

Roadside Safety of National Highways vis a vis Forgiving Roads

D. K. Mohapatra, GM(T), NHAI

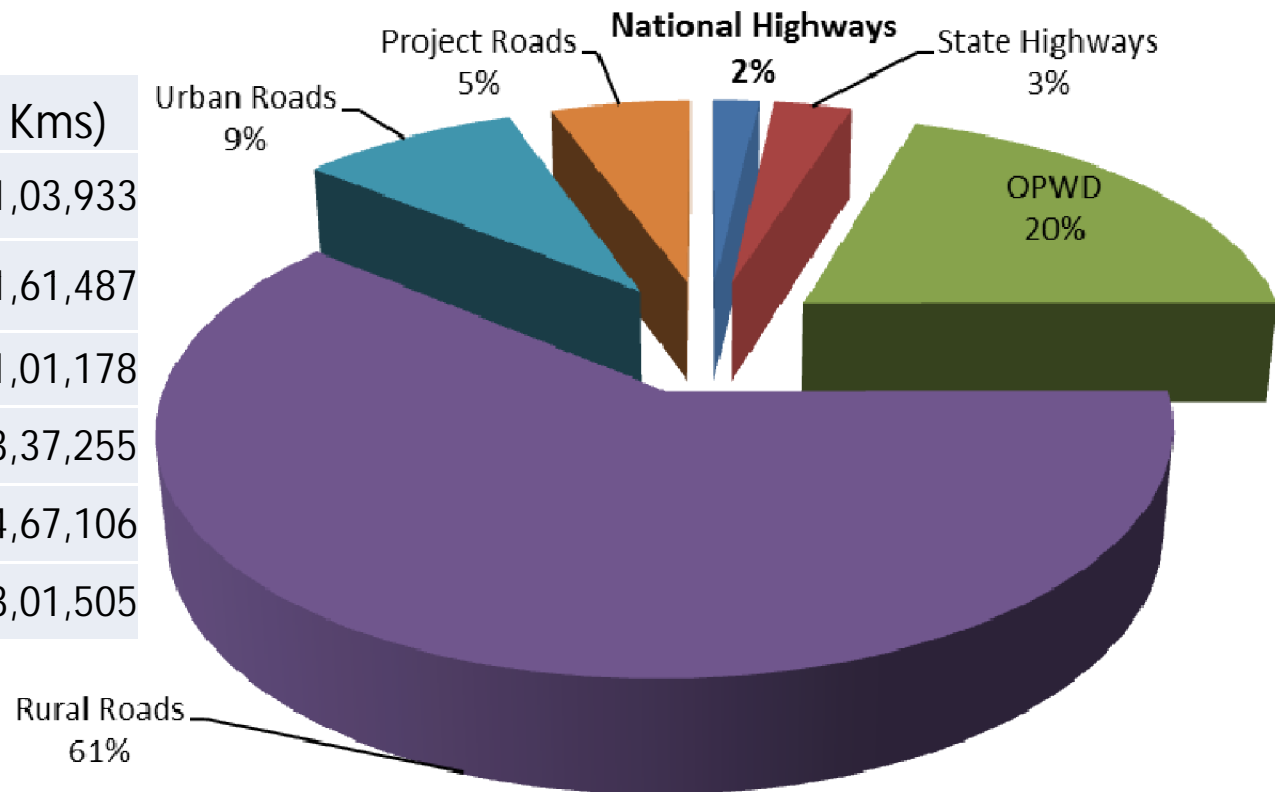
Road Network in India

- India has one of the largest road networks in the world of over 5.4 million km.
- The country's road network consists of national highways, state highways, district roads and village/rural roads
- Over the years, there has been consistent improvement in accessibility and mobility through the construction of new roads and the up-gradation of the existing roads.

Road Length by Road Categories

Road Length by Categories As on 31st March, 2015

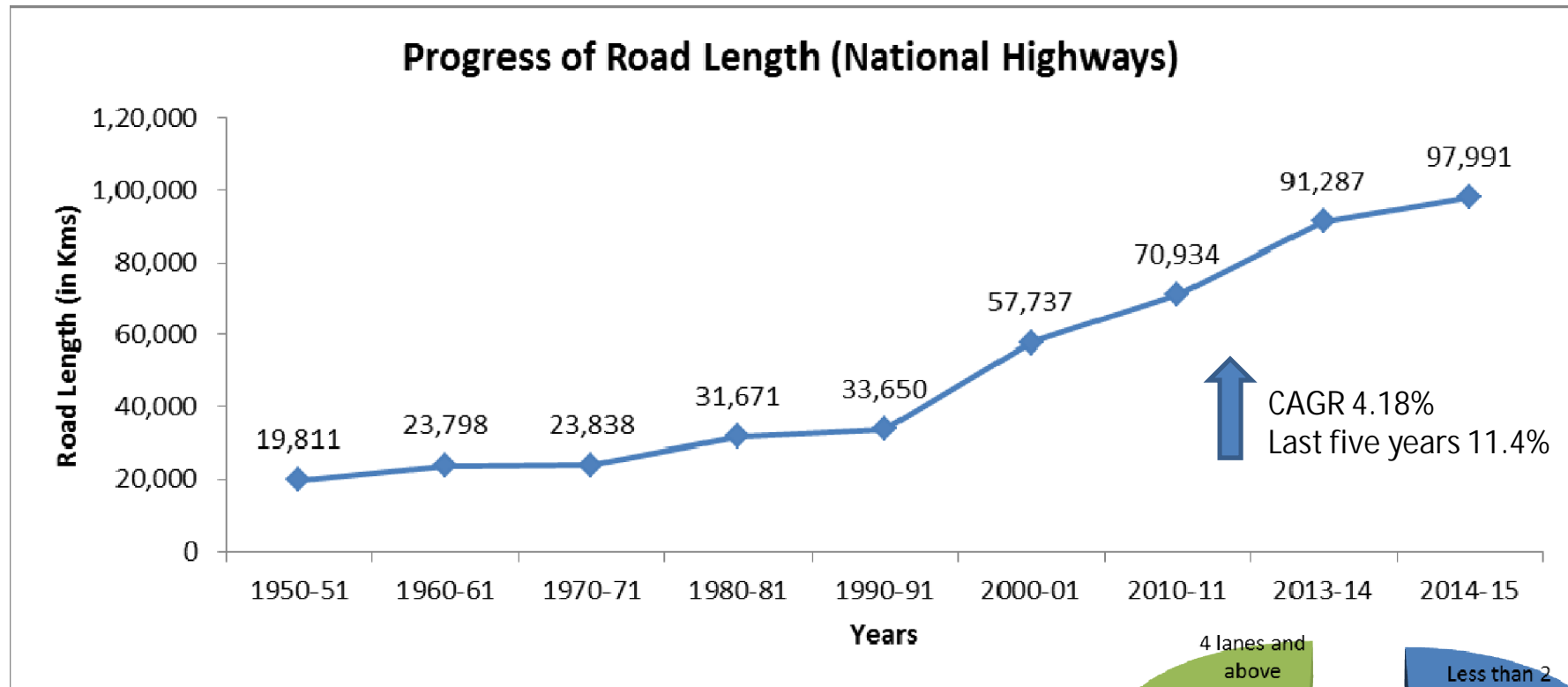
As on 31st Dec, 2016 (in Kms)	
National Highways	1,03,933
State Highways	1,61,487
OPWD	11,01,178
Rural Roads	33,37,255
Urban Roads	4,67,106
Project Roads	3,01,505



