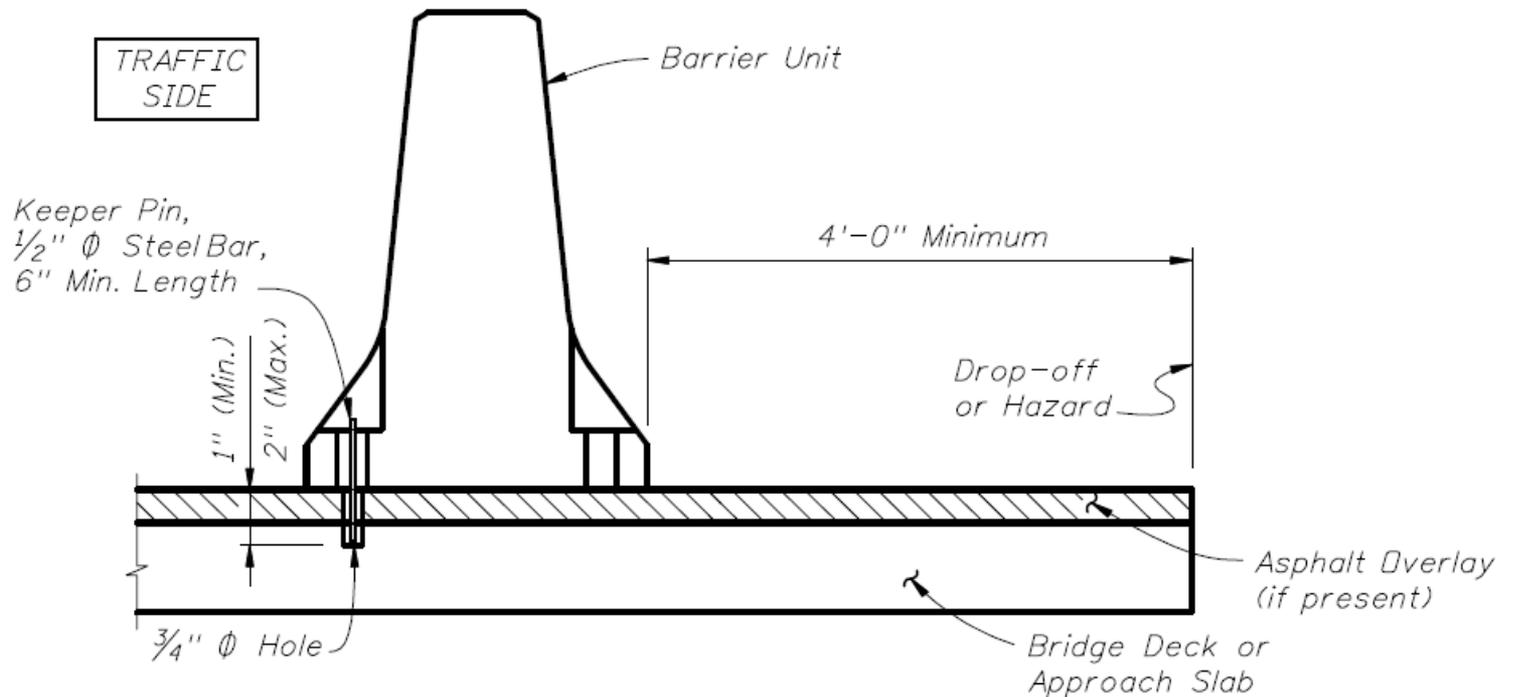
Free Standing Roadway

• See Index 414 -Sheet 6



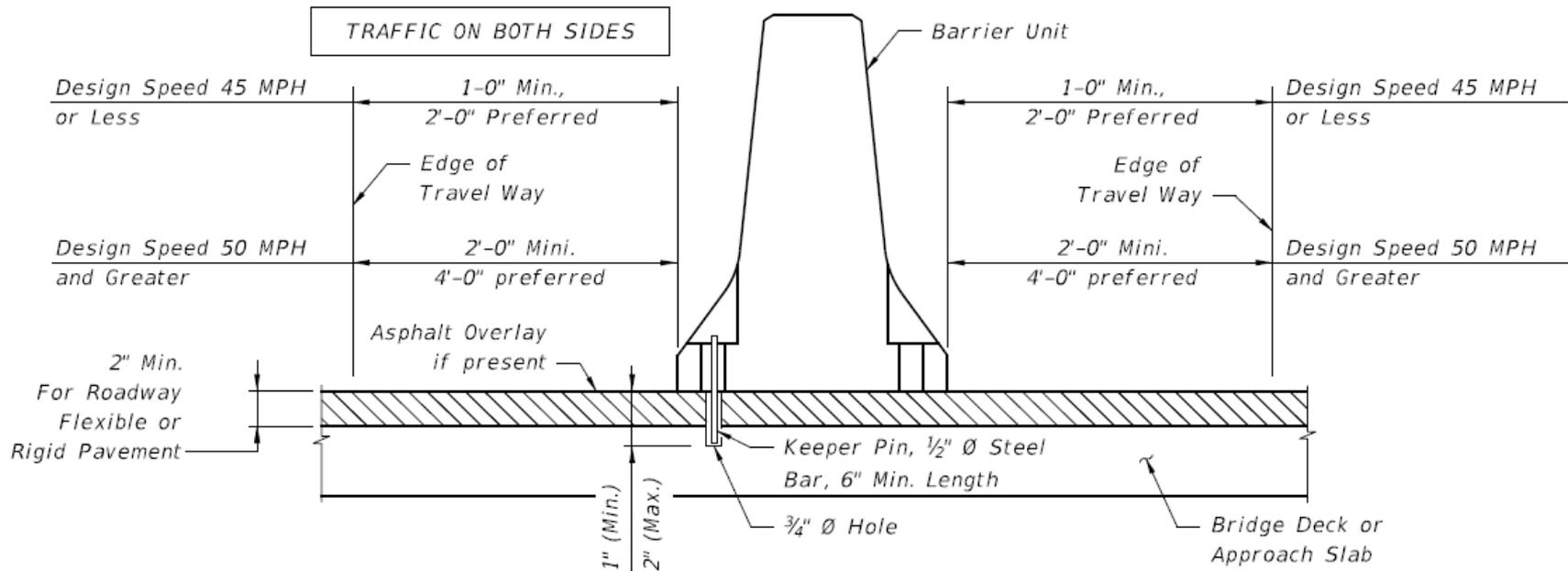
Free Standing Bridge

- See Index 414 -Sheet 6

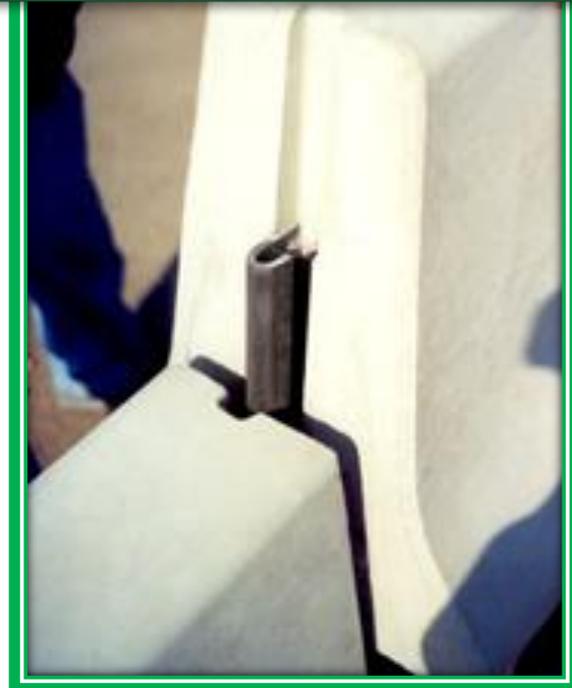
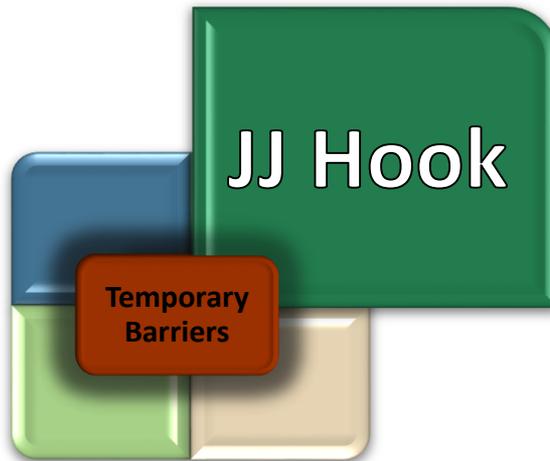


Free Standing Roadway Median

See Index 414 -Sheet 7



See QPL for vendor drawings



Installation

- Free Standing

Surface

- Rigid Pavement (Concrete)
- Flexible Pavement (Asphalt)
- Cross Slope of 1 to 10 or flatter

Transitions

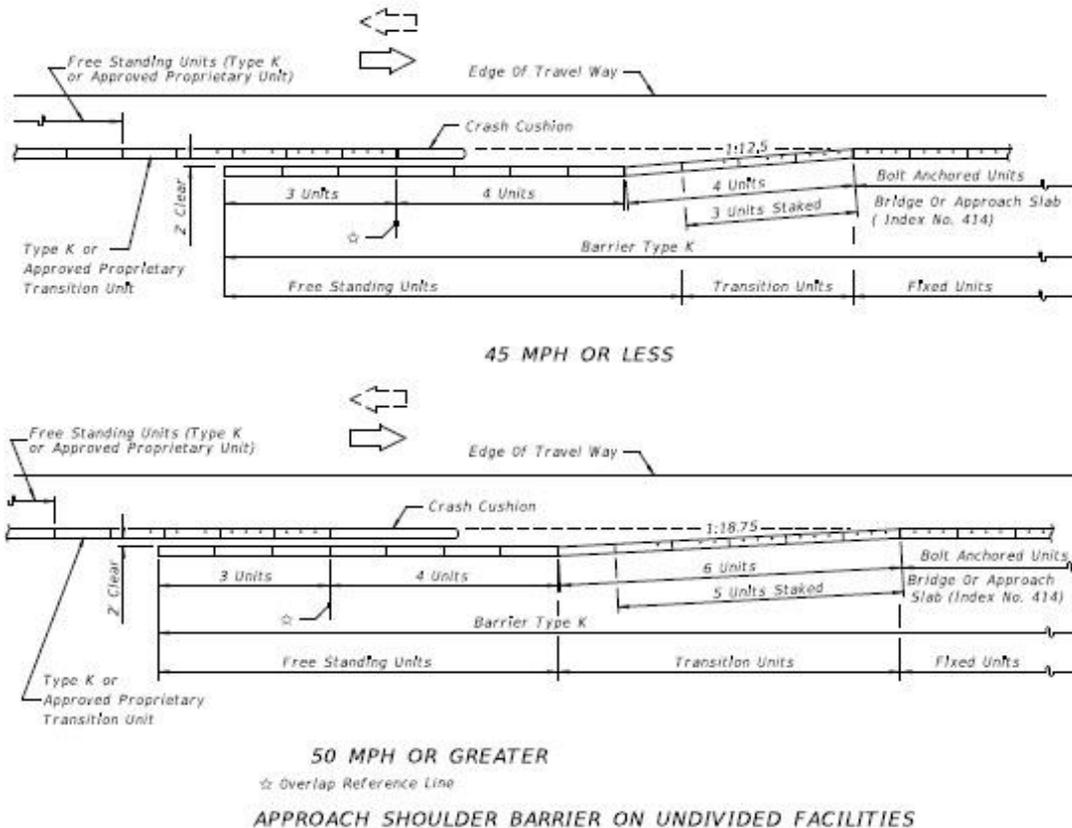
- Required Between Other Types of Barriers

