



IHE – Road Safety Making a Difference
Road Safety In Developing Countries

Halol-Godhra-Shamlaji Road Safety Project
21 January, 2010

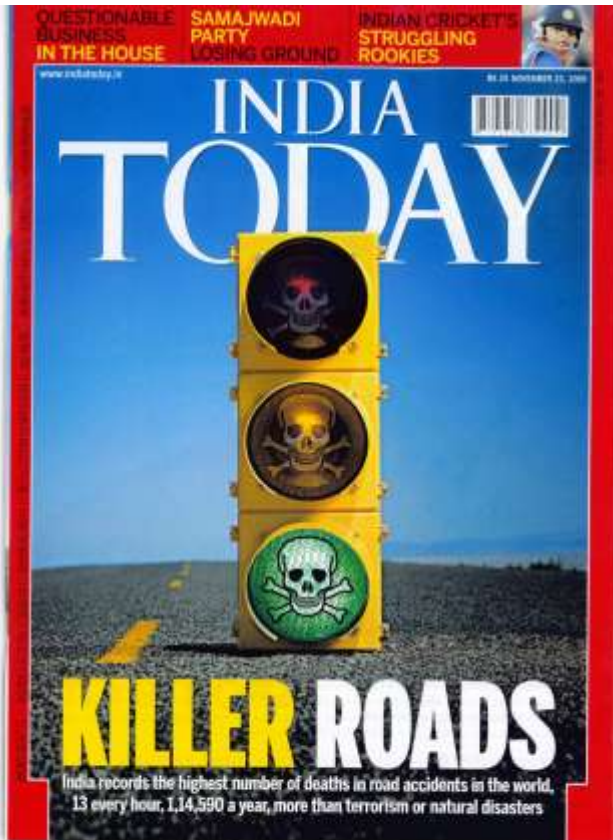
Current Situation



Additional hazards



Safety Awareness



Cover story **ROAD ACCIDENTS**

Road accidents kill 13 people in India every hour. The country reports the highest road fatalities in the world. 1,14,590 were killed in road mishaps in 2007.

KILLER ROADS

11. Outside conflict zones, the most dangerous places on earth are a sorry lot of broken asphalt where an angry army of humans and a brooding variety of vehicular traffic battle for space and the right of way. It is, quite literally, a death trap. India's killer roads account for more deaths than any other single cause, from terrorism to natural disasters. Every hour, 13 people die in road accidents, the highest in the world. Every 50th person who dies in road accidents is an Indian. Every day, about 250 people die in road accidents, or an astonishing 1,14,590 each year. That's a horrific number and even more horrific considering that the majority of fatalities are the sole earning members of their families: 83 per cent are male and 70 per cent are in the working age group of 30 to 54 years. It is estimated that road accidents cause an

DO NOT DRINK AND DRIVE

Safety - Is Anyone Listening?

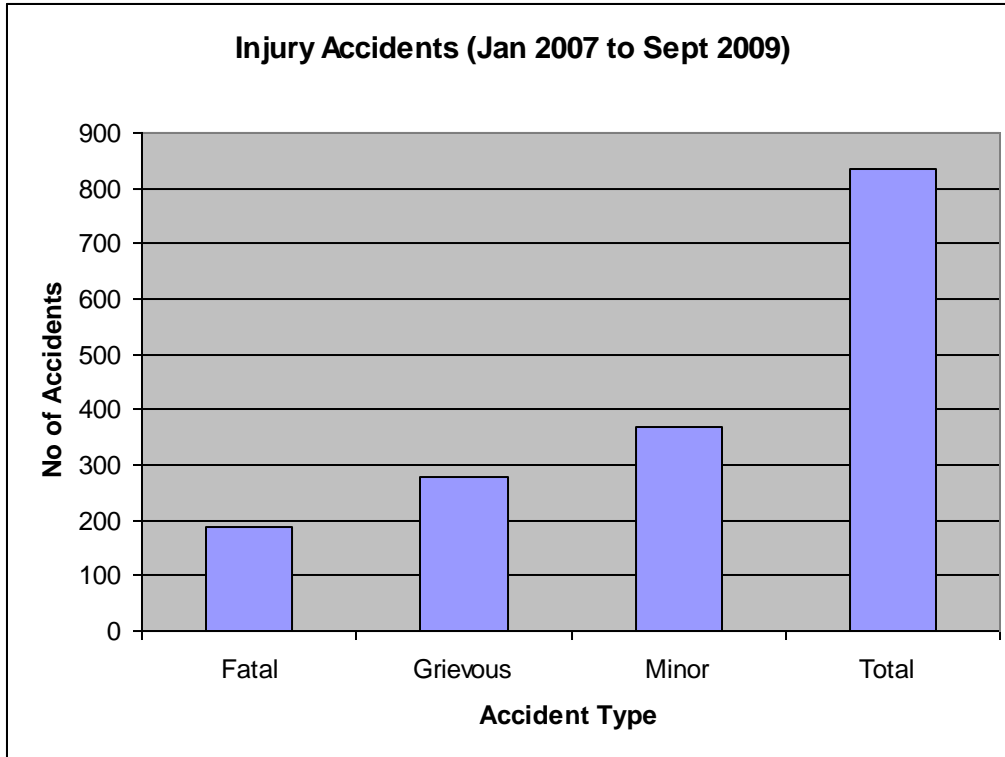


Three Routes Assessed

- Ahmadabad-Viragam-Malia (183km)
- Rajkot-Jamnagar-Vadinar Corridor (131km)
 - Length: 173 Km
- Halol-Godhara-Shamlari Corridor (173km)

Each route was an existing two Lane carriageway which was to become a divided four lane carriageway