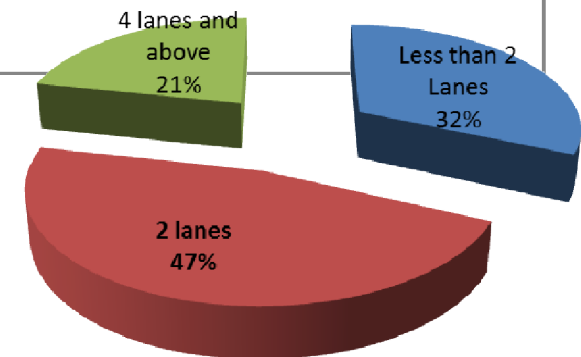
National Highways

- National Highways (NHs) are the major arterial roads of the country for movement of passengers and goods.
- Connecting State capitals, major ports, rail junctions and link up with border roads and foreign highways
- Ministry of Road Transport & Highways, Government of India is responsible for the development, operation and maintenance of NHs in India

National Highways



During the same period, the registered motor vehicles grew at a CAGR of 9.9%.



National Highways under NHAI



NHDP & Other NHAI Projects
31st December 2016

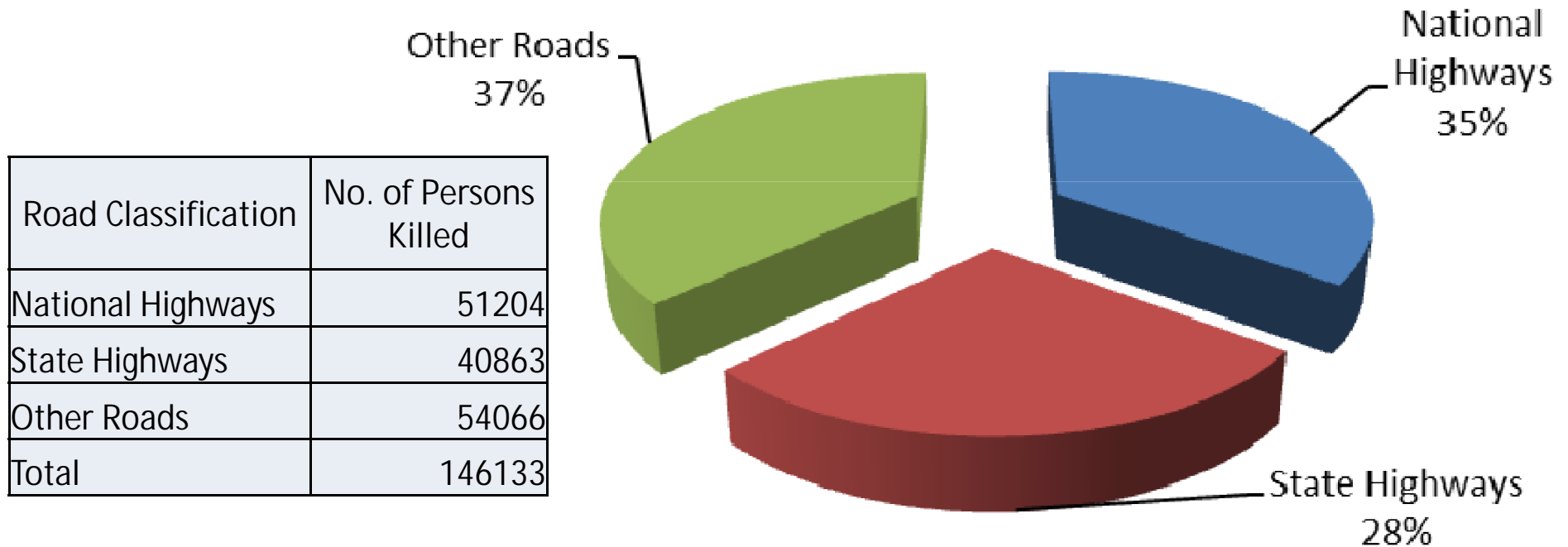
Programmes		Total Length (Km.)	Already 4/6Laned (Km.)	Under Implementation (Km.)	Contracts Under Implementation (No.)	Balance length for award (Km.)
NHDP	GO	5,846	5,846	0	0	0
	NS - EW Ph. I & II	7142	6513	377	29	252
	Port Connectivity	435	379	56	7	0
	NHDP Phase III	11,809	7,269	2,861	79	1,679
	NHDP Phase IV	13,203	3,195	6,169	96	3,839
	NHDP Phase V	6,500	2,502	1,060	27	2,938
	NHDP Phase VI	1,000	-	165	8	835
	NHDP Phase VII	700	22	79	3	599
	NHDP Total	46,635	25,726	10,767	249	10,142
Others (Ph.-I, Ph.-II & Misc.)		1929	1,722	207	11	0
SARDP -NE		110	105	5	1	0
Total by NHAI		48674	27,553	10979	261	10142