Deflection Distance

- Varies on Use, Location and Speed

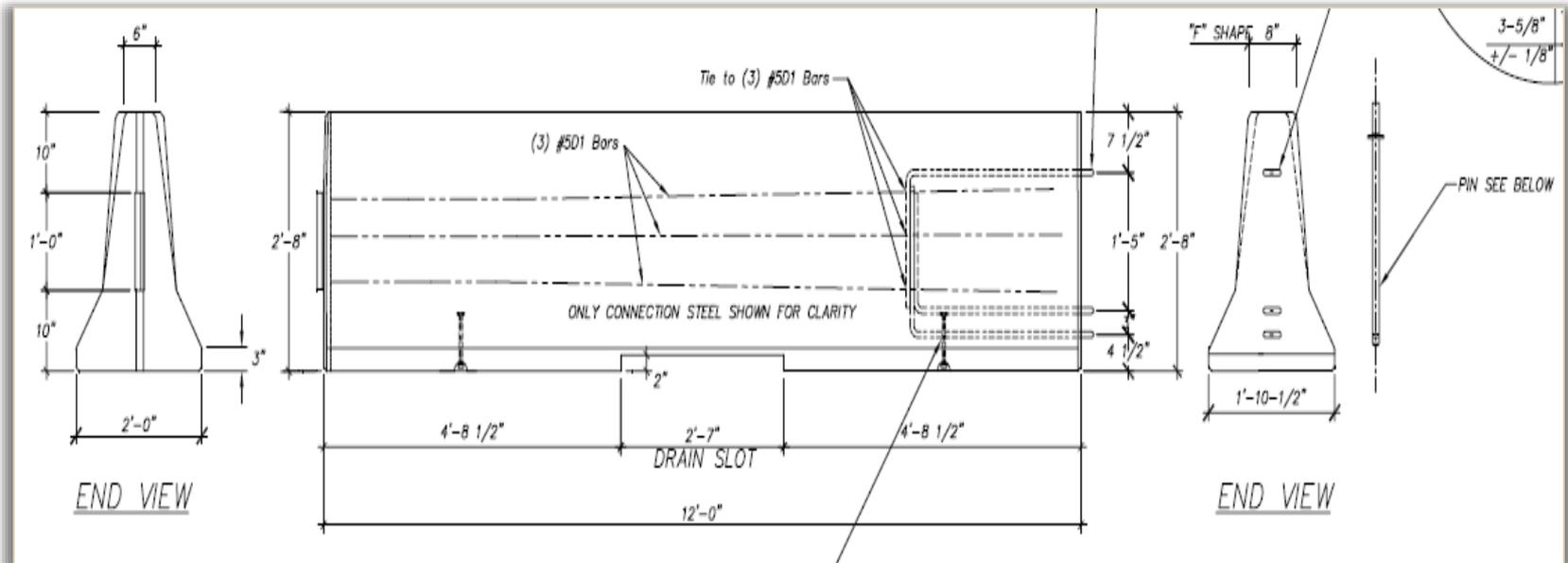
Transitions

- Required Between Other Types of Barriers – Overlap



Transitions

- Required Between Other Types of Barriers – Transition Unit



Installation

- Free Standing

Surface

- Rigid Pavement (Concrete)
- Flexible Pavement (Asphalt)
- Cross Slope of 1 to 10 or flatter

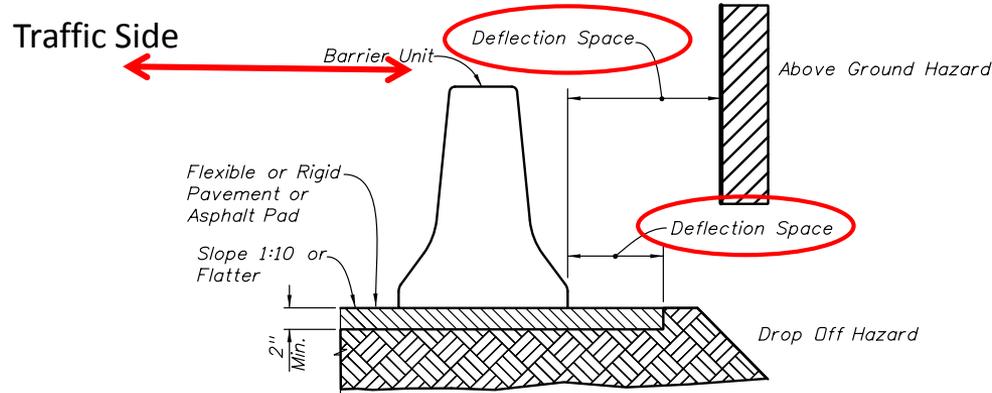
Transitions

- Required Between Other Types of Barriers

Deflection Distance

- Varies on Use, Location and Speed

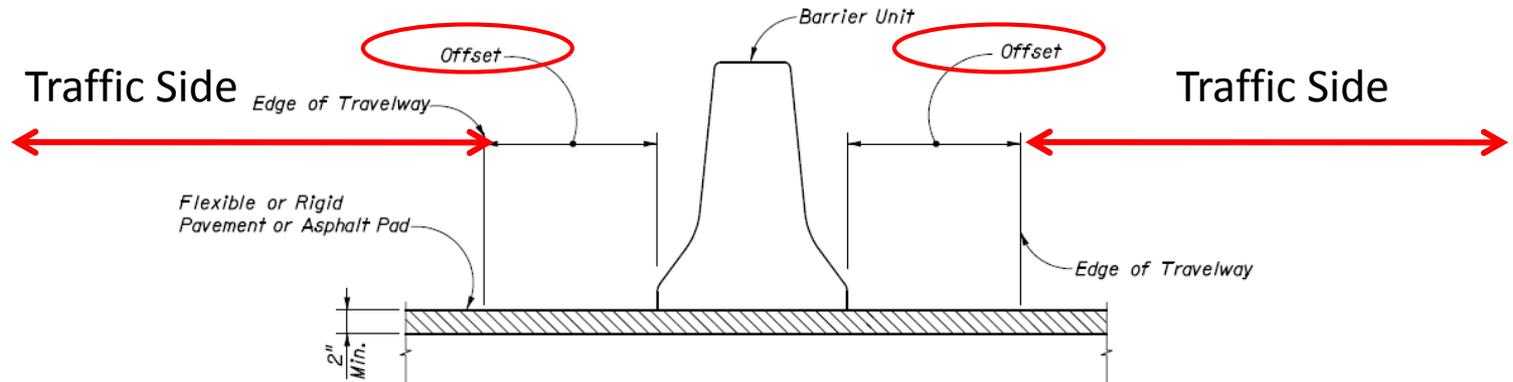
INDEX 415 - JJ HOOK



OFFSET AND DEFLECTION SPACE REQUIREMENTS

Installation	Shielding	Work Zone Speed	Offset to Travelway	Deflection Space
Left or Right Shoulder	Above Ground Hazards	45 mph or Less	1' min, 2' preferred	2' min.
		50 mph and Greater	2' min, 4' preferred	4' min.
	Drop-Off Hazards	45 mph or Less	1' min, 2' preferred	2' min.
		50 mph and Greater		
		a. Drop-offs 4' or Less and NO traffic below	2' min, 4' preferred	2' min.
		b. All drop-off conditions other than 'a'	2' min, 4' preferred	4' min.

INDEX 415 - JJ HOOK



Installation	Shielding	Work Zone Speed	Offset to Travel-way	Deflection Space
Separating Traffic	Adjacent Opposing Traffic	45 mph or Less	1' min. 2' preferred	1' min. 2' preferred
		50 mph and Greater	2' min. 4' preferred	2' min. 4' preferred

Free Standing Roadway Median

LOW PROFILE BARRIER



Intended for use in Urban Areas where sight distance for side streets and driveways may be a problem.

