

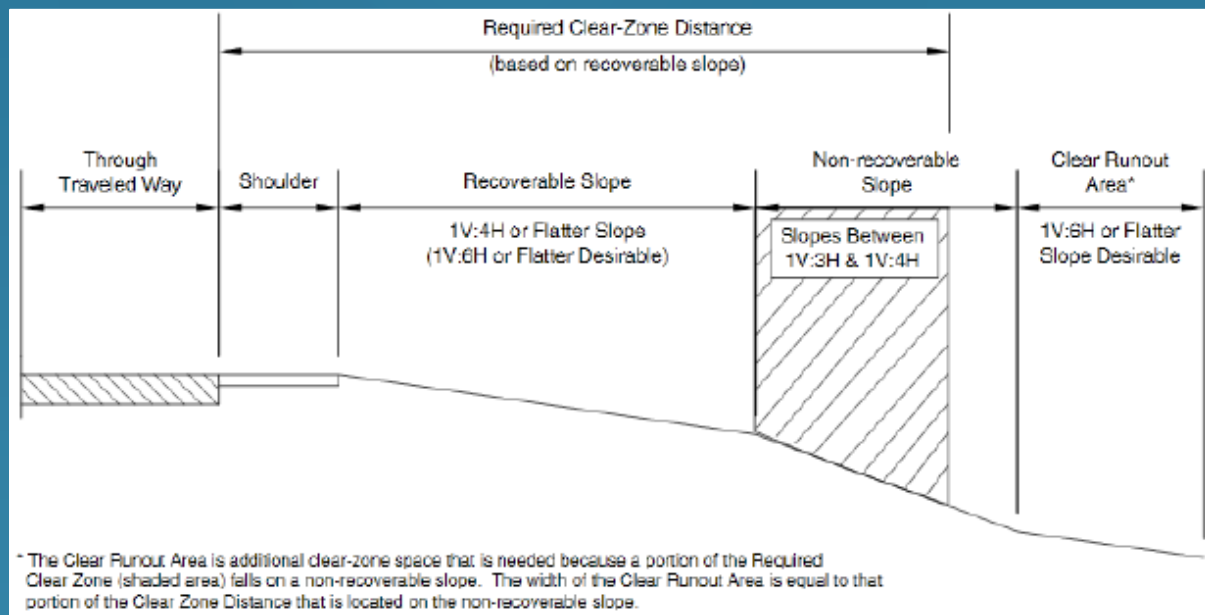
Road Side Hazard Management and Vehicle Restraint Systems

Presented By
Bharat Anand
SAFETY FIRST

Road Side Hazards

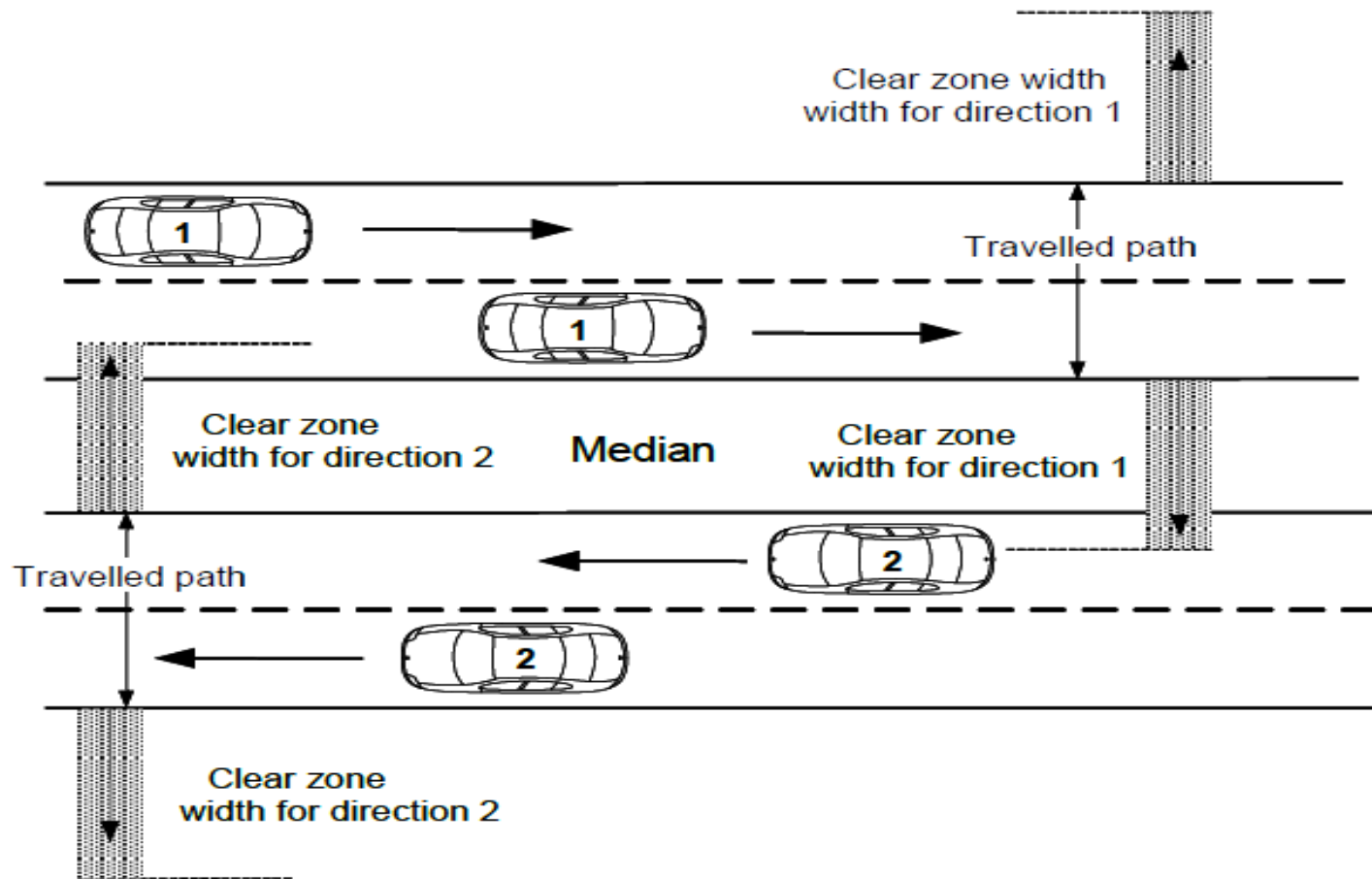
- The Vehicles we travel in and the speeds we travel at are in itself a hazard.
- In the early 19th Century UK and USA had the Red Flag Rule which is that a pedestrian with Red Flag has to walk in front of a moving vehicle to warn passerby's of its presence.
- If the Vehicle errs from its path the results can be extremely hazardous.

Clear Zone- Hazard Free Area required for safe recovery of errant vehicle



Clear Zone is a function of AADT and Speed

Design Traffic AADT	Design Speed, km/h			
	≥ 50	60	80	100
0 -1500	2.5 m	3 m	5 m	6 m
1500 - 4000	3 m	4 m	6 m	7 m
4000 - 12000	4 m	5 m	7 m	8 m
<u>≥ 12000</u>	5 m	6 m	8 m	10 m



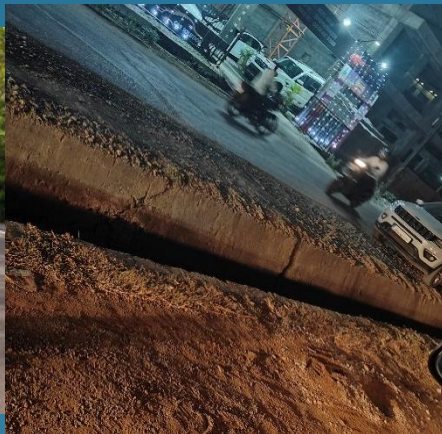
Curve Correction Factors for Design Speed and Curve Radius

Radius (m)	Design speed (km/h)					
	60	70	80	90	100	110
900	1.1	1.1	1.1	1.2	1.2	1.2
700	1.1	1.1	1.2	1.2	1.2	1.3
600	1.1	1.2	1.2	1.2	1.3	1.4
500	1.1	1.2	1.2	1.3	1.3	1.4
450	1.2	1.2	1.3	1.3	1.4	1.5
400	1.2	1.2	1.3	1.3	1.4	–
350	1.2	1.2	1.3	1.4	1.5	–
300	1.2	1.3	1.4	1.5	1.5	–
250	1.3	1.3	1.4	1.5	–	–
200	1.3	1.4	1.5	–	–	–
150	1.4	1.5	–	–	–	–
100	1.5	–	–	–	–	–

Warrants for Vehicle Restraint Systems

▪ Road Side Embankment

Design AADT	Warrants for Barrier at Embankment Height, in m			
	Embankment Slope	Design Speed, km/h		
		≥ 50	80	100
0 – 4000	1 : 1.5	3 m	2 m	1.5 m
	1 : 2	5 m	3 m	2 m
	1 : 3	8 m	6 m	4 m
4000 12000	1 : 1.5	3 m	2 m	1 m
	1 : 2	4 m	3 m	1.5 m
	1 : 3	7 m	4 m	3 m
≥ 12000	1 : 1.5	2 m	1.5 m	1 m
	1 : 2	3 m	2 m	1.5 m
	1 : 3	5 m	3 m	2 m
All Volumes	Elevated Roadway or Bridge with Vertical Drop at Roadside	Warrant for High Containment Barrier		



Permanent Water Body or Drain deeper than 0.6 m

Rough Rock Cuts



Tree with Diameter
Greater than 100 mm

Concrete Structure more than 150 mm above Ground



Retaining Walls



Bridge Piers and Abutments



Signage Poles



Breakaway or Yielding Post with linear impulse Greater than $4895 \text{ N} - \text{sec}$

Vehicle Restraint Systems

Requirements of Vehicle Restraint Systems

- The Purpose of a Crash Barrier is to Redirect and not Stop
- VRS Should Contain and Redirect an Errant Vehicle not allowing it to penetrate or vault over the system.
- It must not cause sudden Acceleration or Spin of the Errant Vehicle.
- The Vehicle after redirection should intrude only minimally in the adjacent traffic lanes.
- The Vehicle must be Upright During and After Impact with the barrier.
- A good VRS should have high containment with minimum impact severity to inhabitants of Errant Vehicle.

Types of Vehicle Restraint Systems (Crash Barriers)

Rigid Crash
Barrier

Concrete
Crash Barrier

Semi-Rigid
Crash Barrier

Crash Tested
Concrete
Barriers

Roller
Barriers

Flexible Crash
Barrier

Crash Tested
Metal Beam
Crash Barriers

Crash Tested
Wire Rope
Barriers

Other
Specialized
Crash Barrier

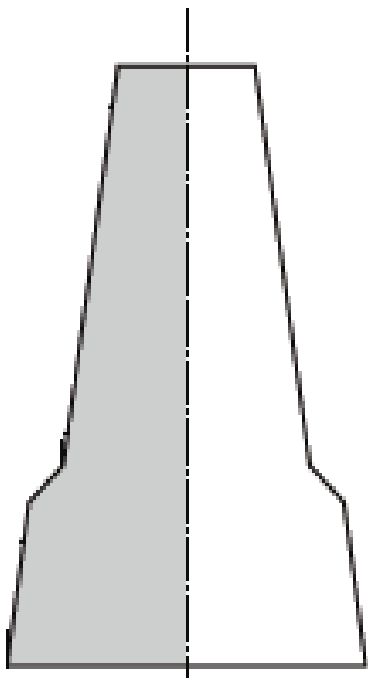
Crash
Cushions or
Attenuators

Bridge
Parapets

Work Zone
Barriers

Rigid Crash Barriers.