Challenges

- Attention was mainly on the road development, and less attention paid till recently on road safety
- Higher speeds on NHDP roads have changed the mobility scenario across the whole country, with consequential impact on safety of road users

Fatalities by Road Categories

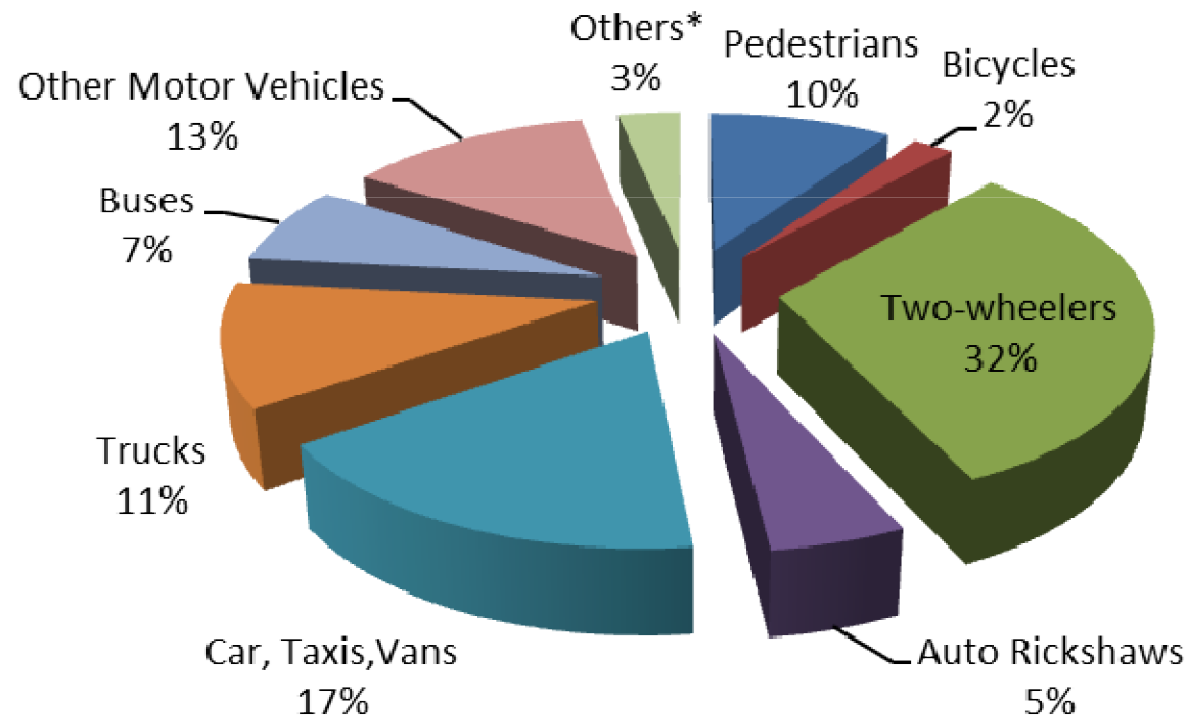
Number of Persons Killed in Road Accidents in 2015



National Highways constitutes of just 2% of Total Road length in India, but 35% Fatalities (due to more high speed roads)

Fatalities by Road Users Categories

Total Number of Persons Killed in Road Accidents in terms of Road User Categories: 2015