LOW PROFILE BARRIER

Application

- Design Speeds of 45 mph or less

Surface

- Rigid Pavement (Concrete)
- Flexible Pavement (Asphalt)
- Cross Slope of 1 to 10 or flatter

Supplemental Devices

- Along the run of barrier:
 - Tubular Markers
 - 50' cc Tangent; 25' cc radii
- Approach end:
 - Type 1 Object Marker

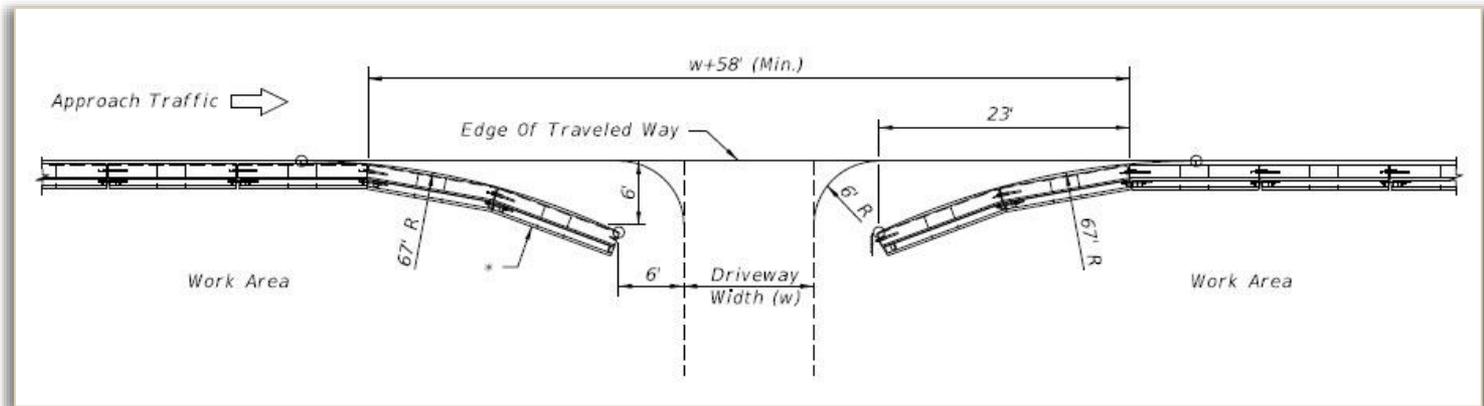
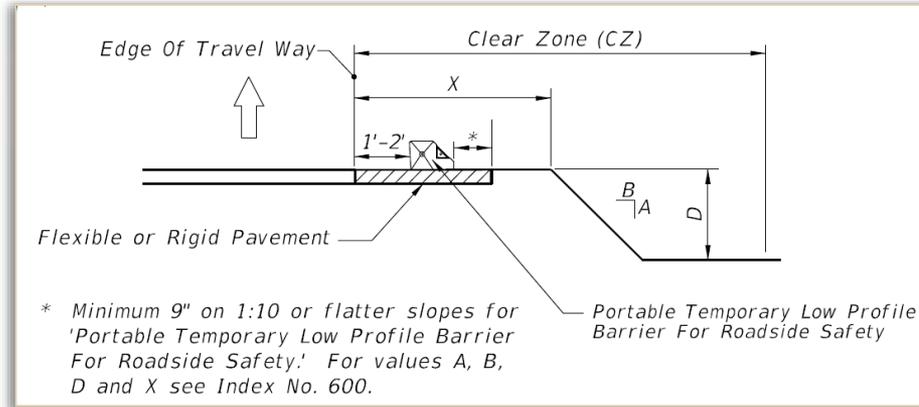
Deflection Distance & Offset

- Deflection Distance - 9 inch min
- Approach End Offset – 6 foot min

LOW PROFILE BARRIER

Deflection Distance & Offset

- Deflection Distance - 9 inch min
- Approach End Offset – 6 foot min

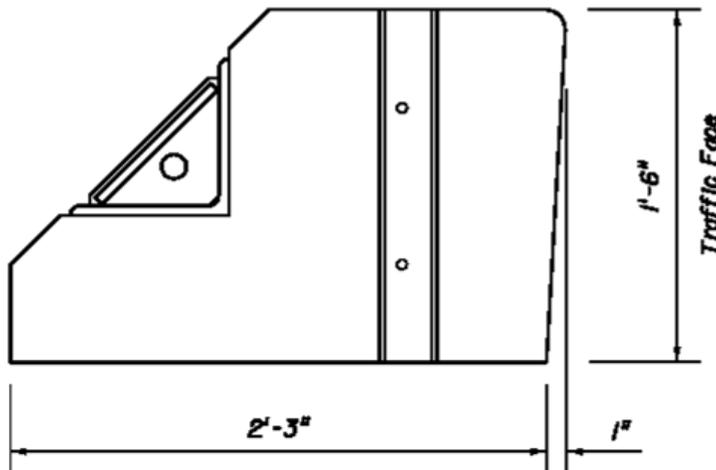


LOW PROFILE BARRIER

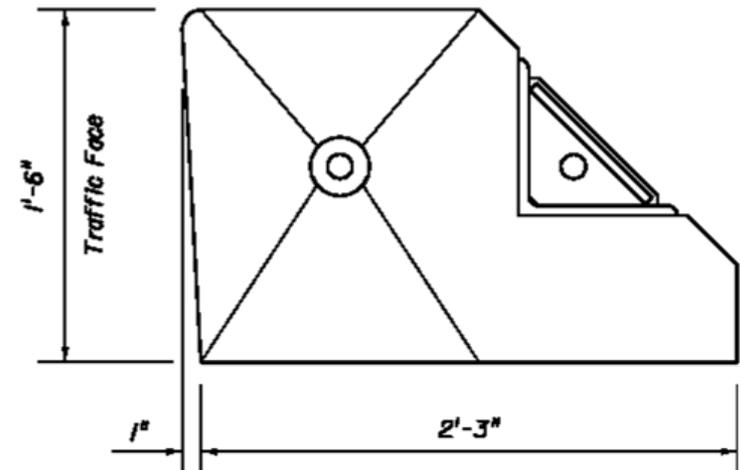


LOW PROFILE BARRIER

PORTABLE TEMP LOW PROFILE BARRIER DESIGN STANDARD 412



FLAT FACE FEMALE END



BEVELED FACE MALE END

END VIEWS

WATER FILLED BARRIERS

4 Systems:

- ❖ Triton
- ❖ Guardian
- ❖ Yodock
- ❖ Sentry



See QPL

WATER FILLED BARRIERS



WATER FILLED BARRIERS

Installation

- Free Standing

Surface

- Rigid Pavement (Concrete)
- Flexible Pavement (Asphalt)
- Cross Slope of 1 to 10 or flatter