RJV – Current Corridor Accident Data



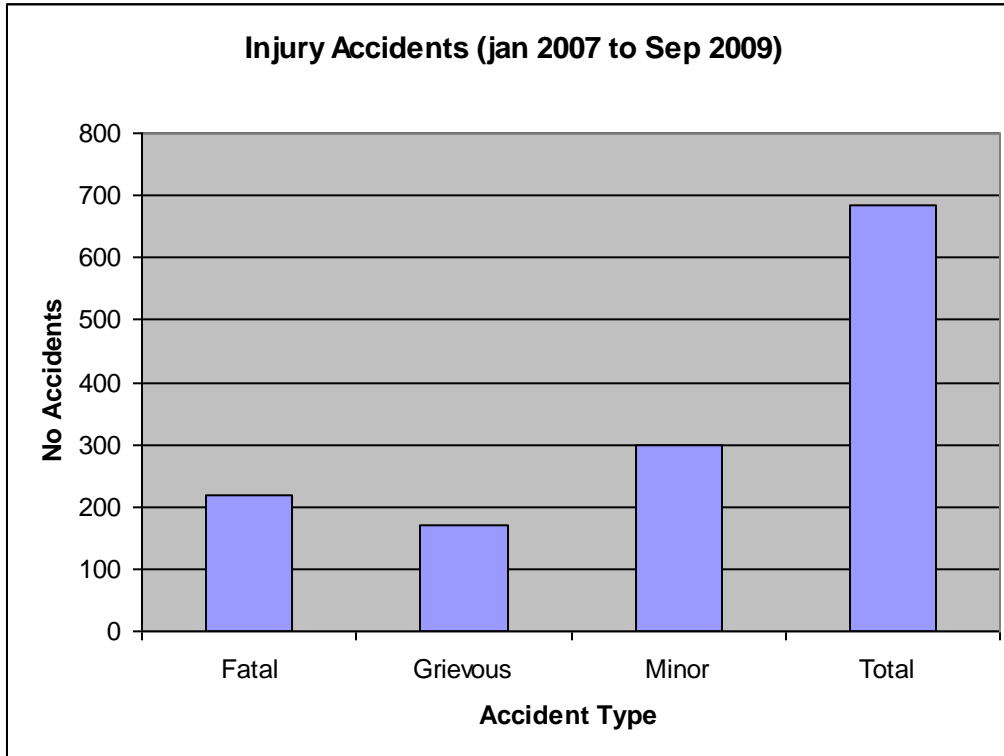
Accident Totals

- *Fatal* 188
- *Grievous* 279
- *Minor* 367
- *Total* 834

- *Ave 6.3 Pia's/km*

From January, 2007 to September, 2009

AVM – Current Corridor Accident Data



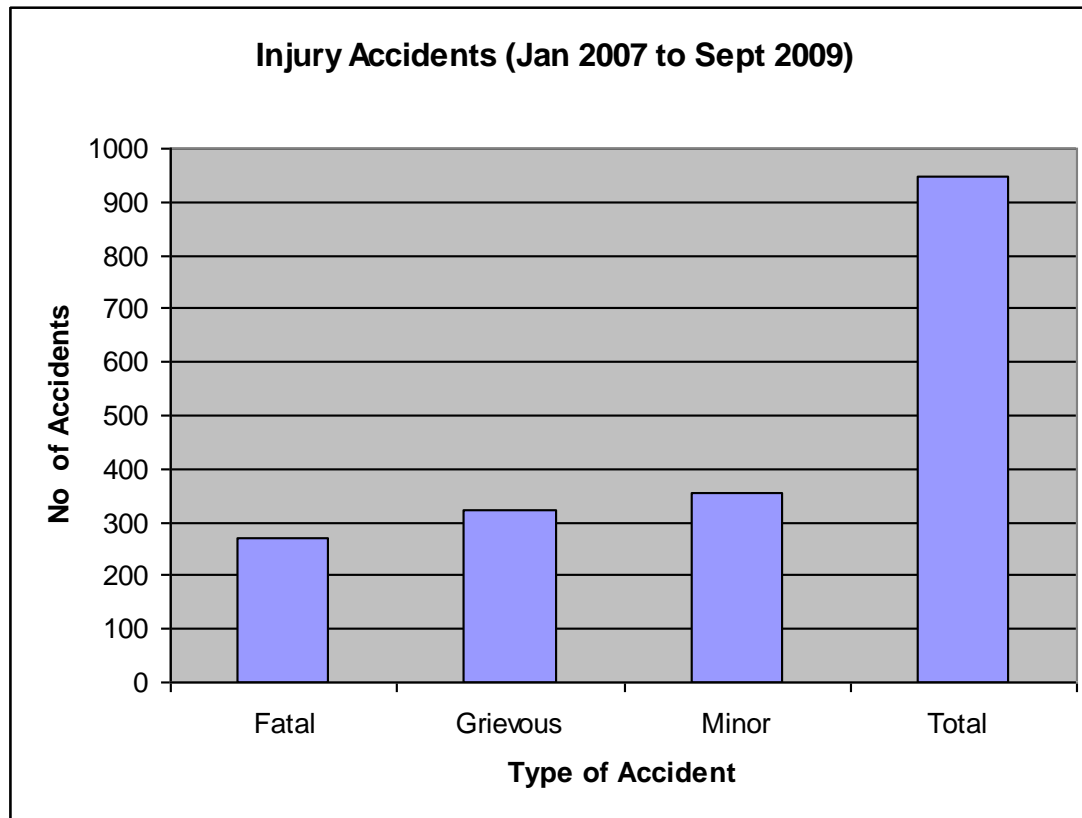
Accident Totals

- *Fatal* 218
- *Grievous* 169
- *Minor* 298
- *Total* 685

- *Ave 3.74 Pia/km*

From January, 2007 to September, 2009

HGS – Current Corridor Accident Data



Accident Totals

- *Fatal* 270
- *Grievous* 321
- *Minor* 355
- *Total* 946

- *Ave 5.4 Pia's/km*

From January, 2007 to September, 2009

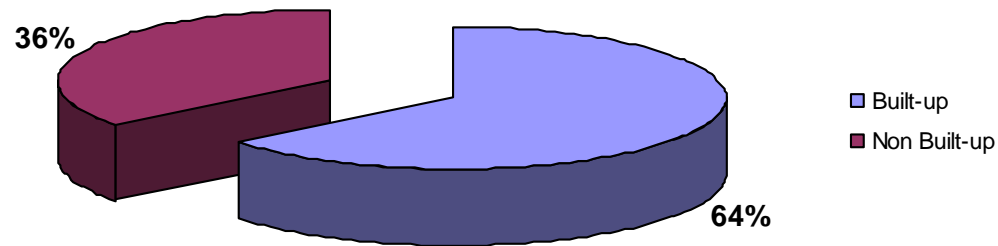
HGS – Accident Analysis

Accidents by Police Station

Police Station	Fatal	Grievous injury	Minor injury	Total	Area KM	Accident/ KM
Godhara Town	5	18	6	29	17	2
Godhara Rular	7	9	7	23	3	8
Halol	22	33	18	73	12	6
Kalol	66	89	111	266	20	13
Khanpur	20	13	17	50	15	3
Kothamba	5	4	8	17	8	2
Lunawada	19	14	29	62	15	4
Malpur	16	15	17	48	19	3
Modasa Rural	37	20	44	101	26	4
Modasa Town	5	4	11	20	12	2
Samlaji	6	6	5	17	4	5
Shahera	39	13	10	62	16	4
Total	247	238	283	768	167	3

Accidents by Location

Land Use	Fatal	Grievous injury	Minor injury	Total	% Accident
Built-up	145	163	186	494	64
Non Built-up	102	75	97	274	36
Total	247	238	283	768	100



Accidents by Type & Lighting

NATURE OF THE ACCIDENT	Dark hours with Good Street light	Dark hours with no street light	Dark hours with Poor Street light	Daylight	Twilight	Total
Collision brush/side swipe	6	10	10	55	11	92
Head on collision	12	56	9	170	24	271
Overturning	0	7	1	48	6	62
Rear end collision	11	42	19	129	42	243
Right angled collision	2	9	2	22	7	42
Right turn collision	0	3	1	11	0	15
Skidding	0	7	0	14	4	25
Others	0	2	0	12	4	18
Total	31	136	42	461	98	768

Accidents by Vehicle Type

All Vehicles involved	Fatal	Grievous injury	Minor injury	Total
Auto rickshaw	14	38	45	97
Bus	19	22	25	66
Jeep	28	19	28	75
Motor car	24	24	30	78
Motorcycle/scooter	77	100	104	281
Moped	0	1	0	1
Taxi	1	2	5	8
Tempo	21	17	29	67
Truck	166	110	165	441
Tractor	13	6	13	32
Articulated vehicle	2	1	5	8
Other motor vehicles	23	11	8	42
Total	388	351	457	1196

Objects Involved in Accidents

Accident involvement	Fatal	Grievous injury	Minor injury	Total	%Accident
Pedestrian	76	70	63	207	27
Cyclist	7	7	6	20	3
Railing	0	0	1	1	0
Tree	1	0	0	1	0
Animal	8	9	4	21	3
Others	1	2	2	4	1
Other Vehicles	154	152	208	514	67
Total	247	240	284	768	100

27% Accidents involving Pedestrian & 3% Cyclist

Route Corridor Proposals – Drawing Review

Limitations

- Review commissioned at end of detail design stage
- Poor quality of accident data (especially with regard to speed)
- Incomplete drawings
- Construction already commenced on site