Safety Deficiencies

Consistency in Design Essential



Improperly designed entry ramp

Intersection of village road not designed for geometry



Geometry deficiency for a high speed road



Unsafe Crossing



Unsafe Approach of Grade Separation



Unprotected higher carriageway



Unsafe Junction



Encroachment – A safety Hazard



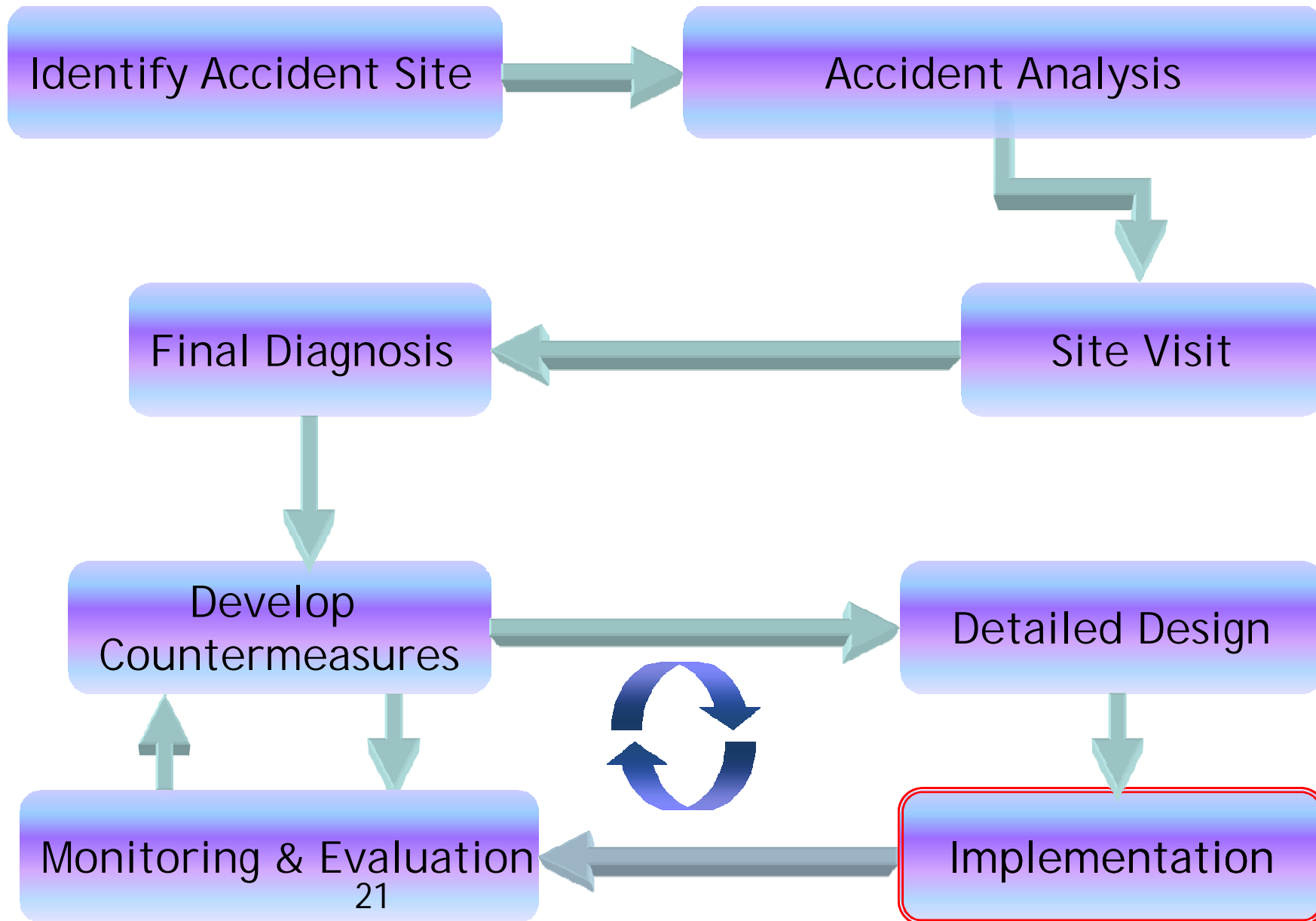
Initiatives taken by NHAI

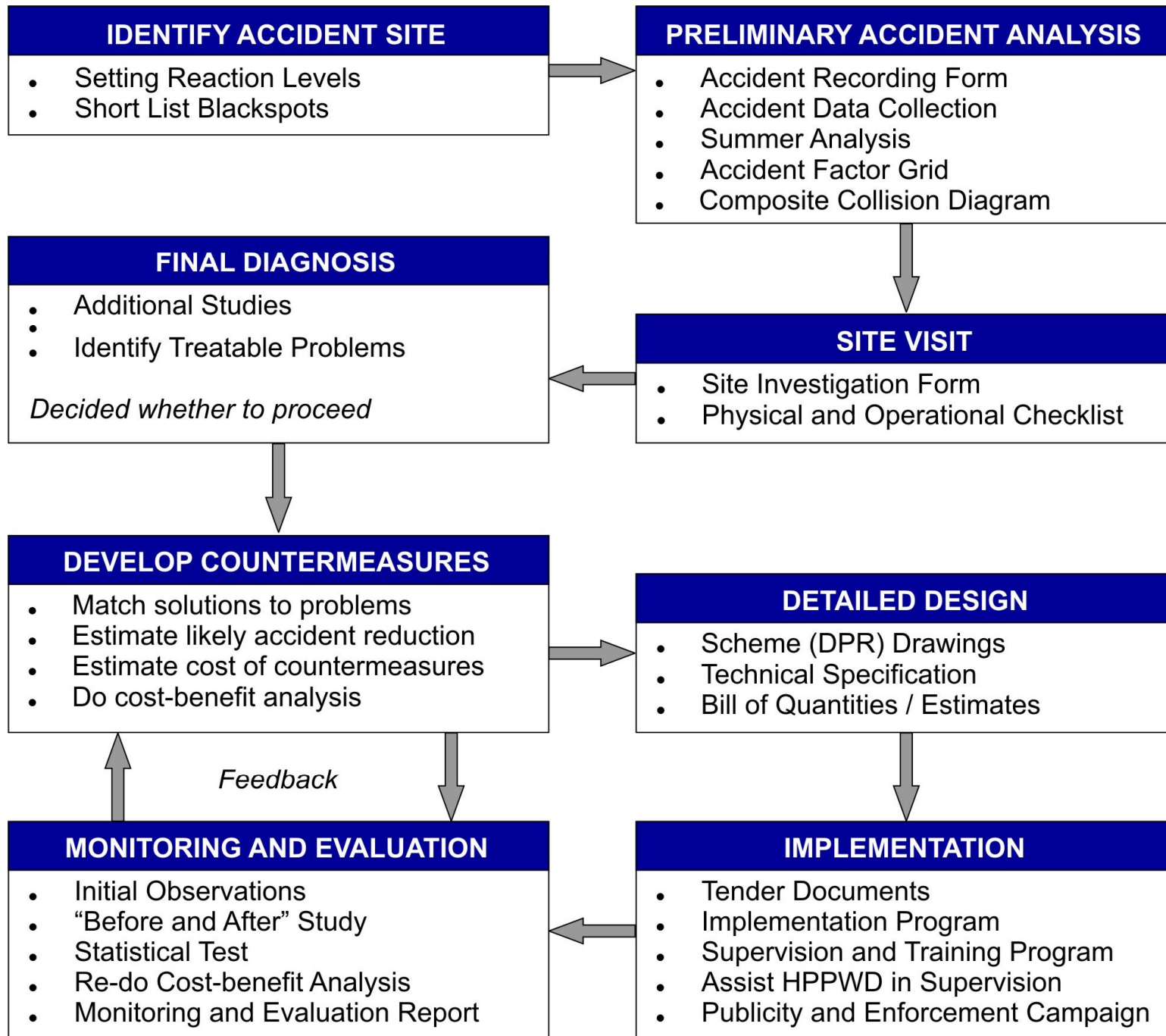
- 789 blackspots (accident prone spots) on national highways (NHs) have been identified by MoRTH. Rectification of identified blackspots on NHs are being done on priority basis.
- Road safety has been made an integral part of road design at planning stage.
- Road Safety Audit of National Highways has been made mandatory at all stages i.e. design, construction and operation stages
- NHAI is taking steps to set up 24x7 Integrated Traffic Incident Management System for NHs

Initiatives taken by NHAI

- Free Eye Check-up Camps for Truck Drivers were organised by NHAI at 50 toll plaza locations across the country.
- Capacity Building on Road Safety – The Road Safety Experts engaged by NHAI are imparting sensitization and awareness training on road safety at field to all stake holders of highways development.
- NHAI has taken steps for development of Wayside Amenity Centres along the NHs across the country for facilitation of road users and to curb unauthorised parking of vehicles on highways.