Transitions

- Required Between Other Types of Barriers

Deflection Distance

- Varies on Speed and Manufacturer

Deflection Distance

- Varies on Speed and Manufacture

<i>OFFSET AND DEFLECTION REQUIREMENTS</i>				
<i>Installation</i>	<i>Shielding</i>	<i>Work Zone Speed</i>	<i>Offset to Travelway</i>	<i>Deflection Space</i>
<i>Right Shoulder</i>	<i>Above Ground Hazards</i>	<i>45 mph or Less</i>	<i>1' min. 2' Preferred</i>	<i>13' min.</i>
		<i>50 mph or Greater</i>	<i>2' min. 4' Preferred</i>	<i>19' min.</i>
	<i>Drop-off Hazards</i>	<i>45 mph or Less</i>	<i>1' min. 2' Preferred</i>	<i>13' min.</i>
		<i>50 mph or Greater</i>		
		<i>a. Drop-offs 4' or less w/ no traffic below</i>	<i>2' min. 4' Preferred</i>	<i>19' min.</i>
		<i>b. All drop-off conditions other than "a"</i>	<i>2' min. 4' Preferred</i>	<i>19' min.</i>
<i>Separating Traffic</i>	<i>Adjacent Opposing Traffic</i>	<i>45 mph or Less</i>	<i>13' min.</i>	<i>13' min.</i>
		<i>50 mph or Greater</i>	<i>19 min.</i>	<i>19 min.</i>

TEMPORARY GUARDRAIL

Same Requirements as Permanent Guardrail

1. Pay Item #102-73, LF Includes End Anchorage.
2. Unless stated otherwise in the plans, temporary guardrail is the property of the contractor.



4 Systems:

- ❖ Barrier Guard
- ❖ Orion
- ❖ Vulcan
- ❖ Zone Guard



Installation

- Bolted (Rigid Pavement)
- Anchored (Flexible Pavement)

Surface

- Rigid Pavement (Concrete)
- Flexible Pavement (Asphalt)
- Cross Slope of 1 to 10 or flatter

Transitions

- Required Between Other Types of Barriers

Deflection Distance

- Varies on Type of Installation (above), Location, Speed, and Manufacture

Minimum Deflection System

Struct.	102- 71- AB	TEMPORARY BARRIER WALL	LF
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A = Operation

1 (Furnish & Install)

2 (Relocate)

B = Material

1 (Concrete)

2 (Water filled)

3 (Low Profile Concrete) Index 412

4 (Type K) see details above

Steel Barrier is alternate design to Type K Barrier!



What were they thinking ???



Transition from guardrail to temporary barrier wall is not standard - **Index 414, Sheets 9, 10, and 13** provides standard attachment to bridge rail – **Type K barrier** is required.



Nonstandard connection to bridge railing -Index 414, Sheet 9 requires transition splice to connect Type K to bridge railing.



**Nonstandard connection to bridge railing -
Index 414, Sheet 9 requires transition splice to
connect Type K to bridge railing.**

2012/12/26 16:11



Type K abutting Low Profile Barrier - The Design Standards do not provide a connection detail for dissimilar barriers that deflect different amounts.



Snag hazard on top of Barrier - Roadway Design Bulletin 14-04 eliminates the channel attachments on top of Barrier.



JJ Hook abutting Low Profile Barrier
Design Standards do not provide a connection detail for dissimilar barriers that deflect different amounts.



No transition from freestanding barrier to backfilled barrier [Index 414, Signage requires staked transition of 1, 2, 3, 3 in advance of backfilled barrier].



Use of JJ Hook for transition
railing [Index 414, Sheet 8 requires
four anchored Type K barrier units
when transitioning to traffic railing]



TEMPORARY CRASH CUSHIONS

Florida Department of Transportation

TEMPORARY CRASH CUSHIONS

What is a crash cushion?

Crash cushions are protective systems that prevent errant vehicles from impacting obstacles by either smoothly decelerating the vehicle to a stop when it hits head-on or by redirecting the vehicle away from the obstacle in glancing impacts. Two types of crash cushions are used in work zones: stationary and mobile, the latter of which are commonly called truck- or trailer-mounted attenuators (TMAs).



Referenced: AASHTO RSDG 2004

TEMPORARY CRASH CUSHIONS

Crash Cushions

- Temporary/Permanent
- Attached to rigid barriers
 - Median Barriers
 - Roadside Barriers
 - Bridge Railing
- Used in either median or roadside application



TEMPORARY CRASH CUSHIONS

Test Vehicles

NCHRP (National Cooperative Highway Research Program) 350: 820C and 2000P
MASH (Manual On Assessing Safety Hardware): 1100C and 2270P

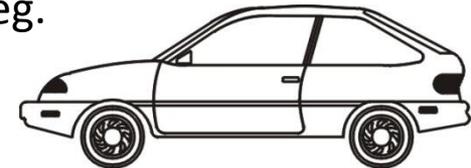
Includes Passenger Cars Of All Sizes, Sport/Utility Vehicles, Mini-Vans, Vans and Pick-up Trucks

TL-2 tested at 70 km/h (44 mph)

TL-3 tested at 100 km/h (62 mph)

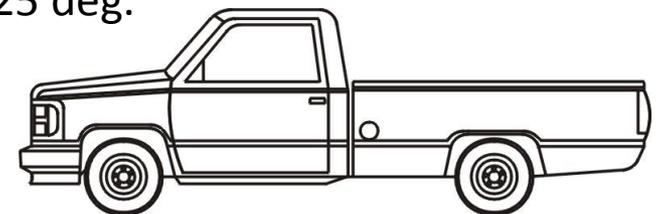
NCHRP 350 = 820C (1800 lb.) Passenger Car @ 20 deg.

MASH = 1100C (2420 lb.) @ 25 deg.



NCHRP 350 = 2000P (4400 lb.) Pickup Truck @ 25 deg.

MASH = 2270P (5000 lb.) @ 25 deg.