Basic approach

- Option A: adapt geometry (design speed) to match posted speed (80km/h)
- Option B: reduce posted speed to geometry (design speed) using traffic calming, signage, gateway features and ITS

Alignment Issues

- Various locations where vertical alignment is substandard
- New carriageway and bypass also have poor horizontal and vertical alignment
- Effort should be made to improve the horizontal alignment where possible
- Junctions on crest at various locations

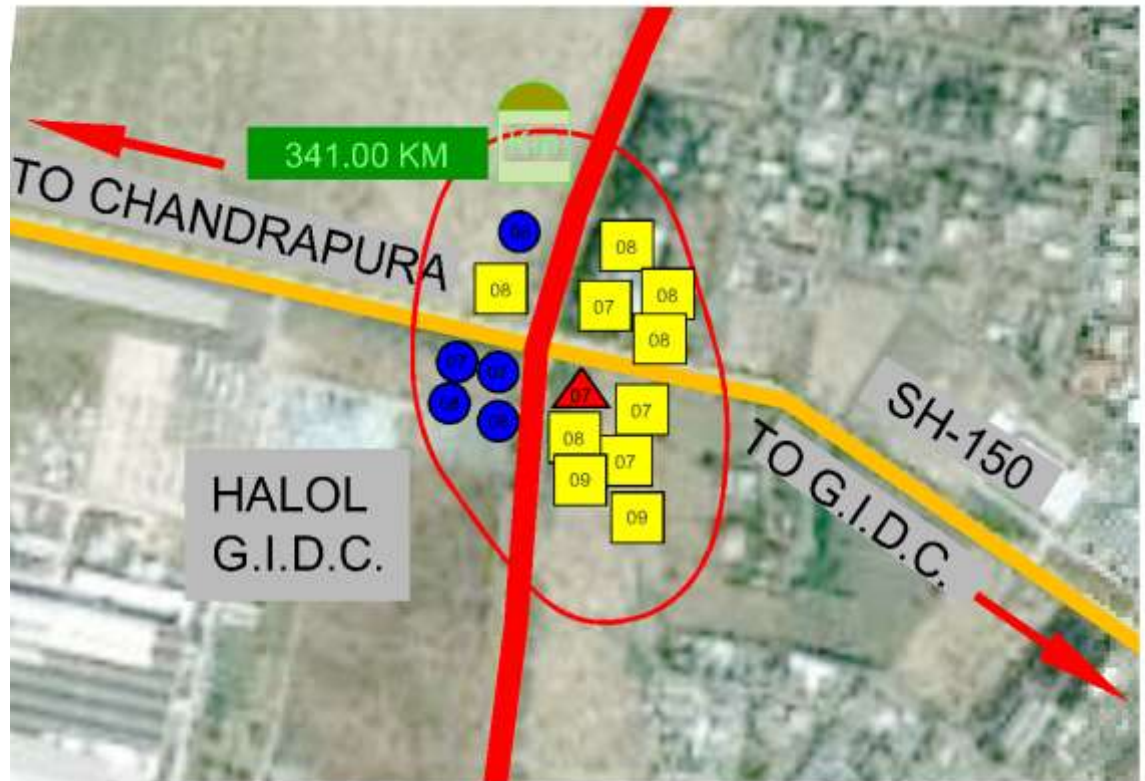
Example 2 – Junction 4



Junction 4 - Accident Cluster

Fatal	Grievous injury	Minor injury	Total
1	10	5	16