- Earlier Rigid Crash Barriers were based on a Design but were not Crash Tested
- Cast In-Situ Rigid Barriers are also Performance Based Designs Now.
- System is able to contain both Small Vehicles as well as Large Vehicles up to a 38 Ton Bus.
- Design is as per Manufacturers Crash Tested Design.



Representative Image of Cast In-Situ Barrier,



Inter-Locking Prefabricated Concrete Crash Barriers

- Prefabricated Concrete Barriers can offer High Containment at low costs.
- Interlocking Mechanisms have been introduced to enable Concrete Barriers also to have flexibility.
- Impact Severity improved to Class B and in Some Cases Class A
- Performance Based Systems, Designs and Specifications are left to the System Manufacturer tested to EN-1317 or MASH.
- Systems Offer High Containment (H4b) with Low Working Width(W2).
- Are Ideal for Bridge Parapets and Reduced Width Median





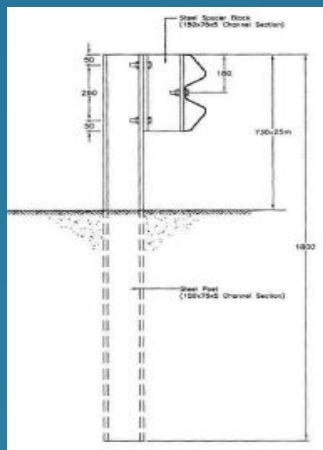
Metal Beam Crash Barriers

Metal Beam Crash Barriers can be categorized into two categories:

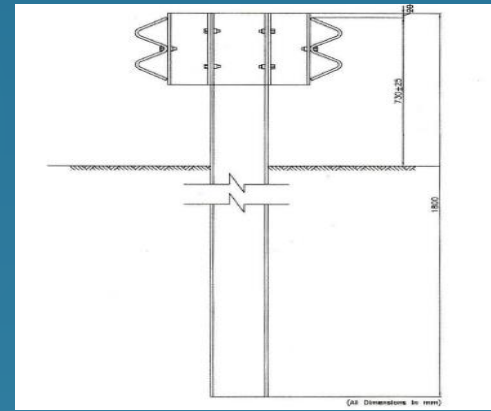
1. Untested Generic Designs.
2. Crash Tested Proprietary Designs.

Generic Design Based Metal Beam Crash Barriers

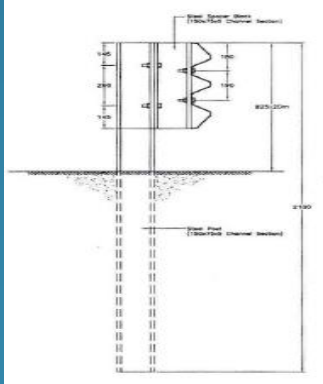
- Untested Generic Designs are Material Based Designs.
- It is a Strong Post Design consisting of Either Two Wave (W-Beam) or Three Wave (Thrie-Beam) Metallic Corrugated Sheet attached to the post with a block out Spacer with Post Centers every 2 meters.
- The System was first designed in the USA keeping in mind vehicles up to 2000 kg in mind.
- In a Strong Post Design the Post is cast In-Situ in a Ready Mix Concrete Pit
- System is Semi-Rigid with only the Tenacity of the Metal Providing for Some Flexibility.



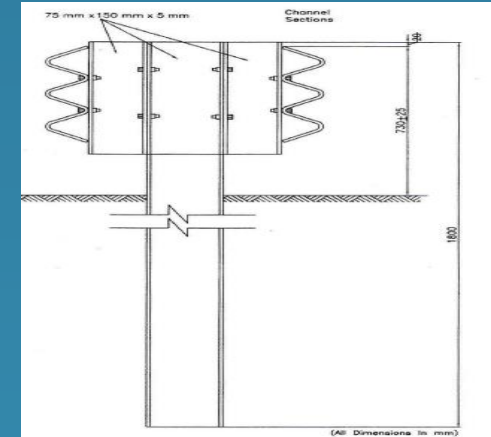
W-Beam Crash Barrier



Double Sided W-Beam Crash Barrier



Thrie-Beam Crash Barrier



Double Sided Thrie-Beam Crash Barrier





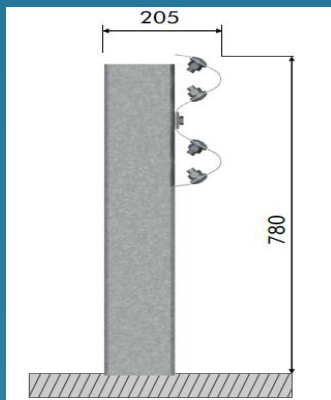




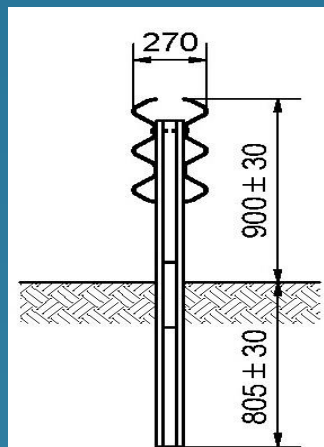


Crash Tested Metal Beam Crash Barriers

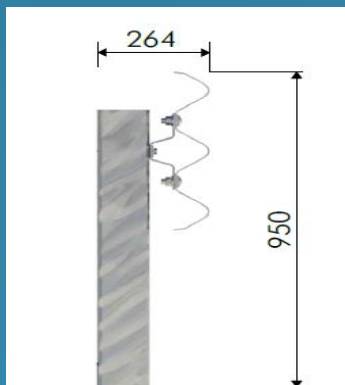
- Performance Based Systems, Designs and Specifications are left to the System Manufacturer tested to EN-1317 or NCHRP:350 or MASH.
- The Containment Level (i.e. weight and kind of vehicle), The Impact Severity to Passengers, The Working Width (Amount of Hazard Free Area Required) is all known.
- Designed and Tested to Contain up to 13,000 kg Rigid Bus.
- Spacer Redesigned or Removed to Contain Larger Vehicles.
- System is Flexible as Post is Driven into Soil and is allowed to rotate when impacted.
- Extensive R&D and Competition has led to Cost Effective



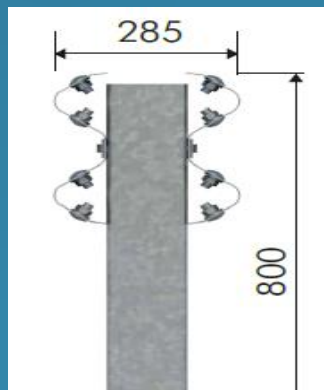
W-Beam Crash Barrier



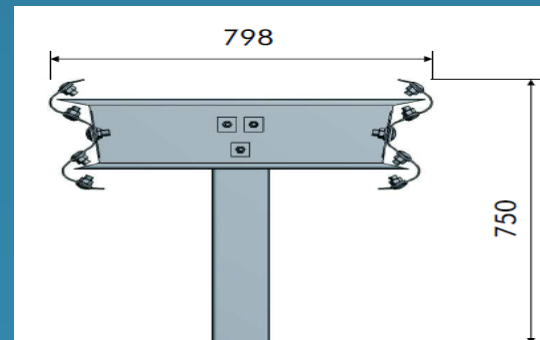
Double Sided Thrie-Beam Crash Barrier



Thrie-Beam Crash Barrier



Double Sided W-Beam Crash Barrier



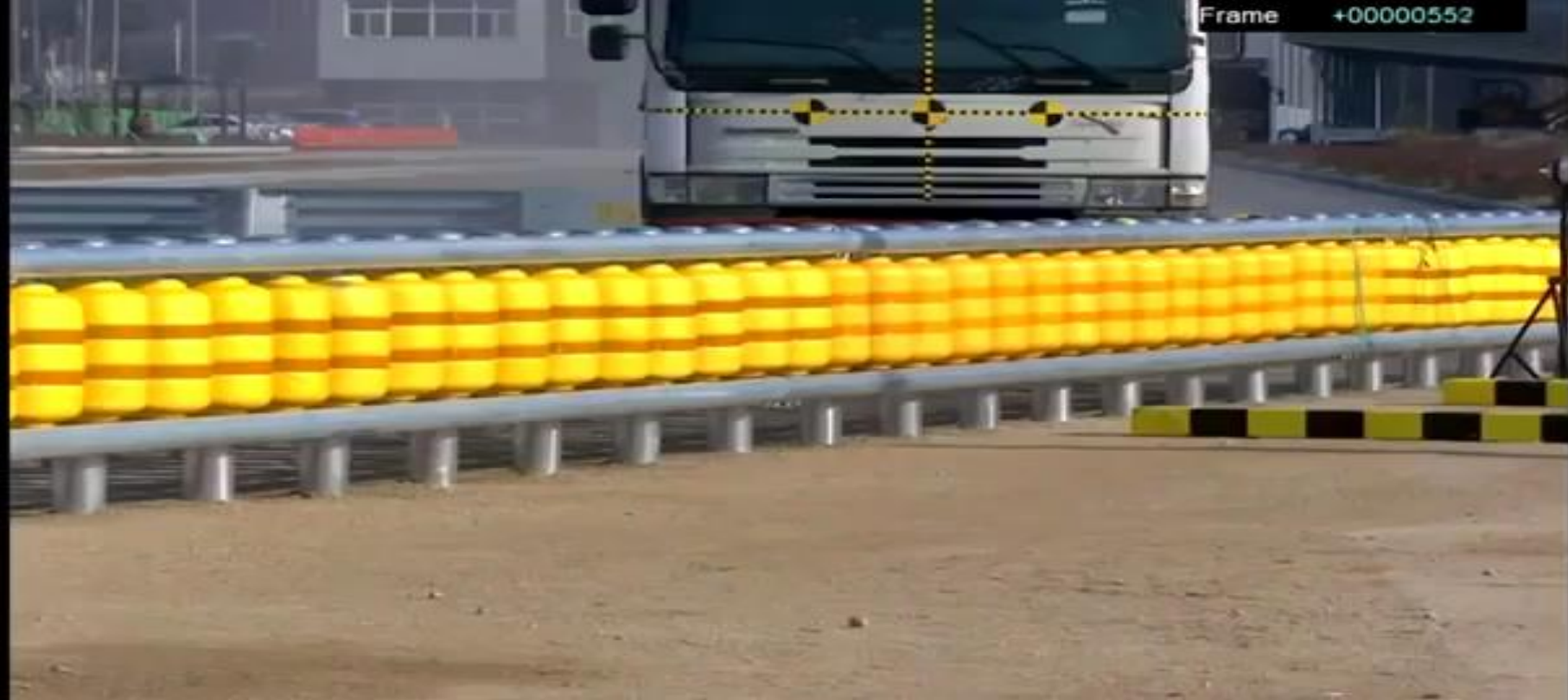
Double Sided W-Beam Crash Barrier



Crash Tested Roller Crash Barriers

- Performance Based Systems, Designs and Specifications are left to the System Manufacturer tested to EN-1317 or NCHRP:350 or MASH.
- Roller absorbs initial collision shock, which converts to rotational energy, front and back rails provide additional strength.
- Highly Effective and Moderate Impact Severity to Vehicle Inhabitants.
- High Cost of Installation and Maintenance.
- Designed and Tested to Contain up to 13,000 kg Vehicle.
- System is Semi-Rigid Type.
- Not Enough Data- Not included in IRC, few installations worldwide.