FDOT Design Requirements

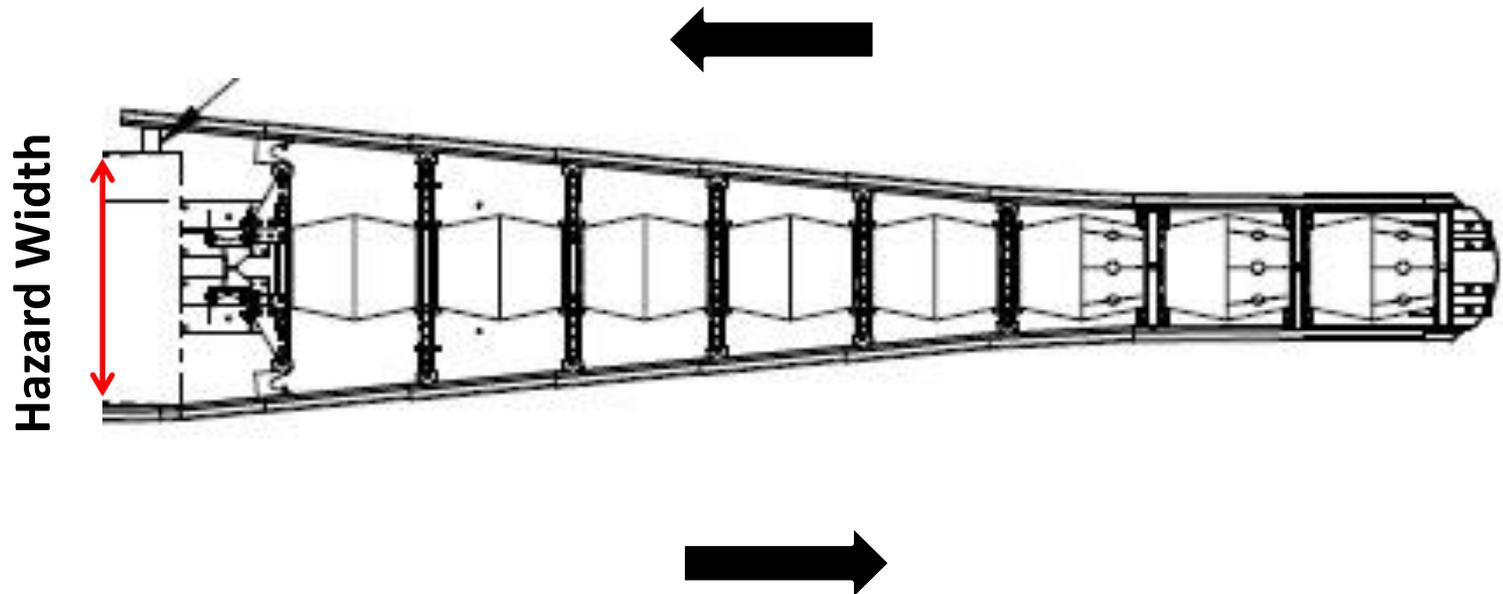
- Station/Offset
- Type of Crash Cushion (TL-2 or TL-3)
- Posted Work Zone Speed
- Width - Narrow vs. Wide
- Length Restrictions
- MOT Phase (Temporary)