Out of 16 accidents 5 involving Pedestrian & 3 Cyclist

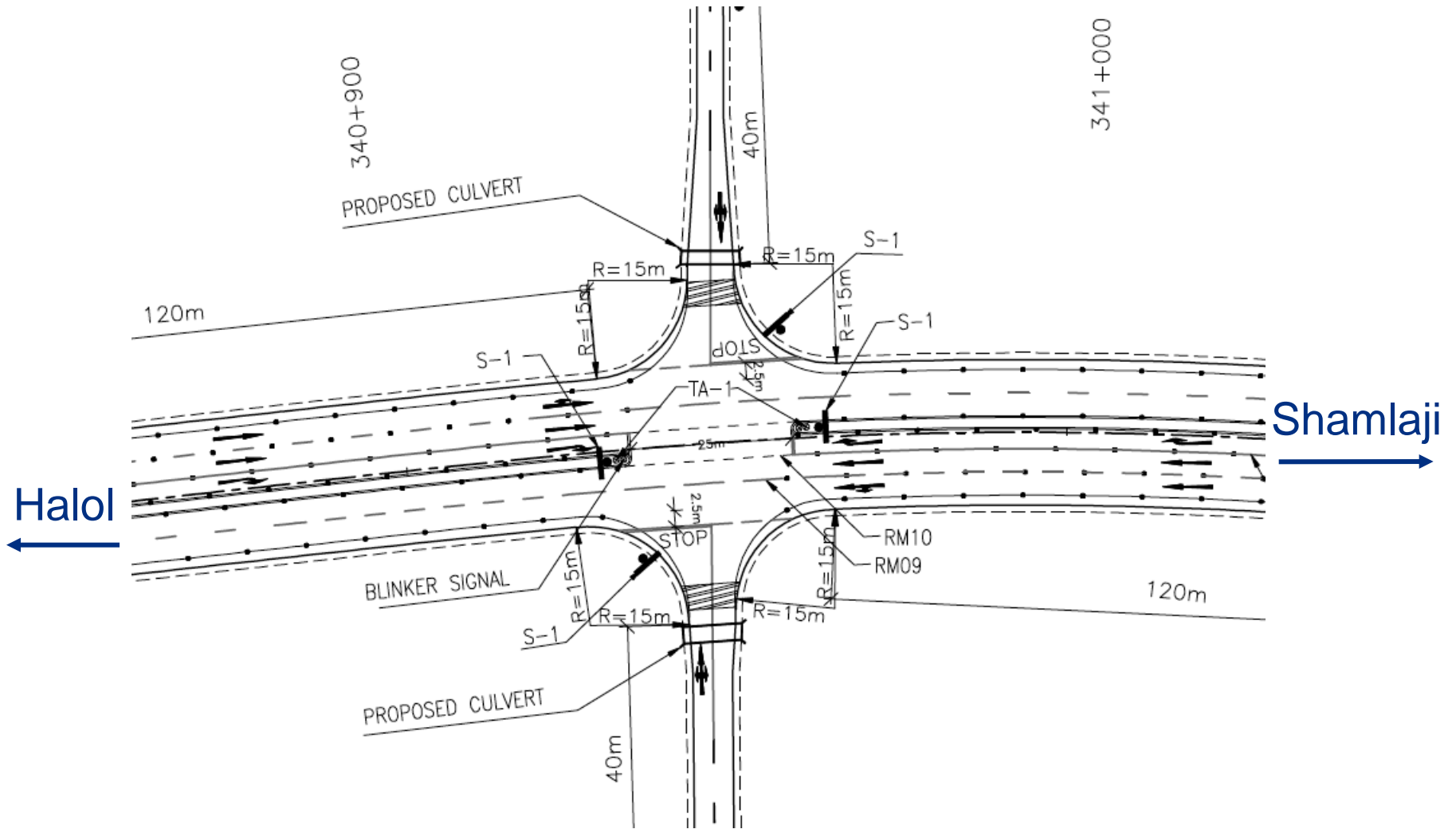


-  MINOR INJURIES
-  GRIEVOUS INJURIES
-  FATAL ACCIDENTS

Junction 4 - Photos



Junction 4 Drawing



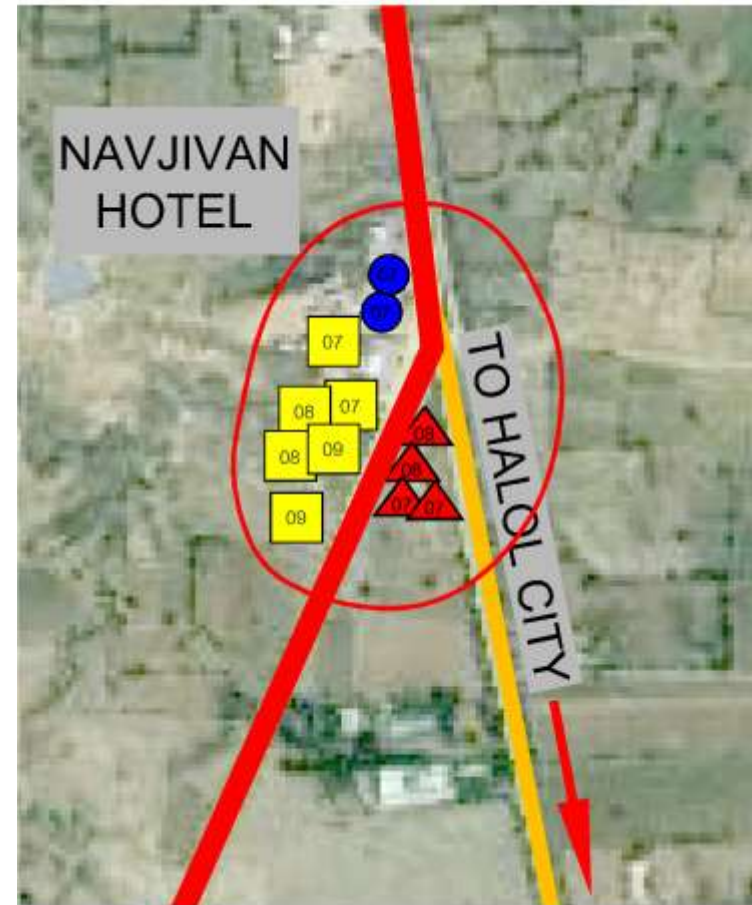
Example 3: Junction 7 - Accident Visual

Fatal	Grievous injury	Minor injury	Total
4	6	2	12

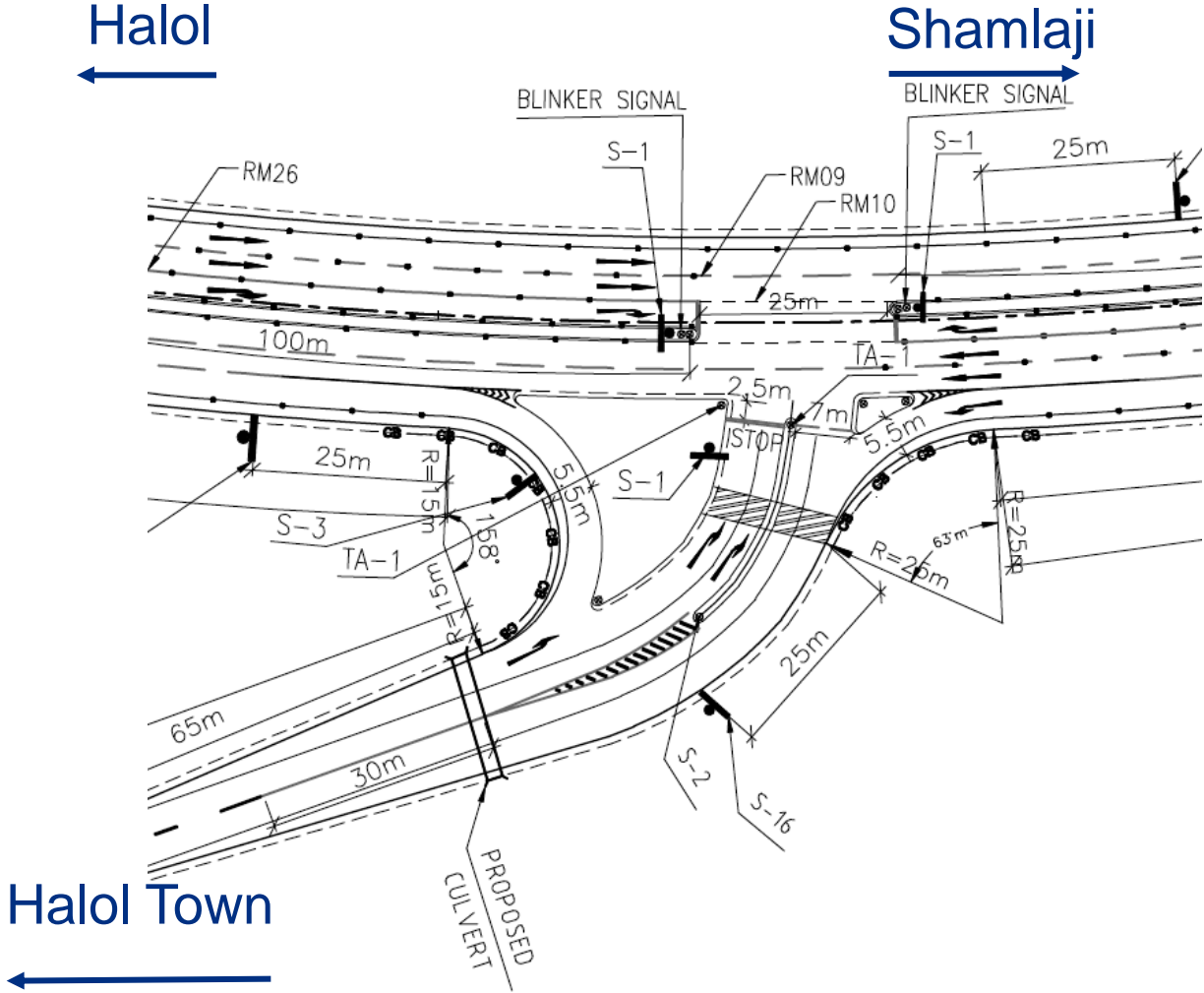
Out of 12 accidents 3 involving Pedestrian & 1 Cyclist

Responsibility of Driver Vehicle	Collision brush/side swipe	Head on collision	Rear end collision	Total
Did not give right of way to vehicle	2	0	1	3
Exceeded lawful speed	1	2	5	8
Followed too closely	0	0	1	1
Total	3	2	7	12