Frame +00000552

Crash Tested Wire Rope Safety Barriers

- Performance Based Systems – Designs and Specifications are left to System Manufacturer; tested to EN-1317 or NCHRP:350 or MASH.
- High Tension, High Tensile Steel Wire Ropes are able to absorb the impact of both small and large vehicles.
- Designed and Tested up to 13,000 kg Rigid Bus.
- Very High Containment Capabilities, (3 Rope System min. 60 MT, 4 Rope min. 80 MT.). Only Next to Rigid Barriers.
- Rope Provides Flexibility thus has lowest Impact Severity to Vehicle Inhabitants and least damage to Vehicles; Most Vehicles Drive Away.
- Low Life Cycle Cost: Easy, Quick & low Maintenance Cost.
- Most Cost Effective System – both for Supply & Installation.





Automotive



Frame: 1 • 200 fps



- Truck Hit another Mini Truck Across the Road
- Crossed Median and Parallel Lanes.
- Fully Controlled by Wire Ropes
- Prevented from falling into canal

End Treatment Of Crash Barriers

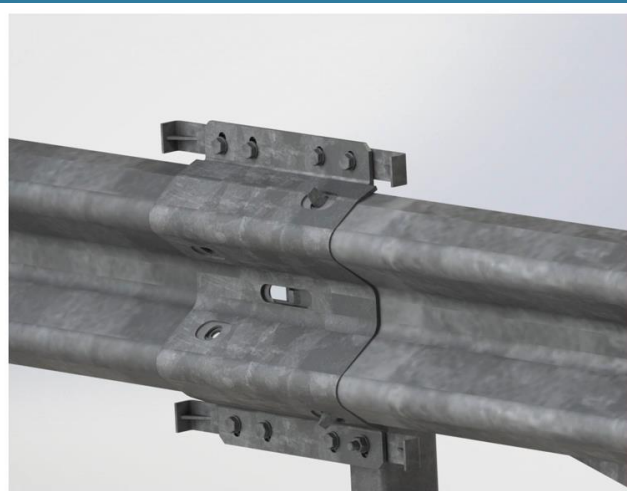
- If Metal Beam Barriers are not terminated properly they themselves become a hazard
- In a Metallic Barrier there are Multiple Instances of the Beam Spearing into the Vehicle.
- Slope Down Terminals are better solution but not fully foolproof as sloped down beam can act as Ramp For Front On Impacts.
- Crash Worthy Tested Terminals offer a Safer Choice



Slope Down Still a Safer Choice



Wire Rope Barrier Ends are Slope Down



ATT END TERMINAL

NEW PATENT PENDING ENERGY
ABSORBING TECHNOLOGY

EASY INSTALLATION WITHOUT A
CONCRETE FOUNDATION

TYPICALLY INSTALLS IN ONE
HOUR

MEETS ENV1317-4 P4 110 KM/PH
CRITERIA



Crash Tested Metal Beam End Terminals

Motorcycle Protection Barriers

- It is noted that large number of serious injuries are inflicted due to rider sliding underneath crash barrier and impacting the post.
- Such injuries usually occur in neck or head and can be fatal.



Solution- Specialized Motorcycle Protection Systems

- Crash Tested Motorcycle Systems designed to be attached to existing or new installations.
- Designed Especially for Sliding Contact.
- Already in prevalence in Europe, America and Australia.



Crash Tested Bridge Parapets

- Performance Based Systems tested and approved to EN-1317 and NCHRP:350.
- Designed for Extreme High Containment Levels i.e. up to 38,000kg Rigid Trucks.
- Have more flexibility and higher capability of handling taller vehicles like Trucks and Buses.
- Much more effective than Concrete Bridge Parapets.
- Available in Steel, Aluminum and Hybrid (Steel+ Wire Rope) Designs.
- Provide Better Transitions with Crash Barriers.







Crash Cushions or Attenuators

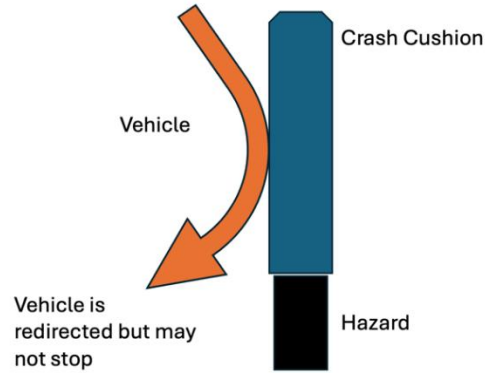
- Designed and Tested as Per EN-1317 or NCHRP:350 or MASH.
- Crash cushions, also called impact attenuators are used as a roadside safety treatment to protect errant vehicles from striking hazardous fixed roadside objects.
- Crash Cushions absorb the Kinetic Energy of the vehicle and Gradually Decelerate its Speed in a Frontal Impact and Safely Redirect a Vehicle in case of an Angular Impact.
- Usually Installed: Bridge Piers, Bridge Rails, Exit Gore Ramps, Sign Trusses among other things.



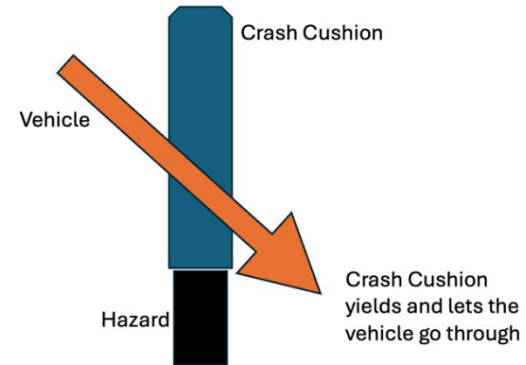
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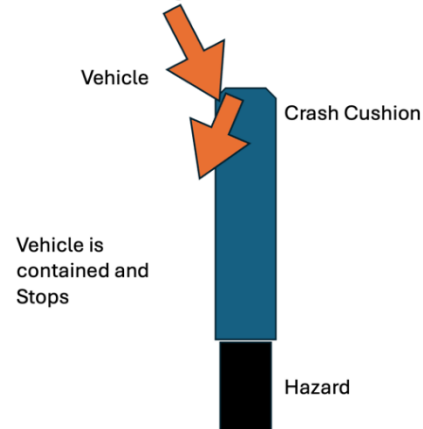
Redirective Crash Cushion



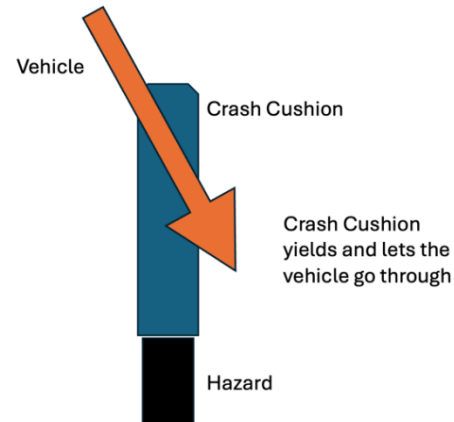
Non-Redirective Crash Cushion



Non-Gating Crash Cushion



Gating Crash Cushion





Non Redirecting Sacrificial Crash Cushion- Gating Type



Redirecting Sacrificial Crash Cushion- Non Gating



Severe (Repairable) Crash Cushion



Work Zone Barriers

- Traditionally Plastic Cones, Plastic New Jersey Barriers or Steel Sheets like used by Metro.
- Crash Tested Options Now Available- EN-1317, NCHRP:350 & MASH.
- Have all the advantages of Permanent Barriers- High Containment, Low Impact Severity Etc...
- Provides Data to Work Zone Managers to be able to plan placement and requirements.
- Can Broadly be divided into 2 types:
 - Mobile Crash Barriers
 - Mobile Crash Attenuators

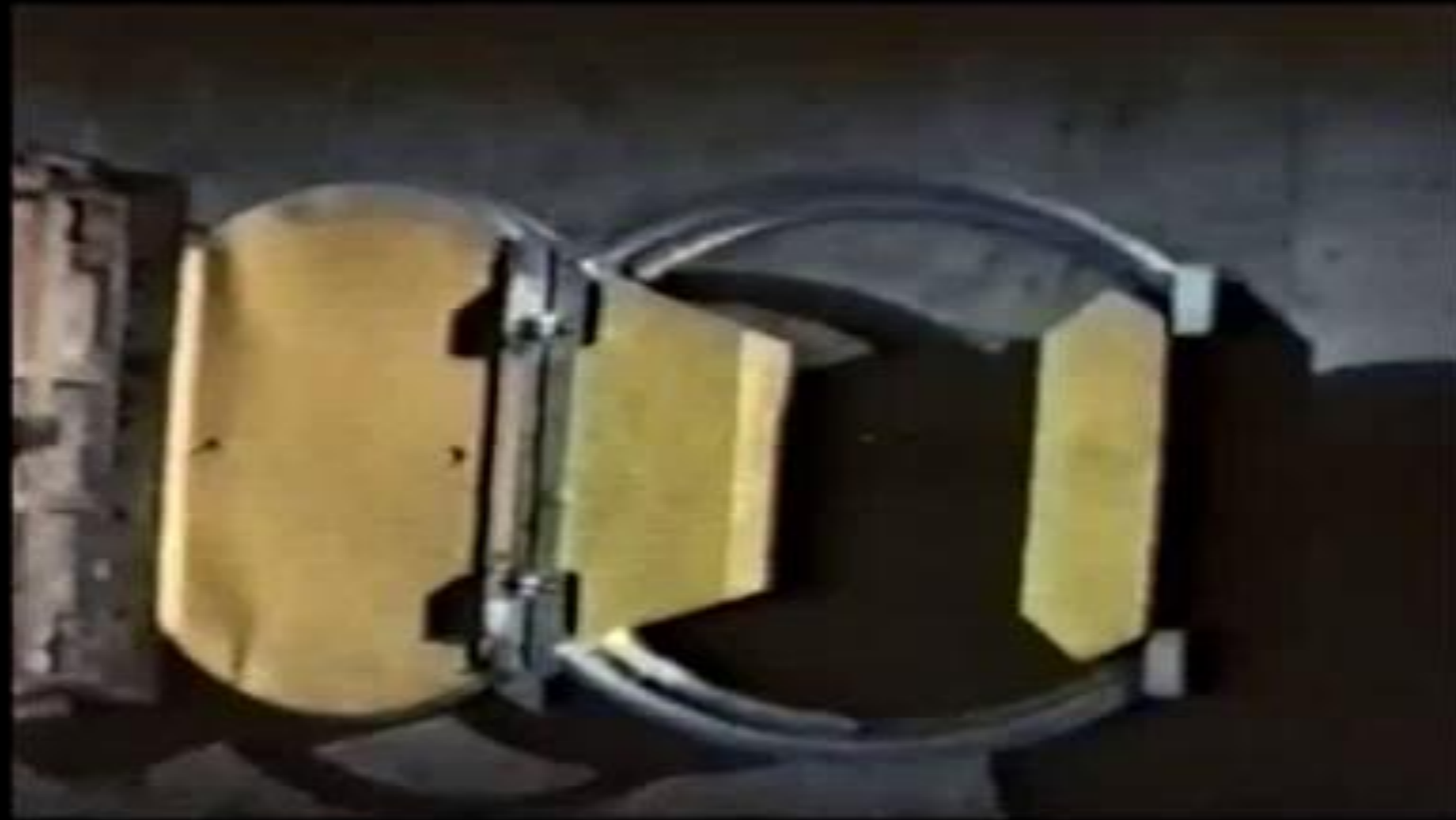


Mobile Crash Barrier

Mobile Crash Attenuator







Understanding Crash Testing Norms

- Three Major Norms Worldwide
 - European- EN-1317
 - American- NCHRP:350 and MASH
- Each Designed according to the majority Vehicles in the Region
- Basic Parameters that are checked when conducting a Crash Test:
 - Containment
 - Working Width / Deflection
 - Impact Severity
- A Crash Test is carried out with a Crash Barrier System so as to provide us with information which can then form criterion for selection of a crash barrier at a given site location
- A Crash Test is carried out by Specific Laboratories and need to be tested only once for a specific design