Accident Site Improvement Programs



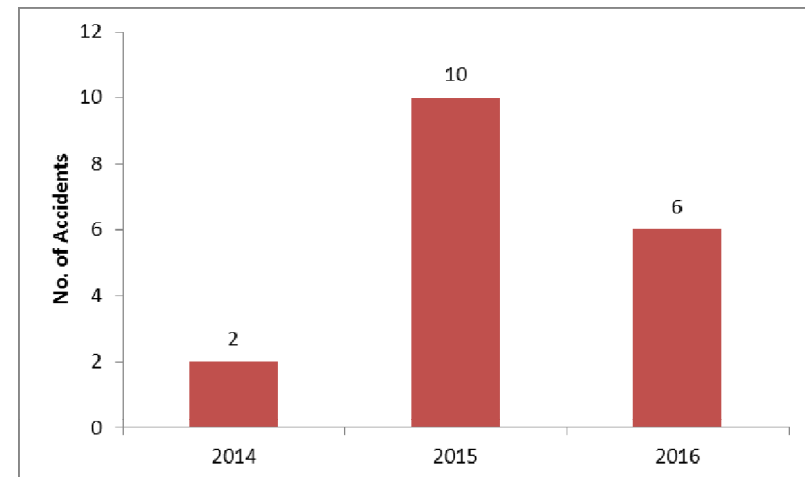
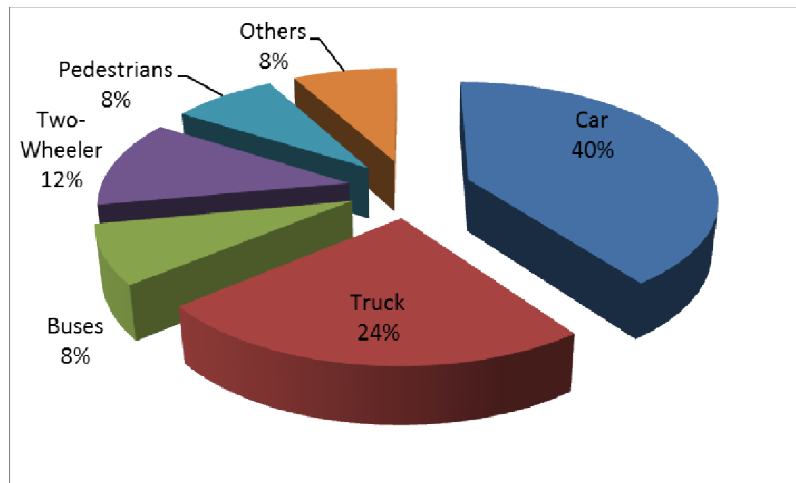


Case Study TN:100-03 (Km 96+000)

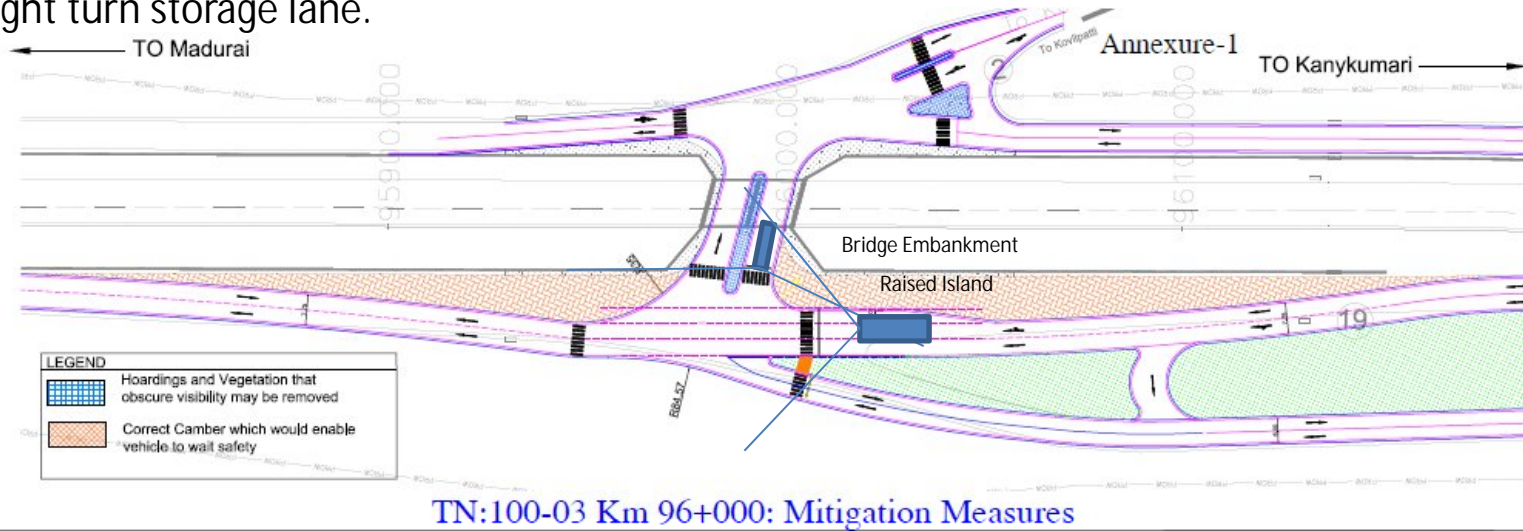
Summary by Collision Type		
Type of Accident	No.	%
Overturning	4	22%
Head on collision	2	11%
Rear end collision	4	22%
Collision brush/Side Wipe	0	0%
Right turn collision	1	6%
Skidding	7	39%
Left turn collision	0	0%
Others(Please Specify).	0	0%
Total	18	100%