- **MINOR INJURIES**
- **GRIEVOUS INJURIES**
- ▲ **FATAL ACCIDENTS**



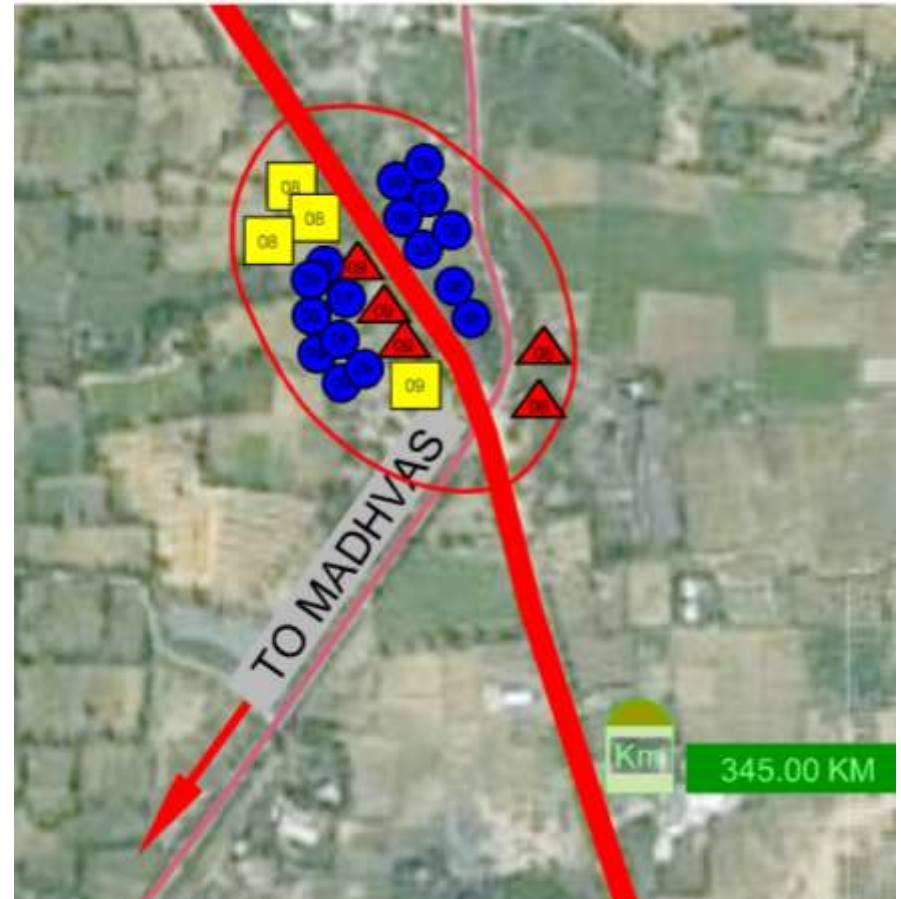
Junction 7 – Drawing



Example 4: Junction 10 - Accident Visual

Fatal	Grievous injury	Minor injury	Total
5	4	16	25

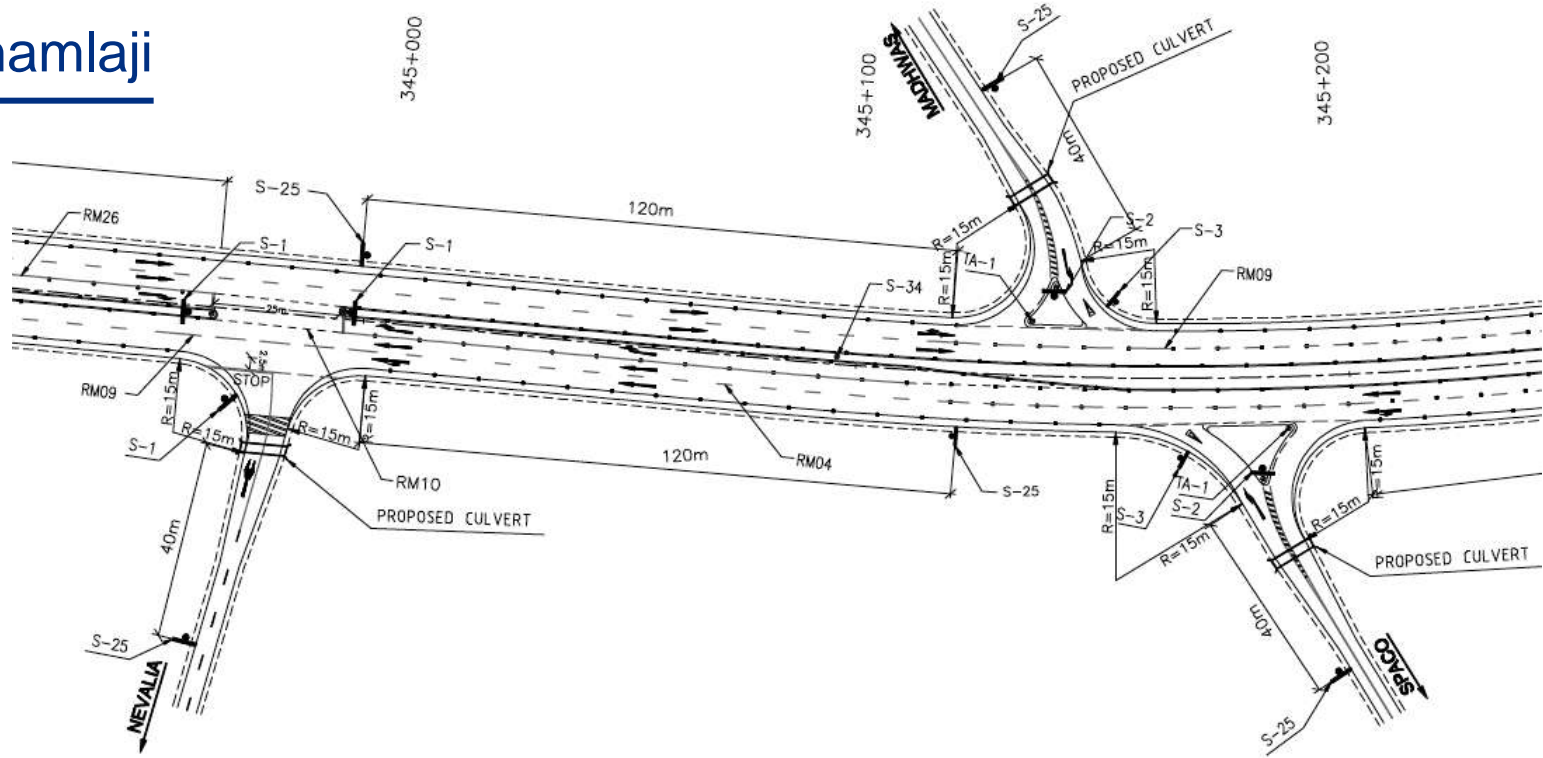
Out of 25 accidents 6 involving Pedestrian & 1 Animal