Containment Level

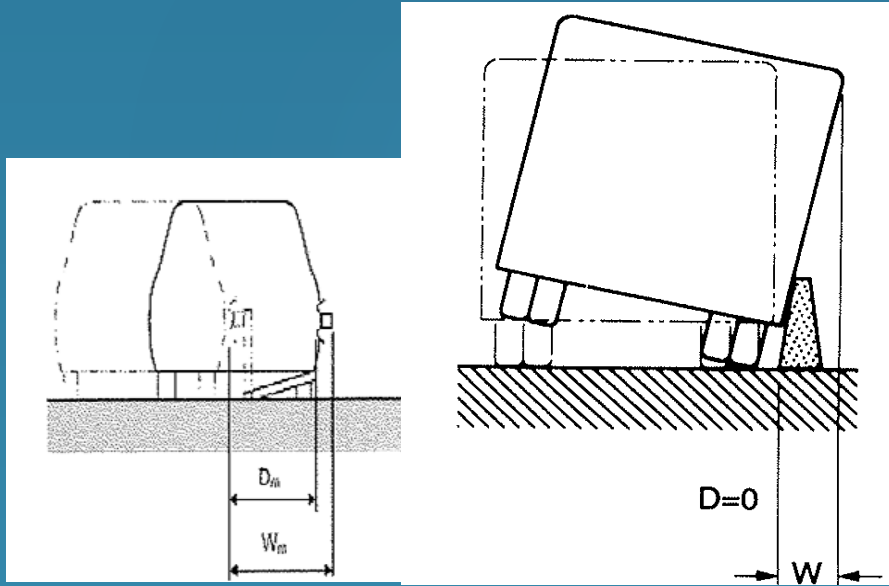
- Containment Level is defined as per class of heaviest vehicle used to conduct the Crash Test.
- Each Containment Level Contains 2 Tests
 - One with The Heaviest Vehicle in the Level.
 - One with a Light Vehicle (900kg) to in order to verify that satisfactory attainment of the maximum level is also compatible with safety for a light vehicle.
- Containment Level also includes Speed of Vehicle as well impact angle at time of test.
- While choosing a Containment Level a Fine Balance is to be maintained- Highest Containment may not always be Best Suited

EN-1317							
Type	Containment Level	Maximum Weight Vehicle	Impact Speed	Impact Angle	Light Vehicle	Impact Speed	Impact Angle
Normal	N2	1500 kg car.	110 km/hr	20°	900 kg car.	100 km/hr	20°
High	H1	10,000 kg Truck	70 km/hr	15°	900 kg car.	100 km/hr	20°
	H2	13,000 kg Rigid Coach (Bus)	70 km/hr	20°	900 kg car.	100 km/hr	20°
Very High (Specialized)	H3	16,000 kg Rigid HGV	80 km/hr	20°	900 kg car.	100 km/hr	20°
	H4a	30,000 kg Rigid HGV	65 km/hr	20°	900 kg car.	100 km/hr	20°
	H4b	38,000 kg Rigid HGV	65 km/hr	20°	900 kg car.	100 km/hr	20°

MASH							
Type	Containment Level	Maximum Weight Vehicle	Impact Speed	Impact Angle	Light Vehicle	Impact Speed	Impact Angle
Normal	TL-3	2270 kg Pick Up Truck	100 km/hr	25°	820 kg Car	100 km/hr	25°
High	TL-4	10,000 kg Truck	90 km/hr	15°	820 kg Car	100 km/hr	25°
					2270 kg Pick Up Truck	100 km/hr	25°
Very High (Specialized)	TL-5	36,000 kg Tractor Trailer Truck	80 km/hr	15°	820 kg Car	100 km/hr	25°
					2270 kg Pick Up Truck	100 km/hr	25°

Working Width

- All Barriers deflect when impacted before they redirect the vehicle back to the traffic way.
- Working Width is defined is the amount of area available to a crash barrier in worst case scenario to deflect without encountering a hazard.



Dynamic Deflection
((Fig 1(b), Page 12, EN 1317-2:2010))

BS EN 1317-2:2010
EN 1317-2:2010 (E)

Table 4 — Levels of normalised working width

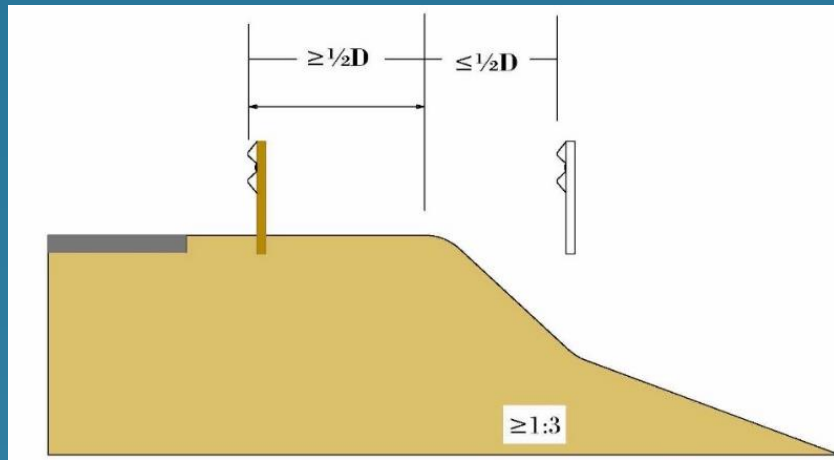
Classes of normalised working width levels	Levels of normalised working width m
$W1$	$W_N \leq 0,6$
$W2$	$W_N \leq 0,8$
$W3$	$W_N \leq 1,0$
$W4$	$W_N \leq 1,3$
$W5$	$W_N \leq 1,7$
$W6$	$W_N \leq 2,1$
$W7$	$W_N \leq 2,5$
$W8$	$W_N \leq 3,5$

NOTE 1 In specific cases, a class of working width level less than $W1$ may be specified.

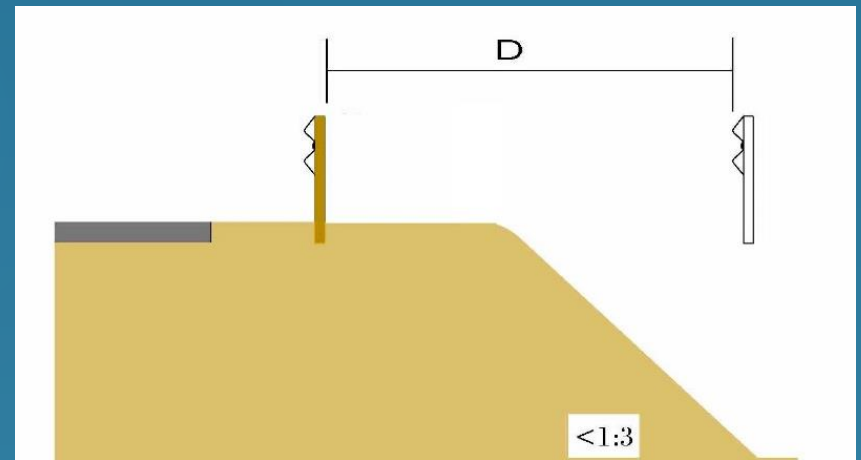
NOTE 2 The dynamic deflection, the working width and the vehicle intrusion allow determination of the conditions for installation of each safety barrier and also to define the distances to be provided in front of obstacles to permit the system to perform satisfactorily.

NOTE 3 The deformation depends on both the type of system and the impact test characteristics.

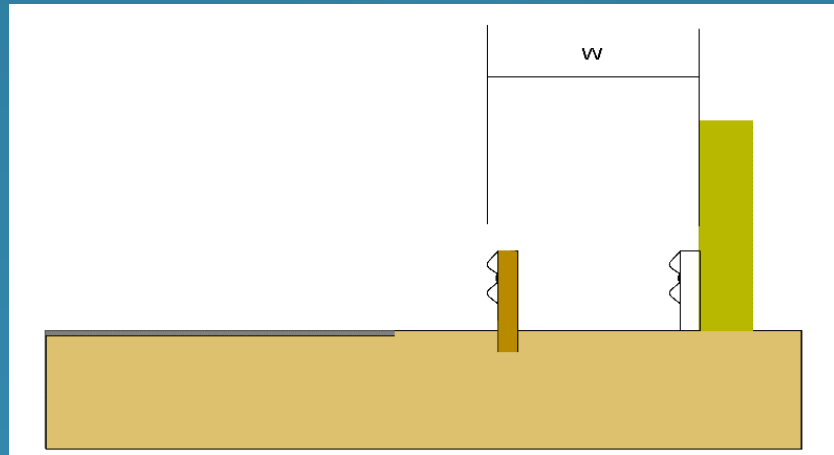
Levels of Normalized Working Width
Table 4, Page 11, EN 1317-2:2010)



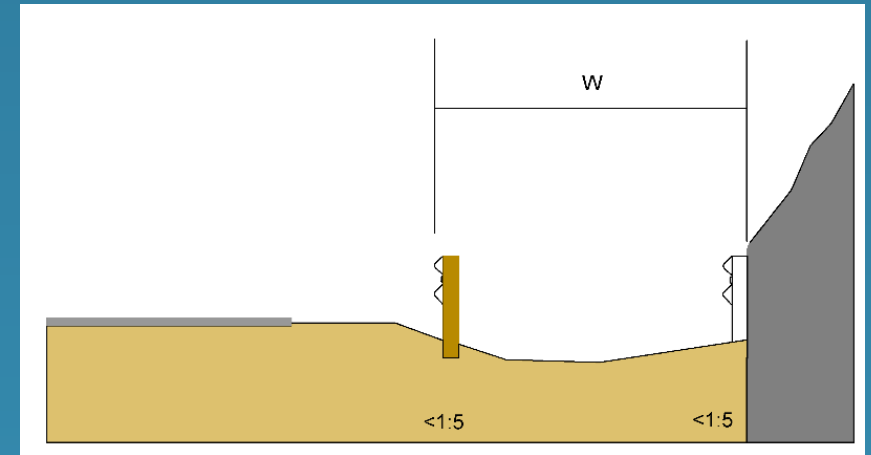
Deflection at Step Slopes



Deflection on Shallow Slopes



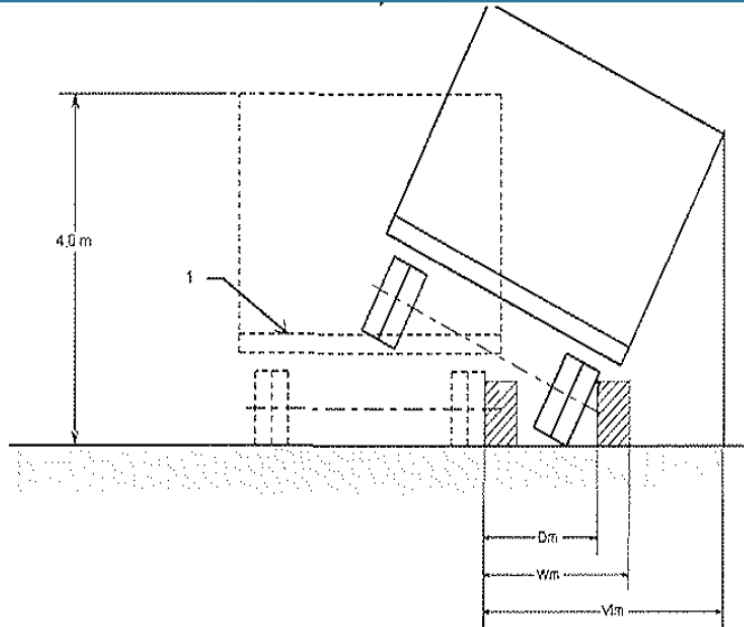
Working Width (W) of Barrier for Fixed Hazard.