TEMPORARY CRASH CUSHIONS



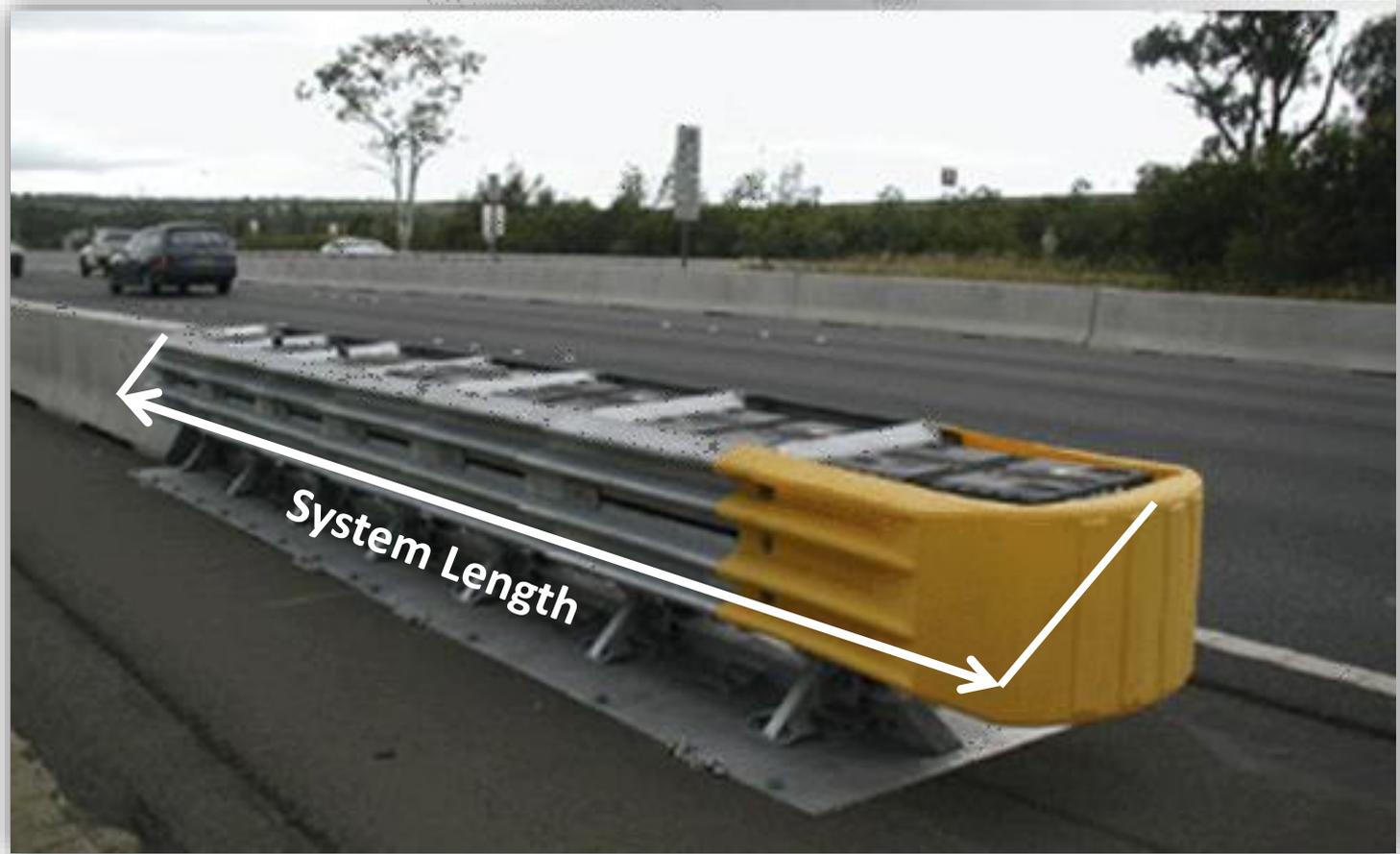
TEMPORARY CRASH CUSHIONS

WIDTH



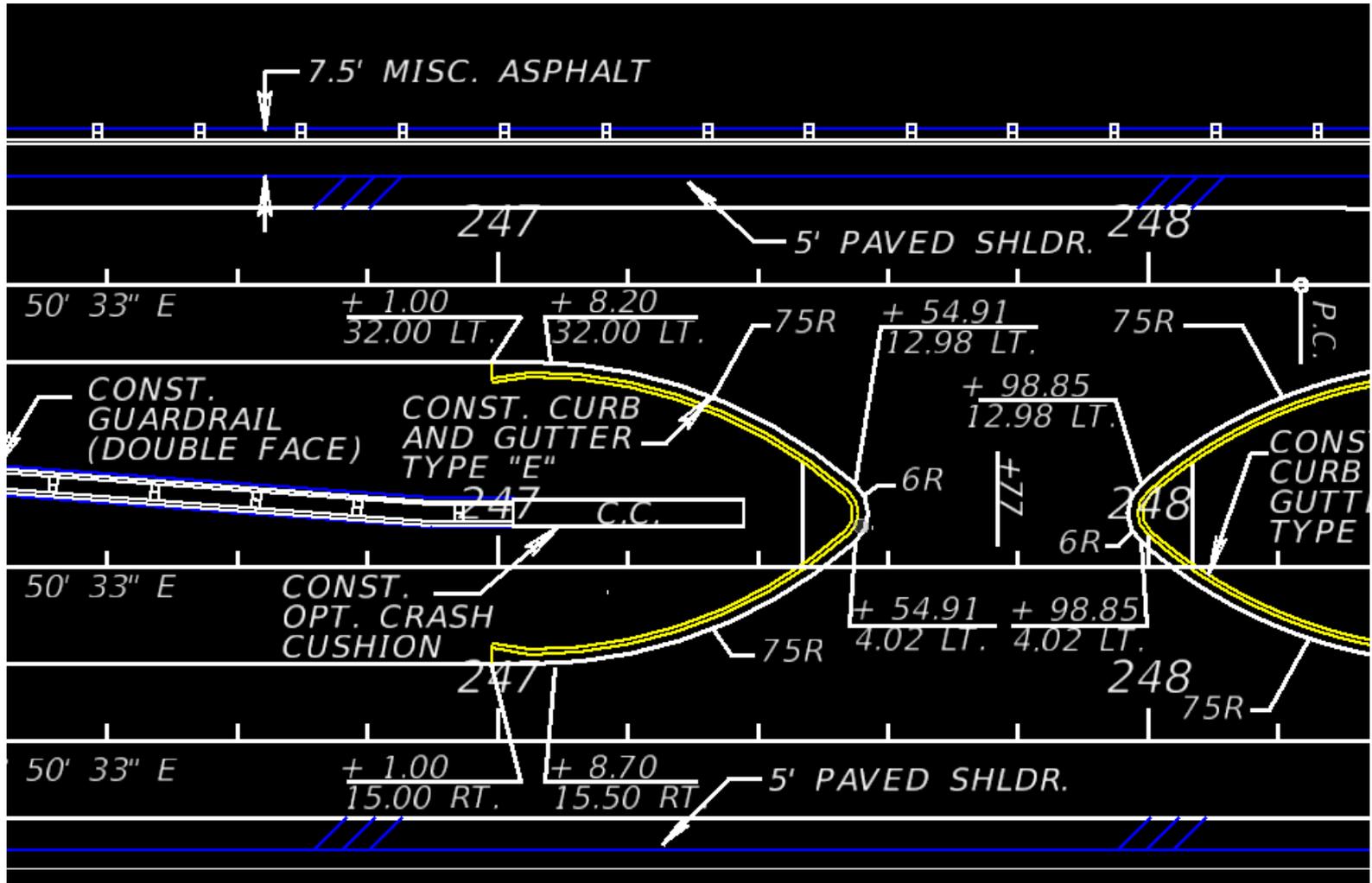
TEMPORARY CRASH CUSHIONS

LENGTH



TEMPORARY CRASH CUSHIONS

LENGTH RESTRICTIONS



TEMPORARY CRASH CUSHIONS

Redirective



ALTERNATIVE:

The contractor has the option to install reflective sheeting on the nose of the crash cushion in lieu of placing the yellow Type I Object Marker 3 feet in front of the nose of the crash