Time of Accident	Total	%
	18	100%
Daytime	10	56%
Night time	8	44%

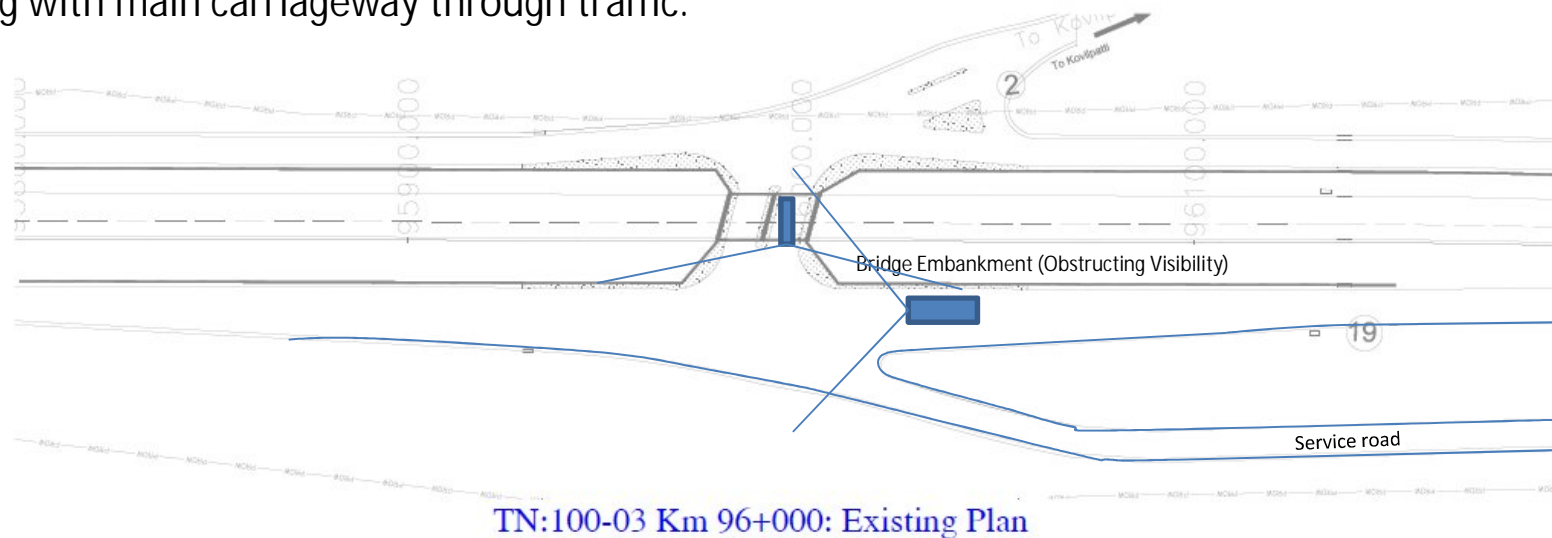
Total	Persons Killed	Persons Injured
	2	17
VRUs	2	6
Motorised	0	11



To improve the visibility for right turning traffic under the VUP, RHS main carriageway has been deflected as shown in drawing. Raised island has been provided along with 30m right turn storage lane.



Accidents are taking at RHS carriageway where right turning traffic from Kovilpatti merging with main carriageway through traffic.

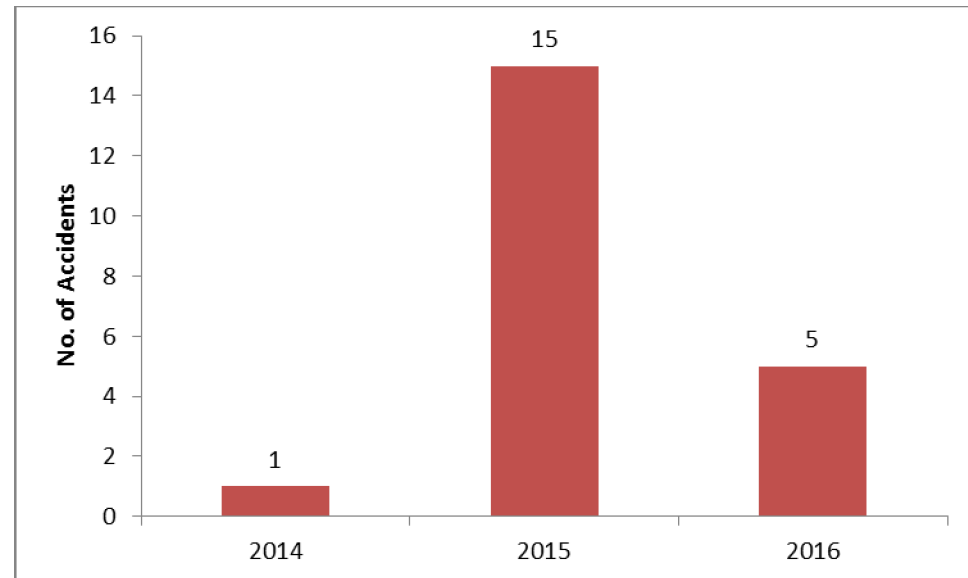
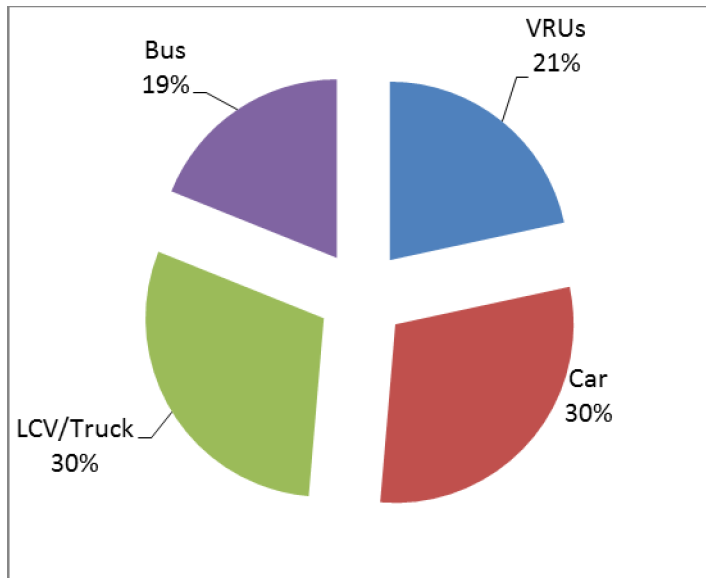