Working Width (W) for fixed hazard with Gradient slope of 1:5 or lesser

Vehicle Intrusion

- Large Vehicles tend to tilt when they impact a Safety Barrier due to their High Center of Gravity.



Vehicle Intrusion

((Fig 1(e), Page 12, EN 1317-2:2010))

Table 5 — Levels of normalised vehicle intrusion

Classes of normalised vehicle intrusion levels	Levels of normalised vehicle intrusion m
V1	$V_{IN} \leq 0,6$
V2	$V_{IN} \leq 0,8$
V3	$V_{IN} \leq 1,0$
V4	$V_{IN} \leq 1,3$
V5	$V_{IN} \leq 1,7$
V6	$V_{IN} \leq 2,1$
V7	$V_{IN} \leq 2,5$
V8	$V_{IN} \leq 3,5$
V9	$V_{IN} > 3,5$

NOTE 1 In specific cases, a class of vehicle intrusion level less than V1 may be specified.

NOTE 2 The dynamic deflection, the working width and the vehicle intrusion allow determination of the conditions for installation of each safety barrier and also to define the distances to be provided in front of obstacles.

Levels of Normalized Vehicle Intrusion

Table 5, Page 11, EN 1317-2:2010)



Impact Severity Level

- Impact Severity Index is a parameter as per EN-1317 which helps in determining the level of impact to the inhabitants of the occupying vehicle.
- It is a function of Acceleration Severity Index (ASI) and Theoretical Head Impact Velocity (THIV).
- THIV-The occupant is considered to be a freely moving object (head) that, as the vehicle changes its speed during contact with the vehicle restraint system, continues moving until it strikes a surface within the interior of the vehicle. The magnitude of the velocity of the theoretical head impact is considered to be a measure of the vehicle to vehicle restraint system impact severity.
- ASI- ASI is function of time intended to give a measure of the severity of the vehicle motion for a person seated in the proximity of point P during an impact.
- In Most Countries Worldwide Impact Severity is one of the most Important Factors to choose a Crash Barrier.
- Most Important factor to Provide Forgiving Road Environment.

Impact Severity Level

Level or Class

Maximum Permissible Values

A

ASI ≤ 1.0

THIV ≤ 33 km/hr

B

ASI More than $1.0 \leq 1.4$

THIV ≤ 33 km/hr

C

ASI More than $1.4 \leq 1.9$

THIV ≤ 33 km/hr

Impact severity levels

- Along with the above 3 major denominators, the following are also measured in a Crash Test:
 - **Safety Barrier Behavior:**
 - No Part of the Safety Barrier Shall Penetrate the Passenger Cabin of The Test Vehicle.
 - No Part more than 2 kgs shall become detached or no part shall after impact shall form undue hazard to passengers, pedestrians, work zone personnel or other vehicles on Traffic Way.
 - **Test Vehicle Behavior:**
 - The Center of Gravity of the Vehicle shall not cross centerline of the deformed system.
 - The Vehicle Shall Remain Upright During and After Impact.
 - **Test Vehicle Deformation:**
 - Is To Be Noted in Every Report.

Placement of VRS

RISK PROTECTED THEREOFF !!!!

Identify Type of Road
and Annual Average
Daily Traffic

Classify Road on the
Basis of Above

Choose Appropriate
Containment Level

Check if Verify
Higher Containment
is required

Identify Type of
Hazard Present at
the Installation
Location of the
Barrier

Choose Barrier Working
Width and Vehicle
Intrusion Class

Choose Softest Impact
Severity Level Available in
Barriers meeting above
Criteria's

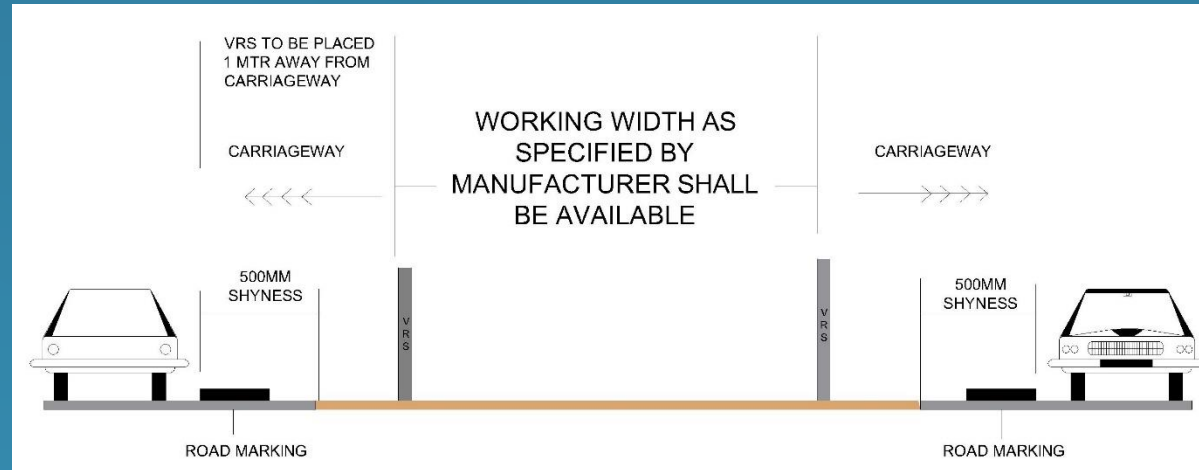
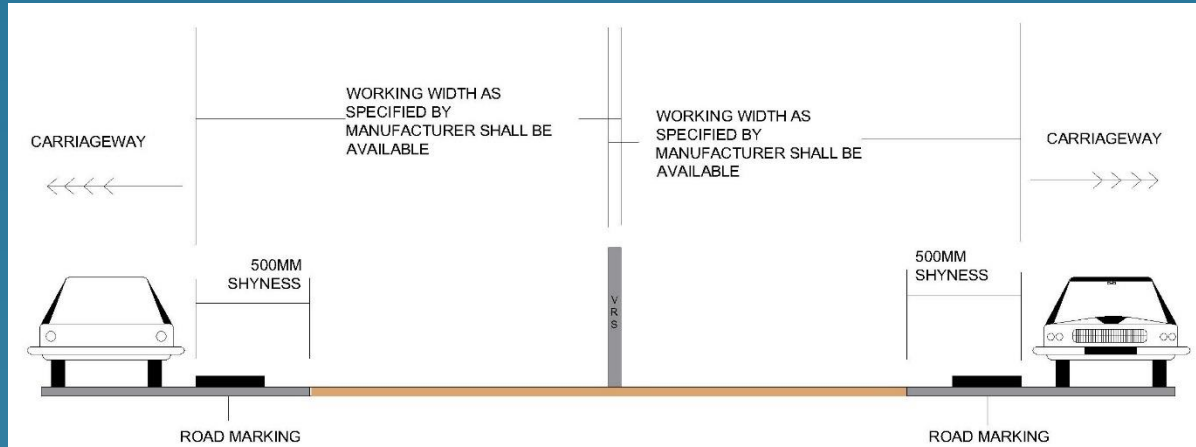
Choose Method and
Location of
Installation

Verify Minimum
Length of Barrier
required

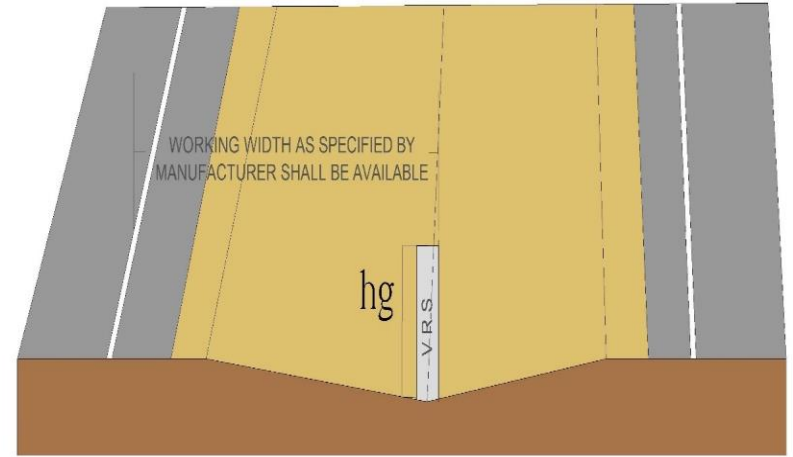
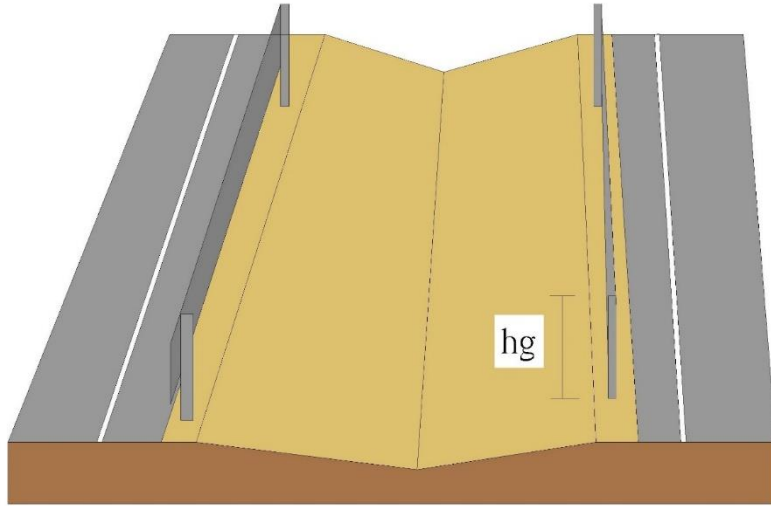
Check for Transitions
and Connections to
other barriers