cushion. The sheeting to be used must be solid yellow, Type III or better, and must be a product listed on the Department's Qualified Products List (QPL). The sheeting to be applied to the nose of the crash cushion shall be a minimum of 360 square inches with a minimum height of 15 inches.

April 30, 2009

Redirective Crash Cushions

TEMPORARY CRASH CUSHIONS

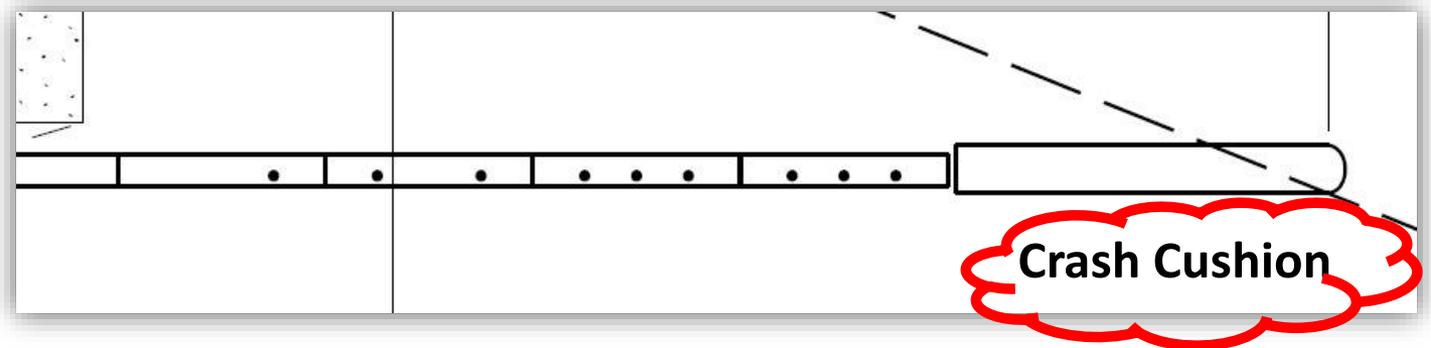
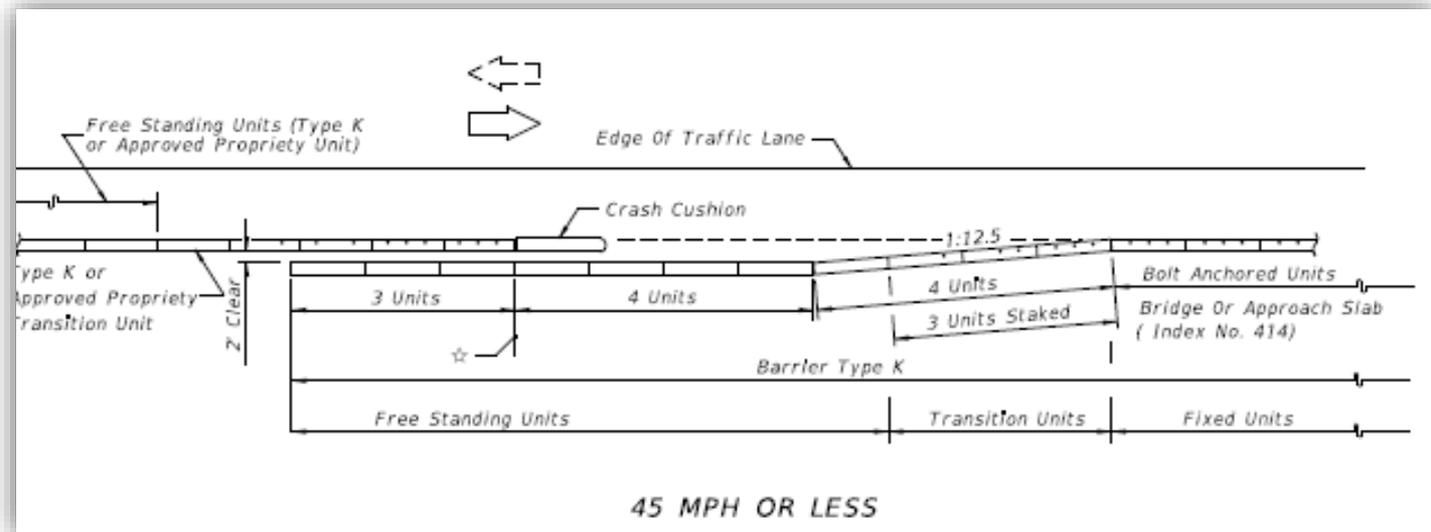
Barrier Wall End
Anchor Plates