Case Study TN:093-03 (Km 158+950)

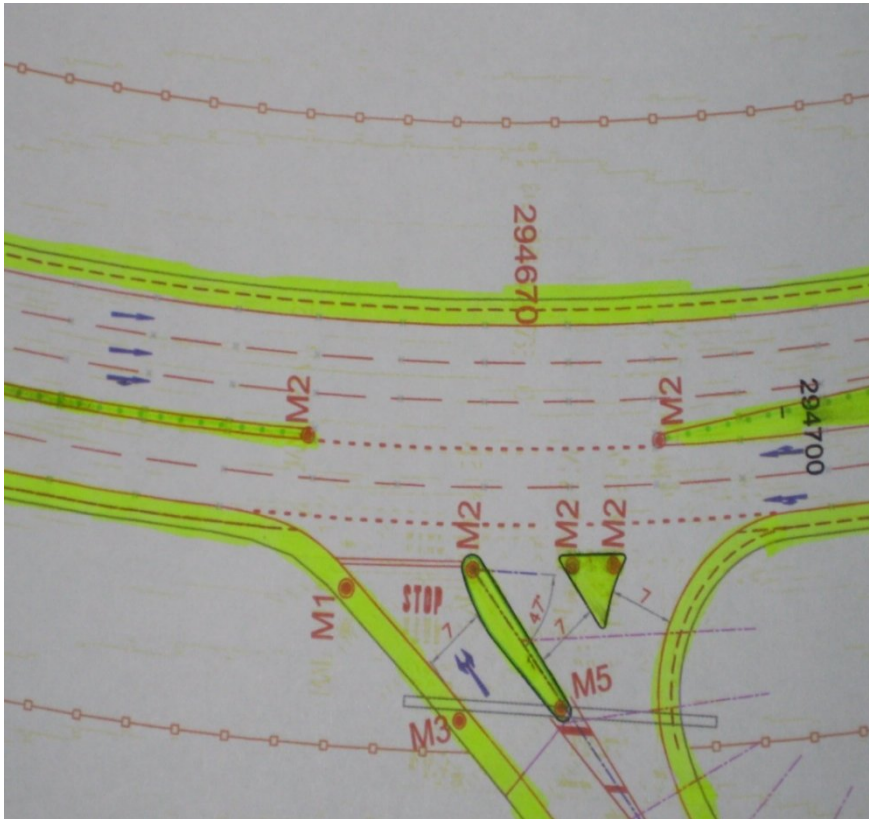
Summary by Collision Type		
Type of Accident	No.	%
Overtuning	2	10%
Head on collision	9	43%
Rear end collision	8	38%
Collision brush/Side Wipe	0	0%
Right turn collision	2	10%
Skidding	0	0%
Left turn collision	0	0%
Others(Please Specify).	0	0%
Total	21	100%

	Persons Killed	Persons Injured
Total	2	50
VRUs	2	10
Motorised	0	40

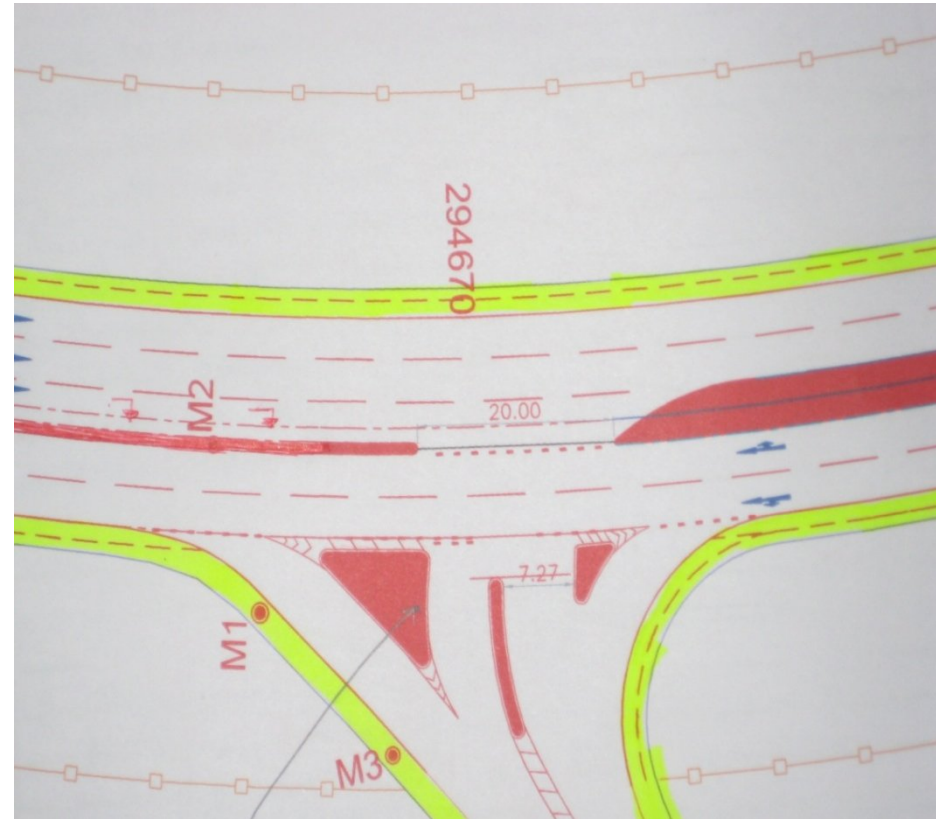
Time of Accident	Total	%
	21	100%
Daytime	13	62%
Night time	8	38%