Check for need of
Installing Motorcyclist
Protection Systems

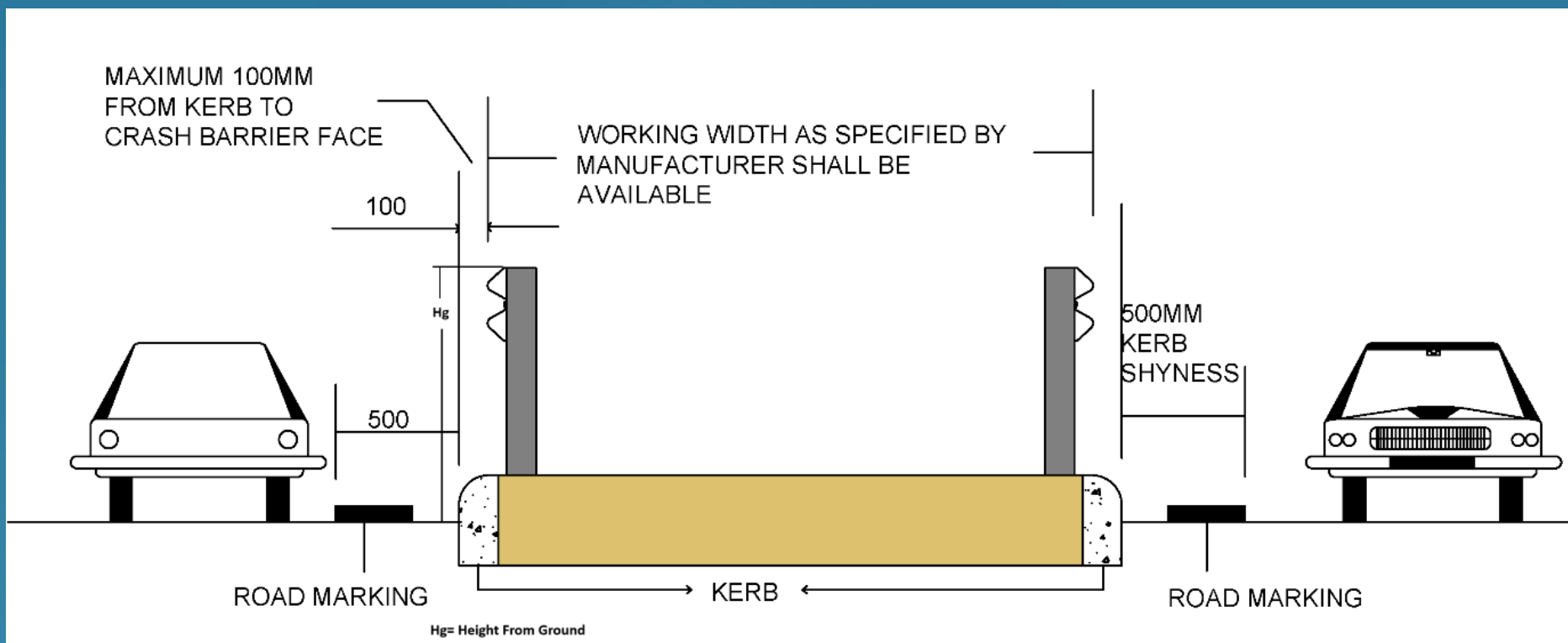
FLUSH TYPE MEDIANS



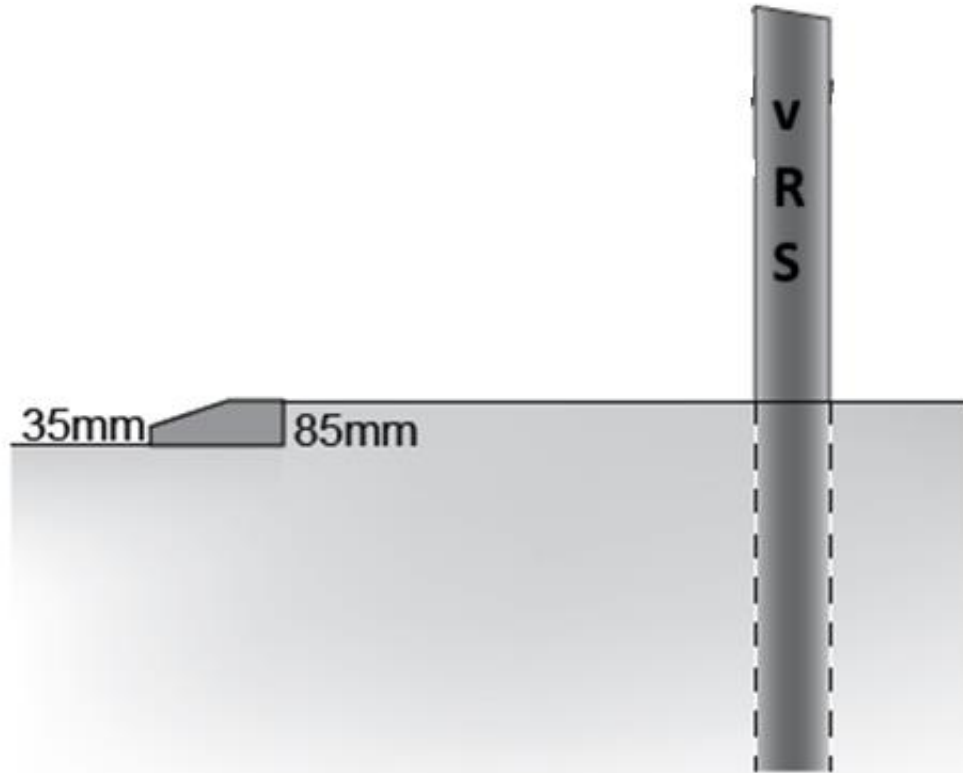
DEPRESSED MEDIANS



EXISTING MEDIAN WITH KERB WHERE KERB CANNOT BE REMOVED



WHERE KERBS ARE MANDATED



Transition to Concrete Barriers or Bridge Parapet

- The Crash Barrier Should be properly terminated with a concrete barrier.
- The Rigidity of the barrier should be increased by decreasing post spacing and then connected using a wall connector

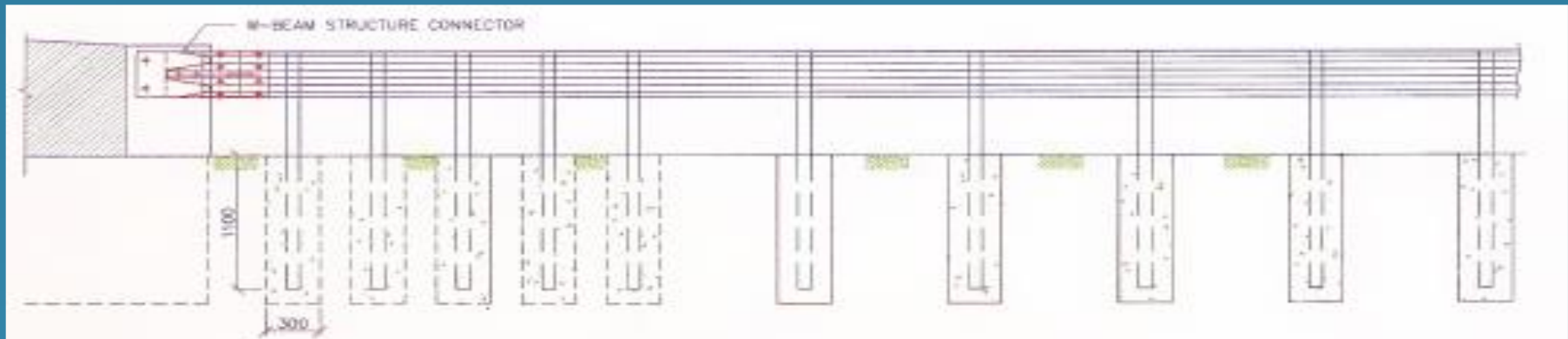
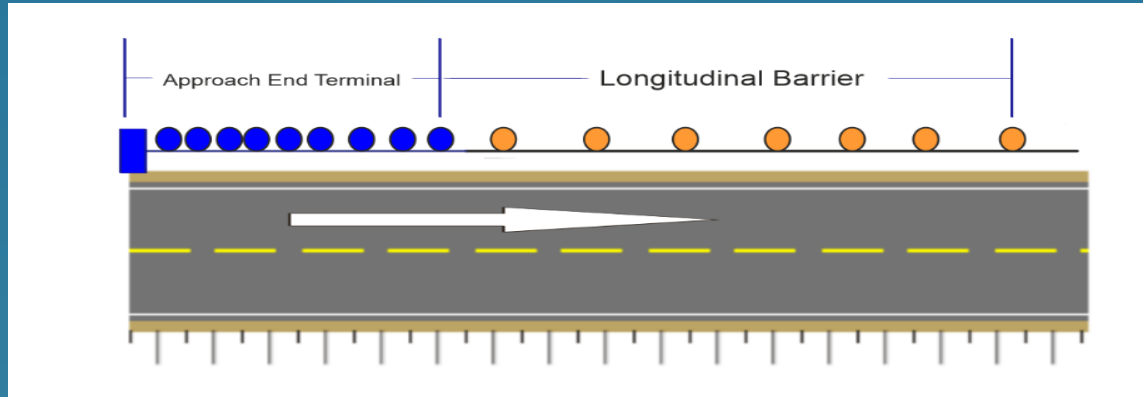


Fig. 9.12 W-Beam to Concrete Connection Details

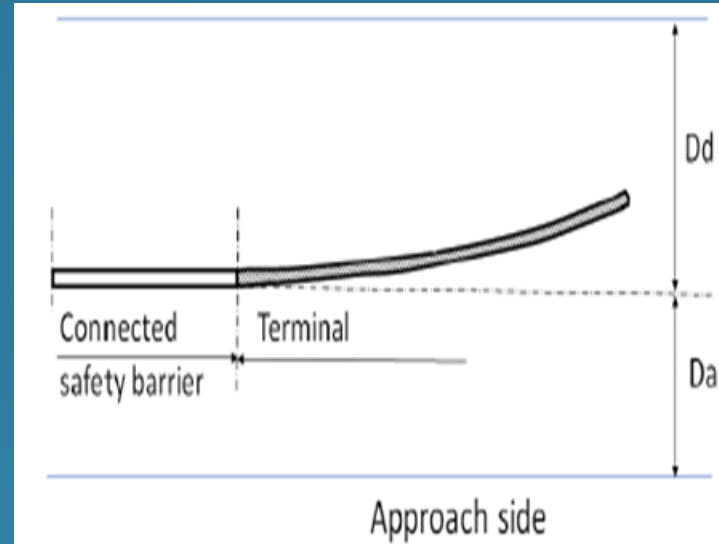
END TERMINALS



Approach End Terminal shall always be Crash Worthy

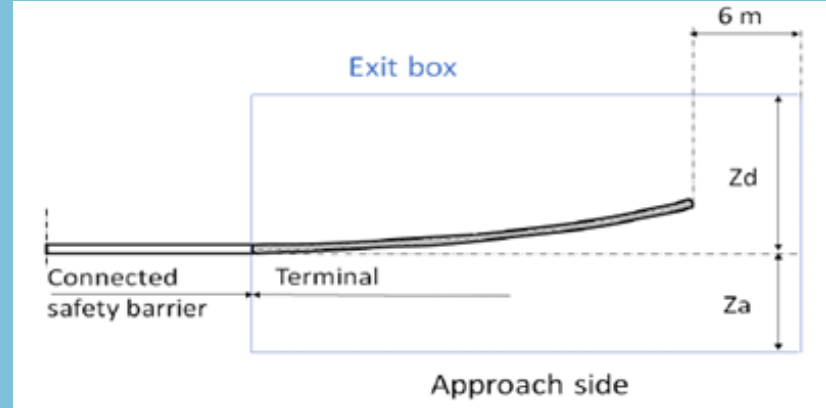


Class Code		Displacement (m)	
x	1	Da	0.5
	2		1.5
	3		3.0
y	1	Dd	1.0
	2		2.0
	3		3.5
	4		>3.5