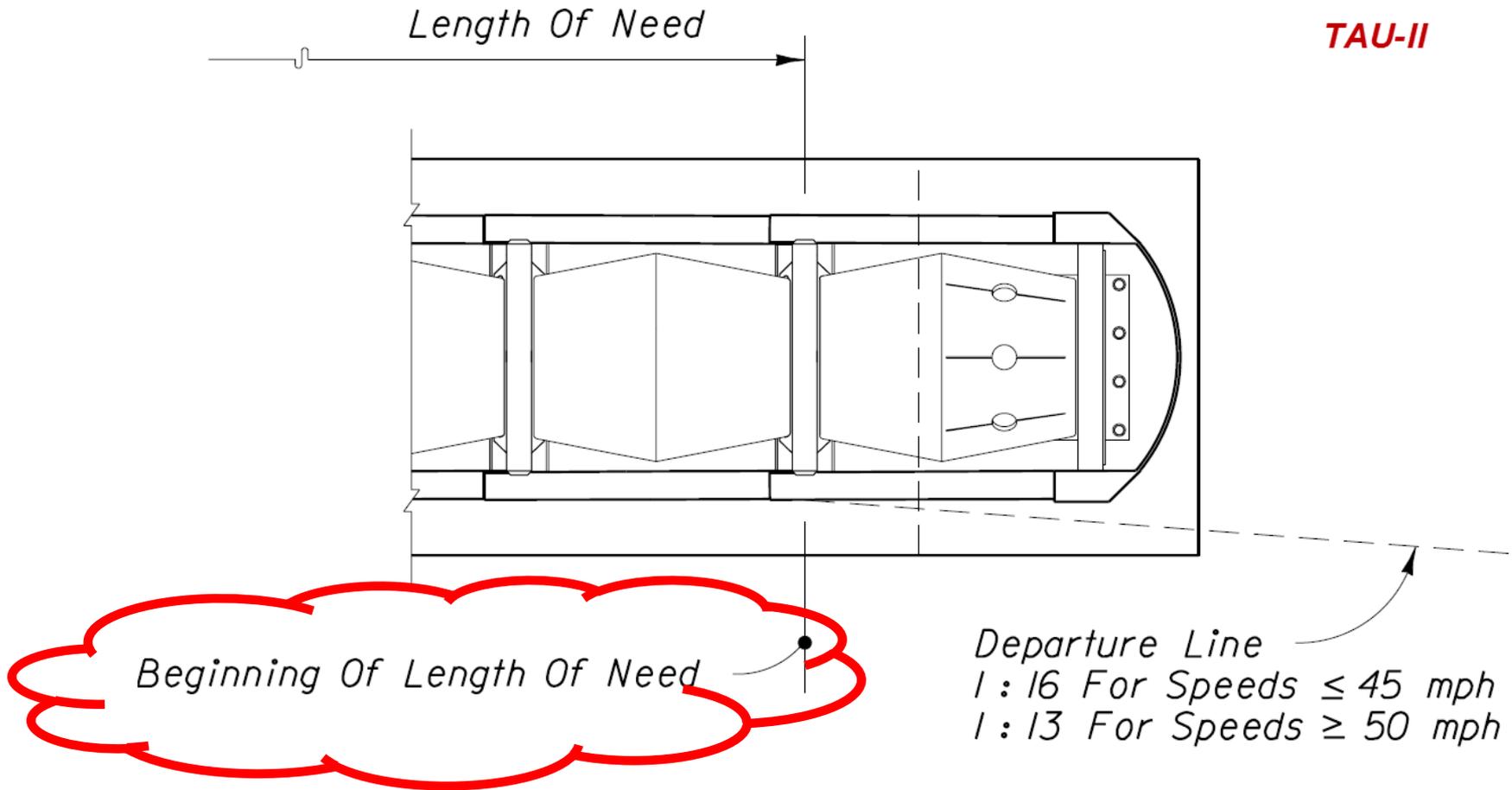
Redirective crash cushions are the principle device to shield approach ends of barrier wall

TEMPORARY CRASH CUSHIONS

Crash Cushion Attached to Barrier Systems



TEMPORARY CRASH CUSHIONS



TEMPORARY CRASH CUSHIONS

TAU II



TEMPORARY CRASH CUSHIONS

X-TENUATOR



TEMPORARY CRASH CUSHIONS

QUADGUARD



TEMPORARY CRASH CUSHIONS

QUADGUARD ELITE



TEMPORARY CRASH CUSHIONS

QUADGUARD II



TEMPORARY CRASH CUSHIONS

React 350 II



TEMPORARY CRASH CUSHIONS

Quest



TEMPORARY CRASH CUSHIONS

Heart



TEMPORARY CRASH CUSHIONS

TRACC



TEMPORARY CRASH CUSHIONS

SCI



TRUCK/TRAILER MOUNTED ATTENUATORS (TMA'S)



**Truck or Trailer Mounted
Listed on QPL**

**Indexes
607 & 619**

**Mounted by
Manufacturers
Recommendations**



TEMPORARY CRASH CUSHIONS

Plans :

Summary of Temporary Crash Cushions							
MOT Phase	Station	Offset (feet)	Side	Work Zone Speed (mph)	Type (TL-2 or TL-3)	Width of hazard (inches)	Length Restrictions (feet)
Phase 1	122+90	16	Rt.	55	TL-3	24 inch	N/A
Phase 2	145+27	16	Lt.	45	TL-2	48 inch	14

QUESTIONS ???????????????????