-  MINOR INJURIES
-  GRIEVOUS INJURIES
-  FATAL ACCIDENTS

Junction 10 – Drawing

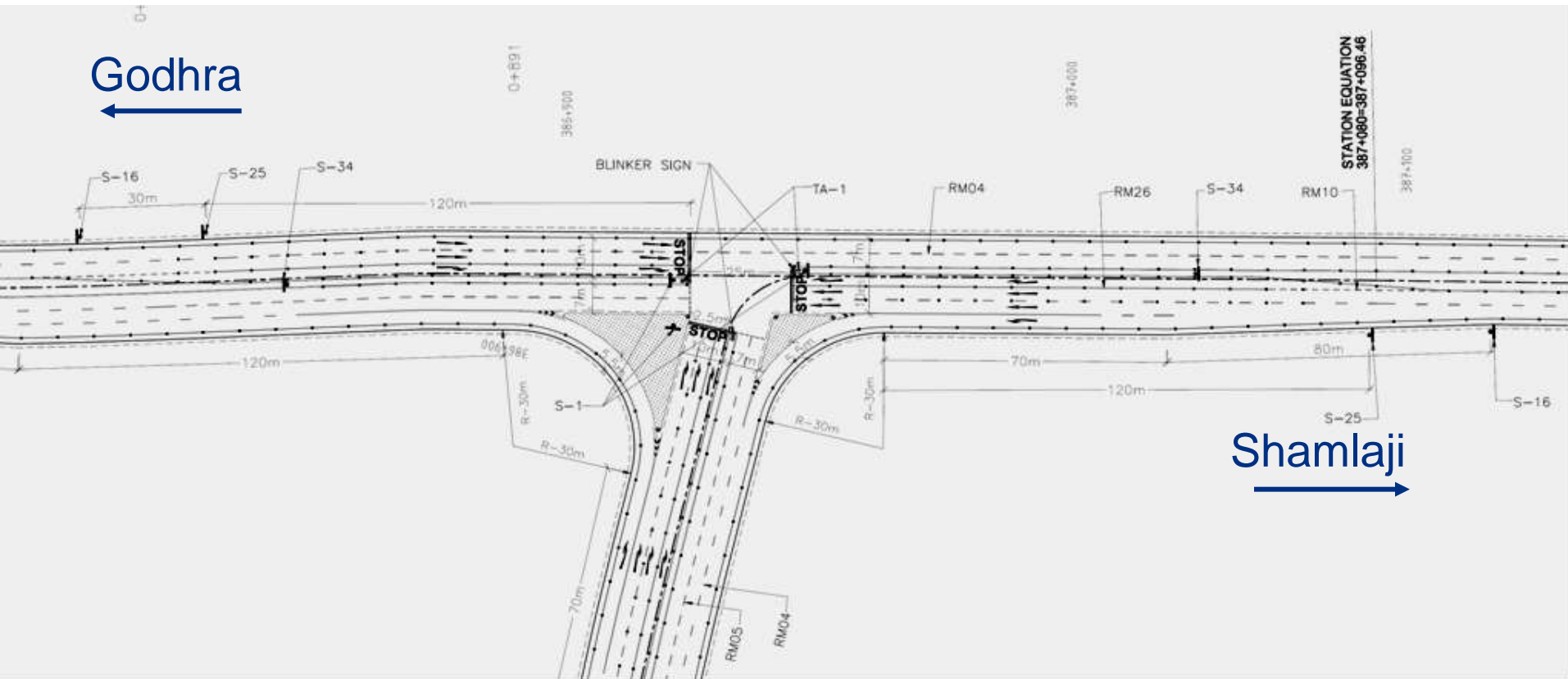
Shamlaji



Halol



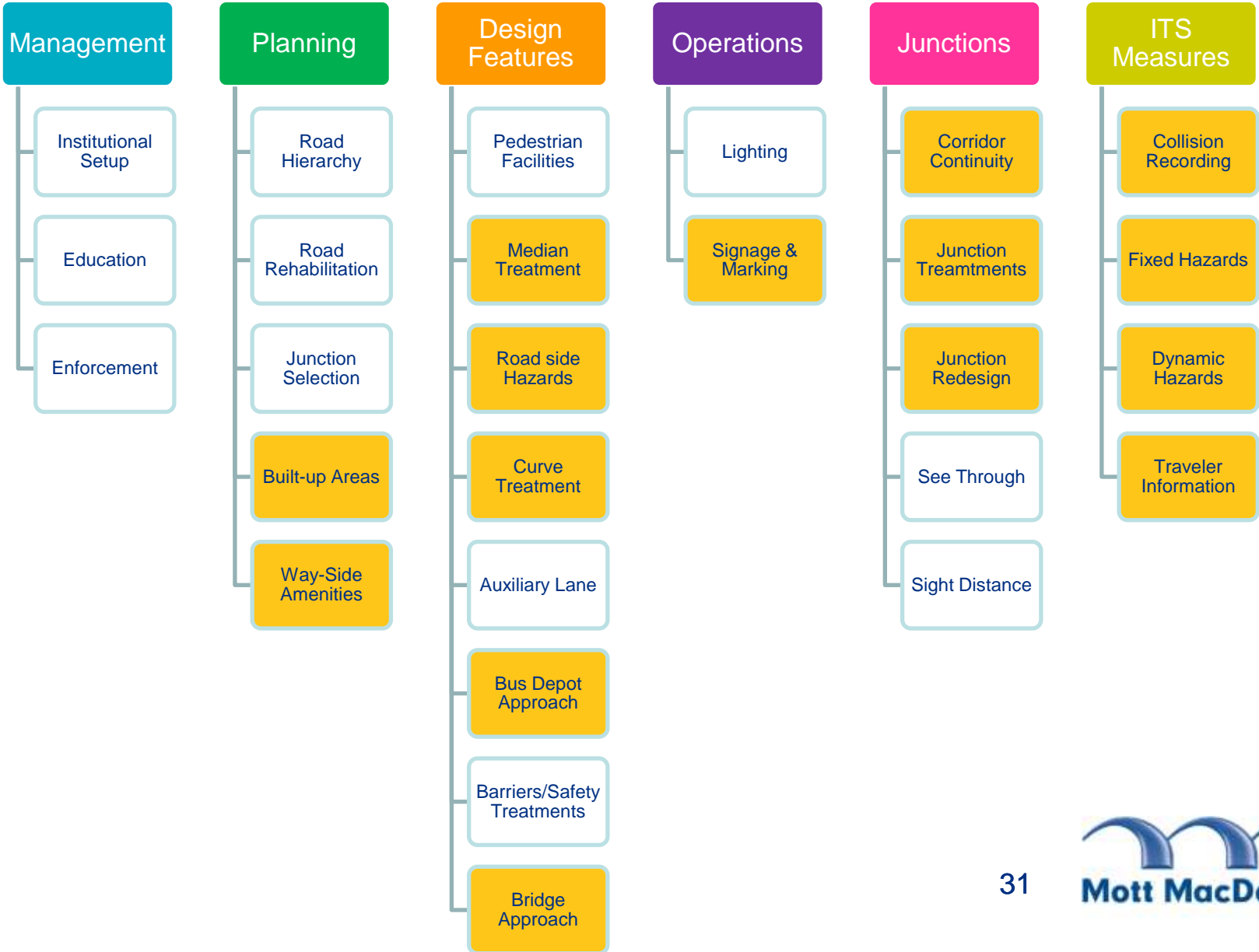
Example 5: Junction - 47 Godhra Bypass Exit