Class of Lateral Displacement

Class of Redirection Zone (Z)	Exit Box	
	Za (m)	Zd (m)
Z1	4	4
Z2	6	6
Z3	4	No Limit
Z4	6	No Limit

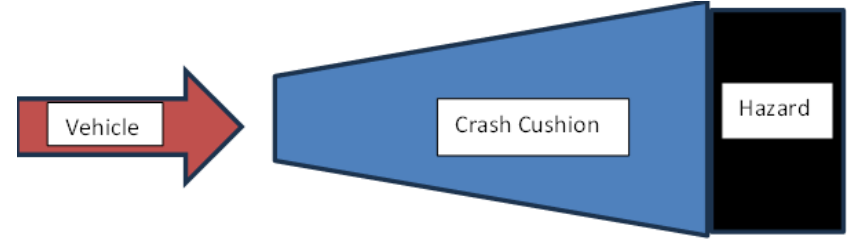


Redirection Zone Class

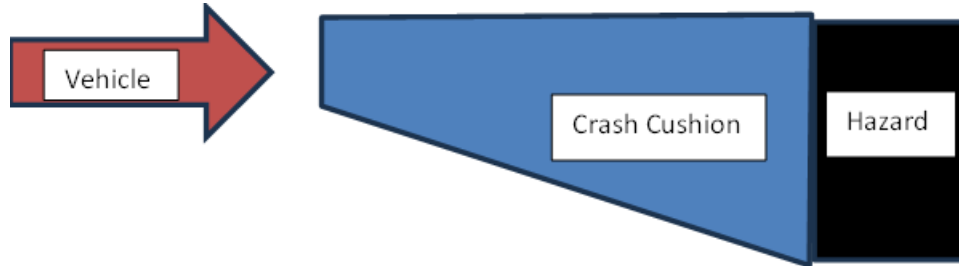
CRASH CUSHIONS



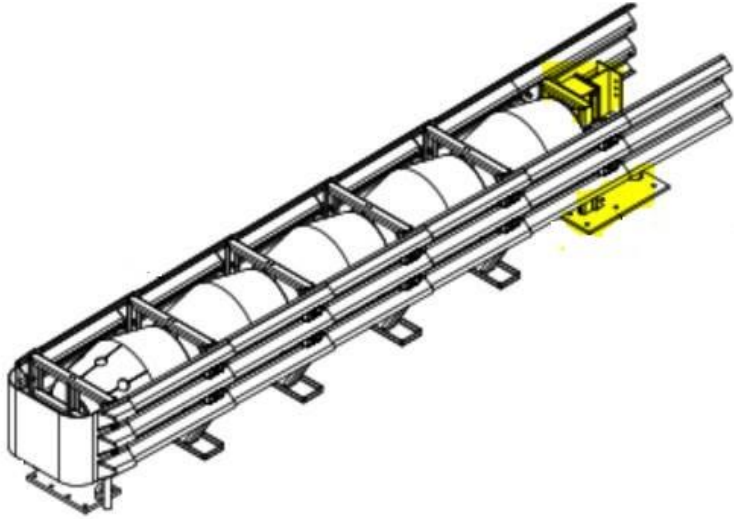
Parallel Type Crash Cushion



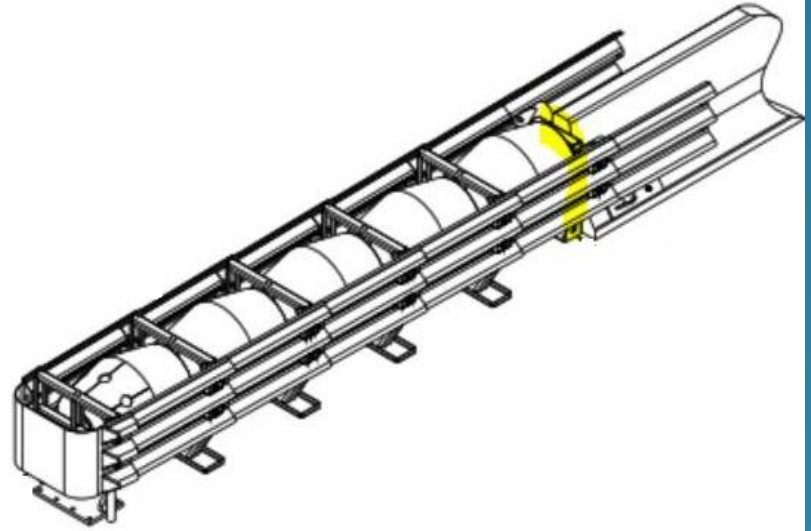
Wide Type Crash Cushion



Semi-Wide Type Crash Cushion



Crash Cushion with Free Standing/ Integrated Backup



Crash Cushion with Backup designed for connection with rigid object

Importance of Crash Barriers in Medians

- 80% of Road Deaths Worldwide are caused by Cross Over Accidents.
- Raised Kerbs are a HAZARD!!!
- It has been proven in America that even a 12-15 meter median is not good enough to stop a crossover accident.
- Nearer Home the same has been proven on Mumbai-Pune Expressway where installation of crash barrier in the 9-12 meter depressed median has led to significant decrease in crossover accidents and fatalities.



03-30-2017 18:32



2019-09-13 08:37:55





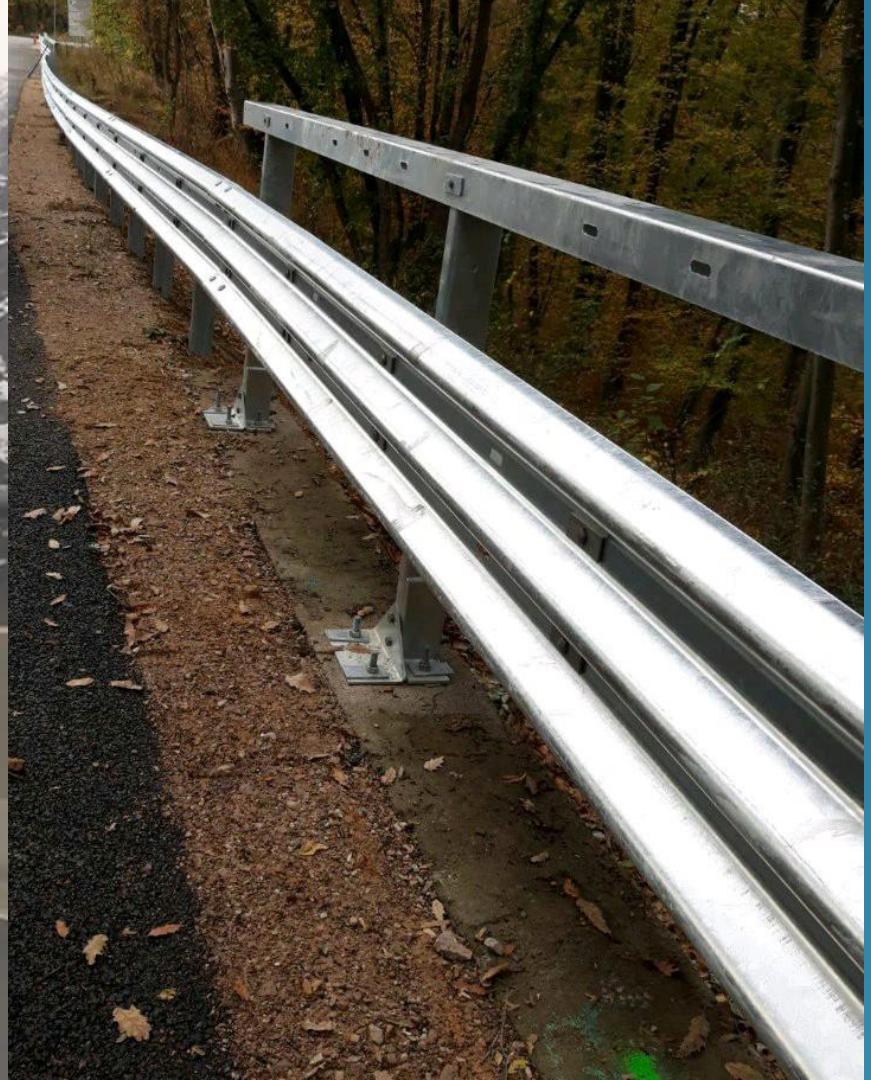
National Transportation Safety Board

Truck-Tractor Double Trailer Median Crossover Collision with Motorcoach and Postcrash Fire

Orland, California
April 10, 2014

Hill Roads a Special Need

- Owing to The Geometry of Our Hill Roads it becomes Imperative to use more Rigid Barriers.
- When we increase the rigidity of the barrier, the chances of the Impacting Vehicle toppling over becomes high.
- The Ideal Scenario Would be to use Bridge Parapets but costs are a Hindrance.
- A Solution could be to use Tall Metal Beam Barriers or Concrete Barriers with Metal Beam Barriers on Top.







Screws Option

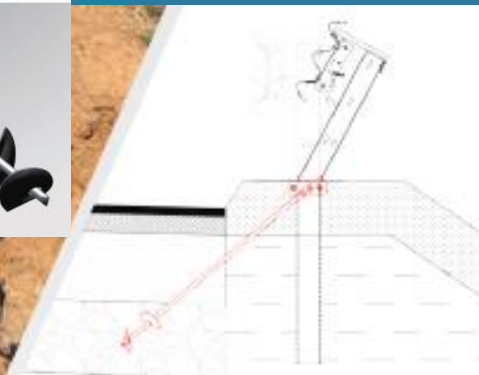
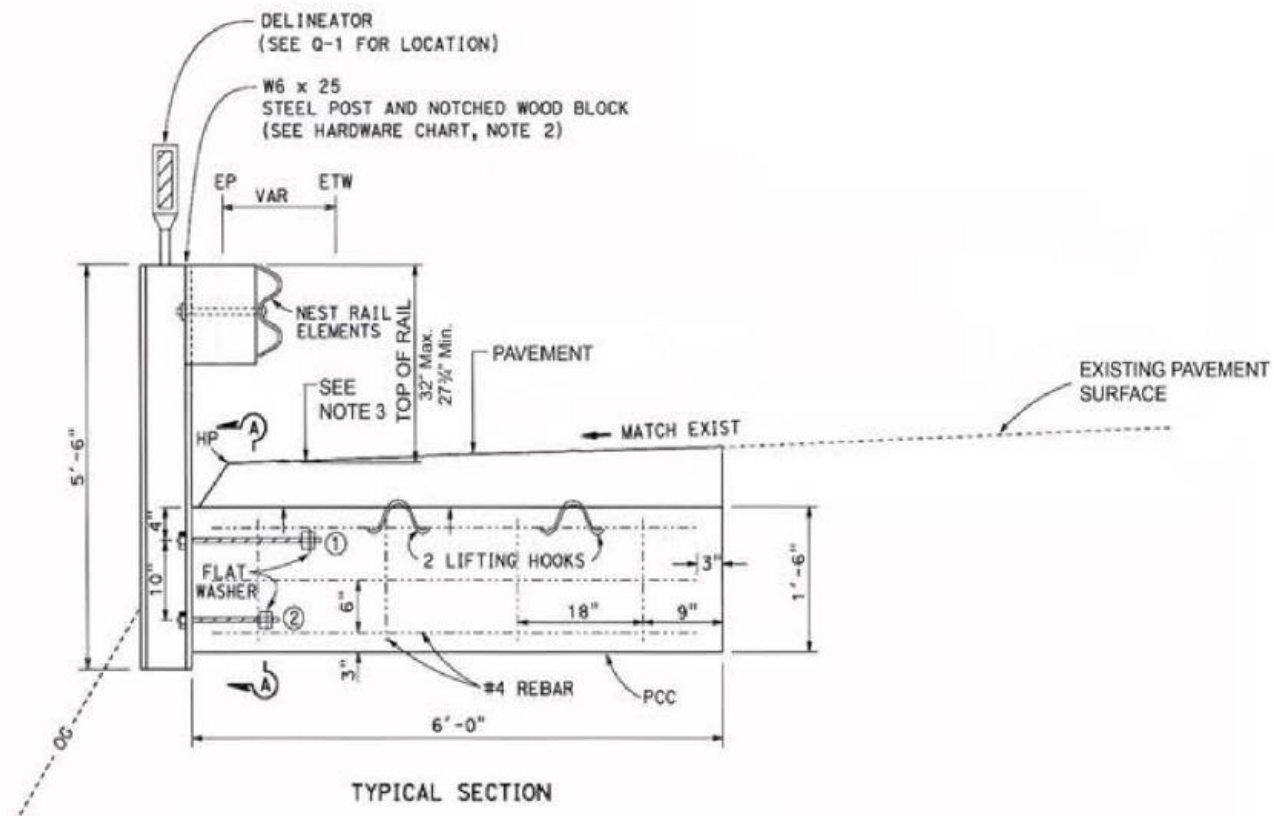