Example : At-grade Junction

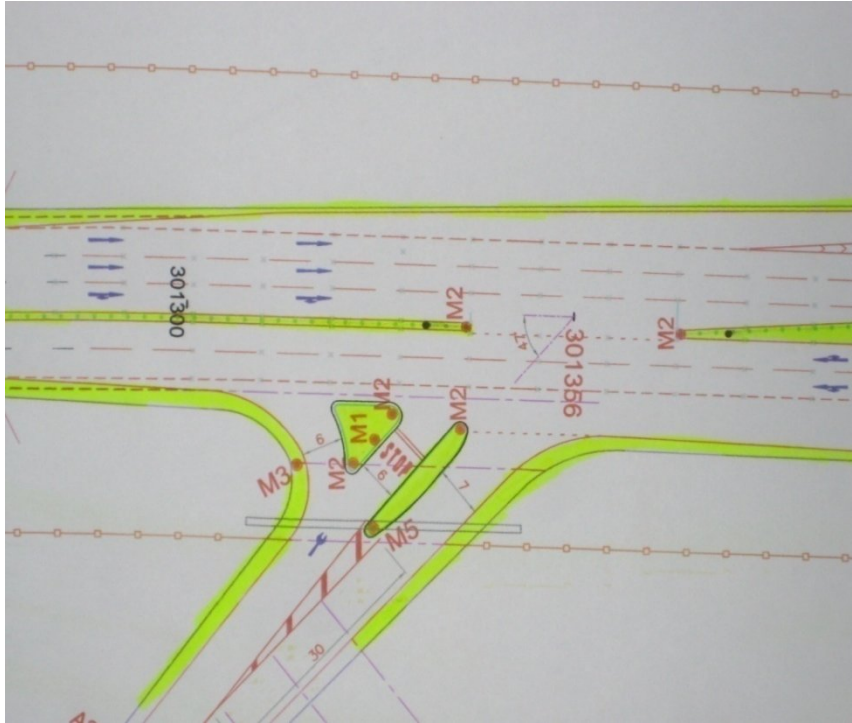


**Current Layout
(Potential safety Problems)**

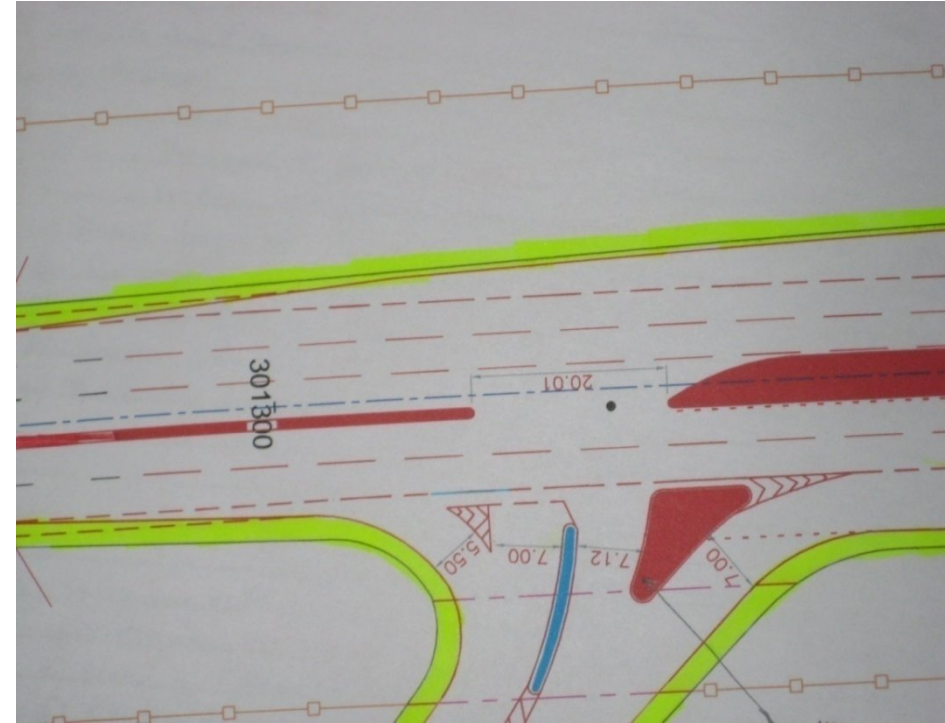


**Possible Revised Layout
(red ink shows the alteration to
reduce the safety risk)**

Example : At-grade Junction



**Current Layout
(Potential safety Problems)**



**Possible Revised Layout
(red ink shows the alteration to
reduce the safety risk)**

Making roads more forgiving

- With the shift to a Safe System goal for road network management there has been a growing emphasis for providing protective features on road infrastructure. Injury prevention is taking priority over crash reduction.
- Road operators are becoming more accountable for the safety performance of their networks and safety rating measures are being developed to objectively rank infrastructure in terms of its protective features.

Forgiving Roads



छोटा उदयपुर
खुर्द →
Chhota Udaypur
Khurd 2

Unpaved Shoulder

Paved Shoulder

Crash Barrier



Service Road

Pedestrian Crossing

Separator of Service Road with Drain

Painted Curb

Railing on Separator



4-Lane Carriageway

Median

**Pavement Edge
Marking**

Cable Barriers at Mumbai-Pune Expressway





Crash Cushion at L&T-IDPL's, 6 Lane, 10 KM long Elevated Corridor on NH-1



Crash Barriers with End Treatment



KARUR BYPASS ON NH-7
Aerial View of Four Lane ROB

Jaipur- Kishangarh







Indian Standards on Traffic Control Devices/Road Safety Devices/ Road Side Furniture

- Road Signs IRC:67
- Road Marking IRC:35
- Road Delineators IRC:79
- Reflective Pavement Markers IRC:73, 84, 87 section 9.5
- Traffic Impact Attenuators IRC:73, 84, 87 section 9.6
- Road Side and Median Safety Barriers IRC:73, 84, 87 section 9.7
- Road Boundary Stones IRC:25
- Work Zone TMPs IRC:SP:55

Thank You