Safety Treatments and Examples

HGS Proposal

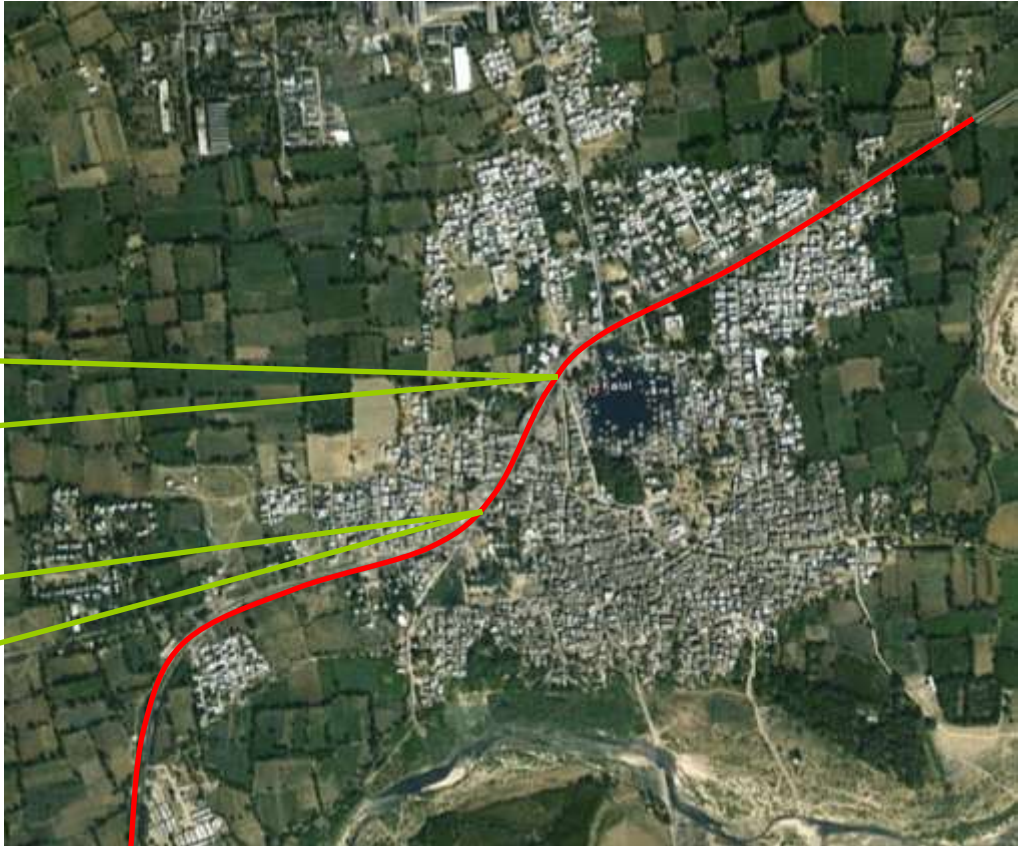
- Safety treatment categories



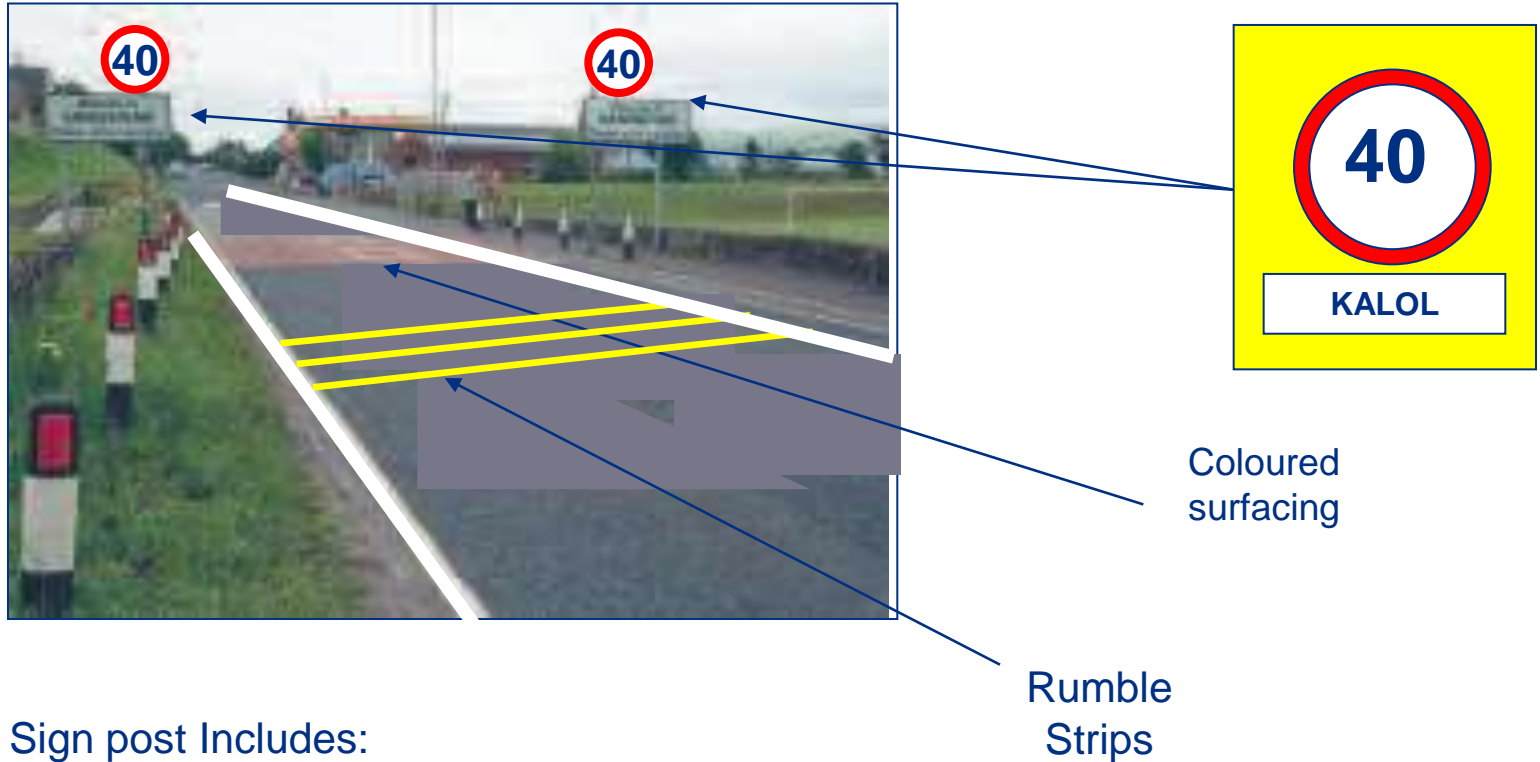
Kalol Police Jurisdiction

-Kalol

Fatal	Grievous injury	Minor injury	Total	Accident /km
66	89	111	266	13



Gateway Treatment (entrances to built-up areas)

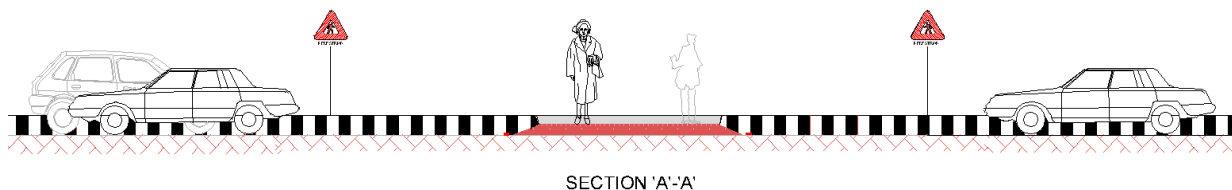
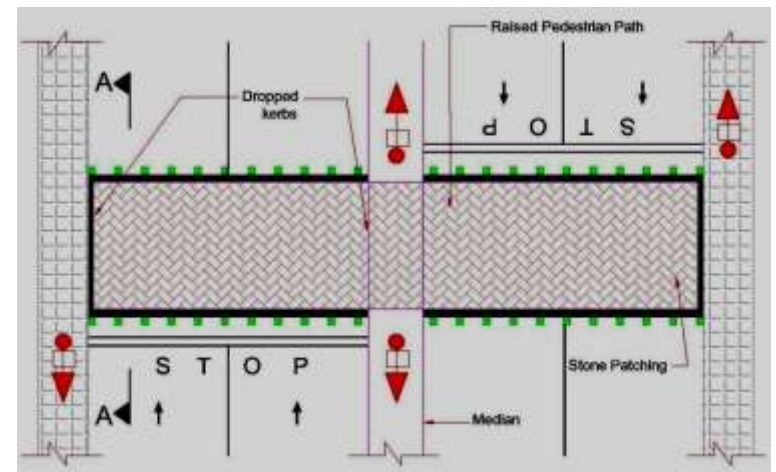


Advanced Sign post Includes:

- Name and length of town,
- Speed limit (40 kmph)
- Colored surfacing to differentiate change of driving condition