Figure 11: Guardrail Concrete Beam on Narrow Embankments



Bridges Over Rivers a Growing Problem

- Indian Bridges are mostly constructed with Concrete Parapets.
- Although they offer High Containment they are Extremely Rigid as well.
- Heavier Vehicles with High Center of Gravity (Especially Buses) tend to topple over when impacting an Extremely Rigid Barrier.
- A Crash Tested Bridge Parapet offers High Containment with Flexibility.
- Approval to Crash Standard provides Testament of Performance.





MUMBAI

CYRUS MISTRY DIES IN CAR CRASH



Letmost Lane vanishes here --- and road goes from 3 lane to two lane. You can go left if you are aware that left also goes to another bridge.

Causes confusion to very best of drivers at high speeds

Crash Site

Golden Quadrilateral

Surya Set

WHAT ALL WENT WRONG ??

- ❑ Bad Road Geometry
- ❑ Lack of Signage
- ❑ Overtaking from wrong side
- ❑ Over speeding
- ❑ Lack of Seat Belt
- ❑ No Crash Attenuator
- ❑ Unprotected Kerb with no transition to Bridge Barrier



HYDERABAD





NTR's son dies in car accident in Telangana

Source : SIFY (<http://www.sify.com/news/moreheadlines/source/sify.html>)

Last Updated: Wed, Aug 29, 2018 12:15 hrs



Hyderabad: Actor-turned-TDP leader and former chief minister NT Rama Rao's son Nandamuri Harikrishna passed away early on Wednesday following an accident on the Narketpally-Addanki highway in Nalgonda district.

Nandamuri Harikrishna had been shifted to Kamineni Hospital on the outskirts of Hyderabad, in a critical condition but succumbed to his injuries shortly after. Two others were also injured in the accident, which occurred when the car in which they were travelling overturned near Anneparthi.

The actor-politician and son of former Andhra Pradesh Chief Minister was on his way to Nellore district of Andhra Pradesh to attend a marriage.

- Mr. Harikrishna looked back to pick up water bottle and lost control, car hit median and was flung in air and crossed over and hit car in opposite carriageway



5 Powerlifters Including World Champion Saksham Yadav Killed In Accident Near Delhi

The force of the impact was so high that the car rolled over several times and its roof got completely blown off, before it hit a pole.

[Delhi](#) | Edited by [Debanish Achom](#) | Updated: January 07, 2018 22:08 IST

- **5 Power Lifters Driving from Delhi to Murthal, traveling high speed as well as under the influence of alcohol hit the divider which flung the car in the air and died as car crashed into a Light Pole.**

17 killed as bus rams into divider

IN UP State announces ₹2L compensation, most victims were daily wage workers returning home for Eid from Jaipur

Hemendra Chaturvedi

hemendra.chaturvedi@hindustantimes.com

AGRA: At least 17 people were killed and two dozen others injured in Mainpuri district on Wednesday when a private tourist bus lost control and rammed into a road divider, police said.

The private Volvo bus was travelling from Rajasthan's Jaipur to Farrukhabad in Uttar Pradesh when the accident occurred near Kiratpur village at 8am.

Mainpuri district magistrate Pradeep Kumar confirmed the death of 17 passengers, and said 21 people were injured. Three of the victims sustained severe injuries and were shifted to Safai medical college in Riwahi district, one of whom died during treatment. Other injured passengers were admitted to Mainpuri district hospital.

"Most of the passengers were sleeping when the accident took place," he added.

Police also said that most of



■ The overturned bus at the scene of the accident in Mainpuri district on Wednesday. CHANDRAPAL SHARMA/HT

them were daily wagers working in Jaipur and were heading home for Eid.

UP chief minister Yogi Aditya-

nath condoled the deaths and asked the administration to provide appropriate medical treatment to the injured passengers.

He also announced an ex-gratia of ₹2 lakh each to the family of the deceased and ₹50,000 to those seriously injured in the accident.

Ajay Shankar Rai, SP, Mainpuri, said the bus was carrying 60-70 passengers.

Senior police officials from Mainpuri reached the accident spot and cranes were pressed into action to lift the bus, which turned turtle in the accident.

Some passengers said the driver was speeding and that many of the deceased were passengers travelling on the roof. The driver, who is yet to be identified, lost his leg and was admitted to Safai medical college.

SP patriarch and former MP from Mainpuri Mukayam Singh Yadav visited the hospital to meet the injured people.

PM Narendra Modi condoled the deaths and hoped for the early recovery of the injured. "My condolences to families of those who lost their lives in a tragic accident in Mainpuri, UP. I hope those who are injured recover at the earliest," the PMO tweeted quoting him.

(With agency inputs)

- A Bus traveling on the National Highway New Mainpuri, traveling at High Speed lost control and turned turtle after it hit the divider.

Printed from

THE TIMES OF INDIA

4 of family die, 5-yr-old critical after car hits truck in Dausa

TNN | Sep 3, 2018, 12:38 AM IST

Jaipur: Four members of a family were killed and a five-year-old girl is battling for life, after their car collided head-on with a truck on a National Highway in Anterheda village in Dausa district, on Sunday morning.

The deceased have been identified as Bhagwan Sahay (56), his wife Chandrakala (50), their son Deepak (35) and his son Lakshya (10.) "Deepak's daughter Divya (5) is critically injured and has been referred to the trauma centre of the SMS hospital in Jaipur," said Mahwa SHO, Amit Kumar.

The family hailed from Balheri village of Mahwa tehsil in Dausa district. They were driving to Sikari to attend a family function.

The accident happened when stray cattle suddenly appeared in front of their car. "The driver immediately swerved the car to avoid hitting the cattle, but the speeding car lost control and jumped across the divider. It landed on the wrong side, where it collided with a truck coming from Jaipur," Kumar said.

The locals told cops that they saw the car getting tangled into the truck, which dragged it for a few metres, until the driver applied the brakes. A local villager informed Dausa police control room about the accident on the highway, following which, an ambulance and a PCR van from Mahwa police station were dispatched to the accident spot.

The bodies were crushed in the mishap and were taken out by cops with the help of the locals. "Four of the family members were declared brought dead by the doctors, but Divya was still breathing though she was unconscious. The doctor immediately rushed her to the trauma centre in Jaipur, where her condition remains critical," a senior official told TOI.

<https://timesofindia.indiatimes.com/city/jaipur/4-of-family-die-5-yr-old-critical-after-car-hits-truck-in-dausa/articleshowprint65649670.cms>

1/2

- Family Travelling on Highway in Dausa District, as Cattle came in front of driver and he swerved to avoid it.
- Car Hit Divider and flung to Opposite Carriageway and Collided with Truck
- Police is looking for truck driver to arrest him

Drunk woman driver rams SUV carrying family in Delhi, 1 dead

The car speeding on the opposite side rammed the divider and clambered onto the SUV, in which eight members of a family were travelling.

DELHI Updated: Nov 10, 2018 23:49 IST



Anvit Srivastava
Hindustan Times, New Delhi



The car that the accused was driving rammed the divider and hit the SUV on the other side at a flyover in Punjabi Bagh. (HT Photo)

**Girl and Friends driving from CP to Gurgaon, ram SX4 into divider, Vehicle flies to other side and rams a Mahindra Xylo on the other side.
Lady in the Xylo killed, while her daughter critically injured.
Driver presumed drunk because driving back from a Pub.**



2 Amity students dead as car hits divider, bus at Yamuna Expressway

EXPRESS NEWS SERVICE
NOIDA, SEPTEMBER 13

TWO STUDENTS died and three were injured after their car hit the divider on the Yamuna Expressway, flipped several times and crashed into a moving bus on the opposite side Friday evening. Police said the victims, aged 20-21, were BSc students at Amity University, and were returning from Agra when their i20 crashed.

"We were informed about the accident by a passerby. The car was mangled and parts of it had to be cut to pull out the students. Two of them, Owais Chaudary and Shivani Yadav, were declared dead on ar-



Mangled remains of the vehicle. *Express*

rival at the hospital. Three others, Aditya Saxena, Sai Sharma and Shaurya Gupta, are currently receiving treatment. We will ascertain more details once they are able to make a statement," said Sujeet Upadhyay, SHO, Beta 2 police station.

While Owais, Shivani and Sai hailed from Ghaziabad, Shaurya

belongs to Delhi and Aditya stays in Noida.

Eyewitnesses told police that the car hit the divider a few kilometres before the zero point milestone.

Shaurya's family said they were unaware of the trip. "He left in the morning saying they were going to college. He did not tell us about any plan of going out of town. At this point, we don't even know whose car it is," said a relative. Police said they are investigating if the car belonged to one of the students.

On Tuesday, two men riding a Royal Enfield died after falling 30 feet from a bridge on the Yamuna Expressway. The accident took place at zero point, where the expressway ends.

The Indian EXPRESS
epaper editions

Sat, 14 September 2019
epaper.indianexpress.com/c/43557465



- **THEY WERE NOT UNDER INFLUENCE OF ALCOHOL**
- **DRIVING AT SPEED but then SPEED LIMIT IS 100 km/hr.**

- **5 Friends from Amity University Driving Back from Agra lost control of i20 car and hit raised median.**
- **Car Topped Multiple Times and had head on collision with bus on other carriageway**
- **Number of dead now 3. Other 2 with Spinal Injuries**

- In all Incidents cited above , were the vehicle drivers at fault-
YES !!!!
- Did they deserve to DIE – NO !!!!!
- IT is Only Human To Make Mistakes....
- The Difference between our country and some others is a
FORGIVING ROAD ENVIROMENT

- While in India bringing 168,491 (2022) deaths to Zero is a long way away.
- The need for Change in Thinking is now.
- Special Focus has to be on Crash Barriers – Using Tested Barriers with Proven Performance Standards and Low Impact Severity is a Must...

THANK YOU!!!!

ANY QUESTIONS

Presented By

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