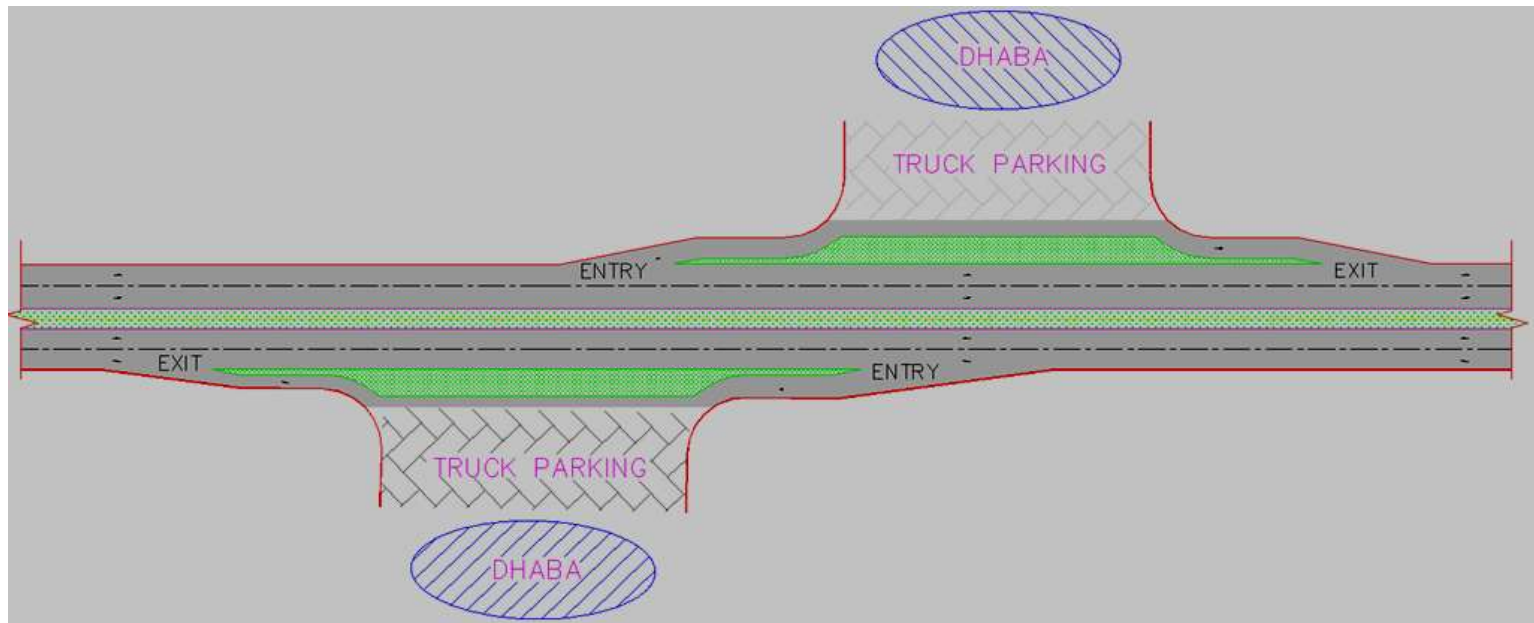
Treatments:

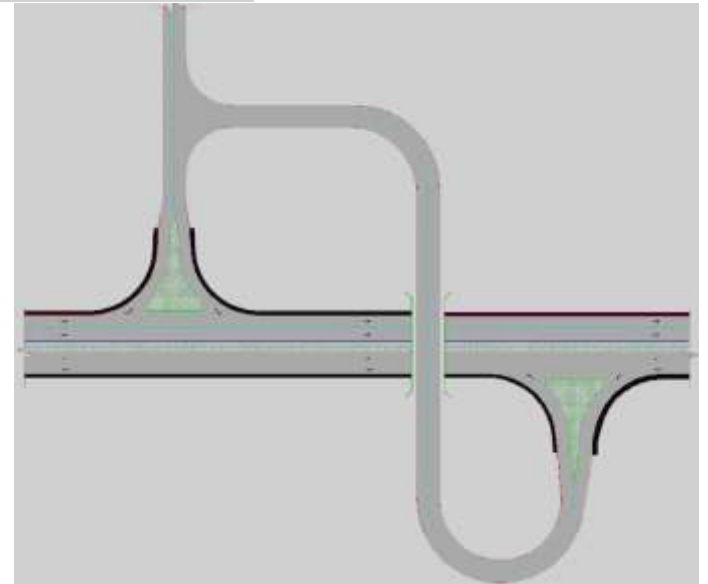
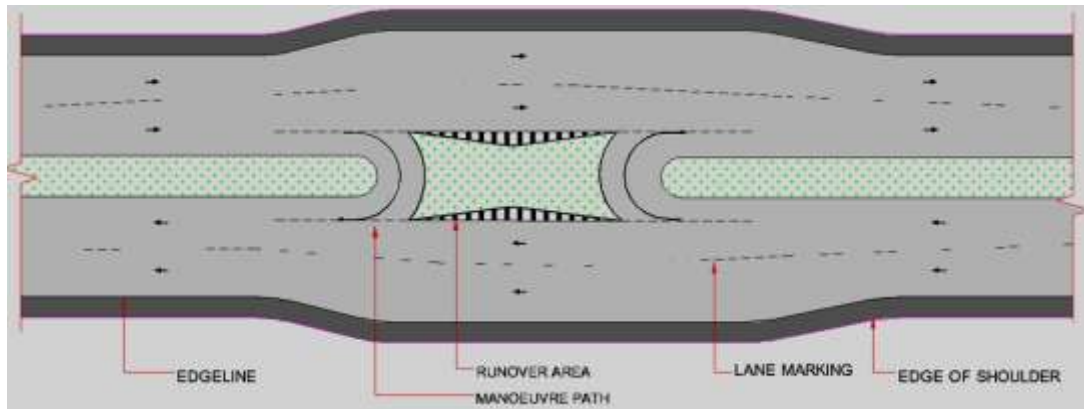
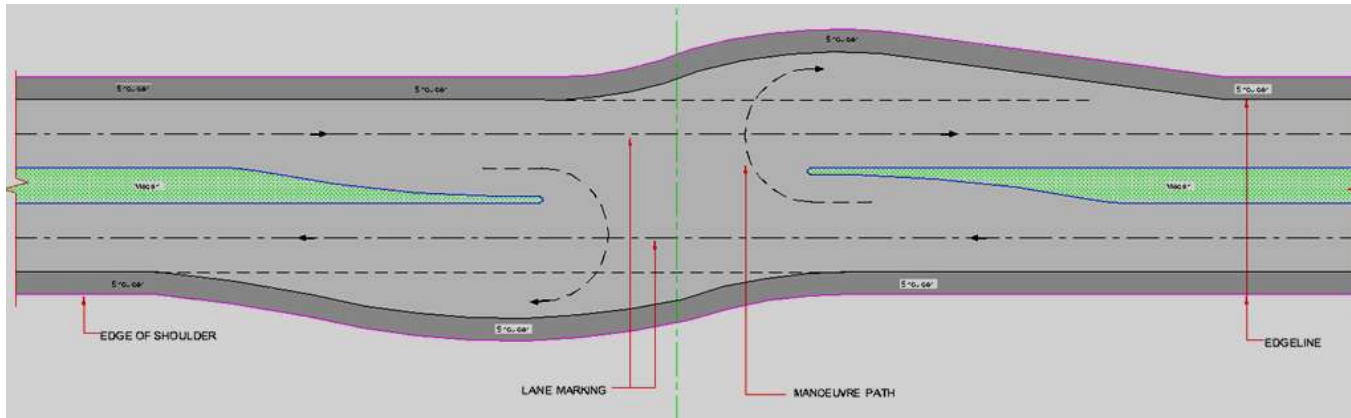
- Bright street light along the length of the town.
- Rumble strip
- Raised pedestrian crossing,
 - Sign board @ 100-150m
- Central median barricaded.
- Continuous paved shoulder of 2.5m/1.5m width
- Parking provision, signalisation & enforcement.



- On-Street Parking Management & Enforcement

- Lay by of 6m wide provided by segregating from footpath/median and/or with paved shoulder on both side of corridor.





U-turn facilities

Design Features

Curve Treatment

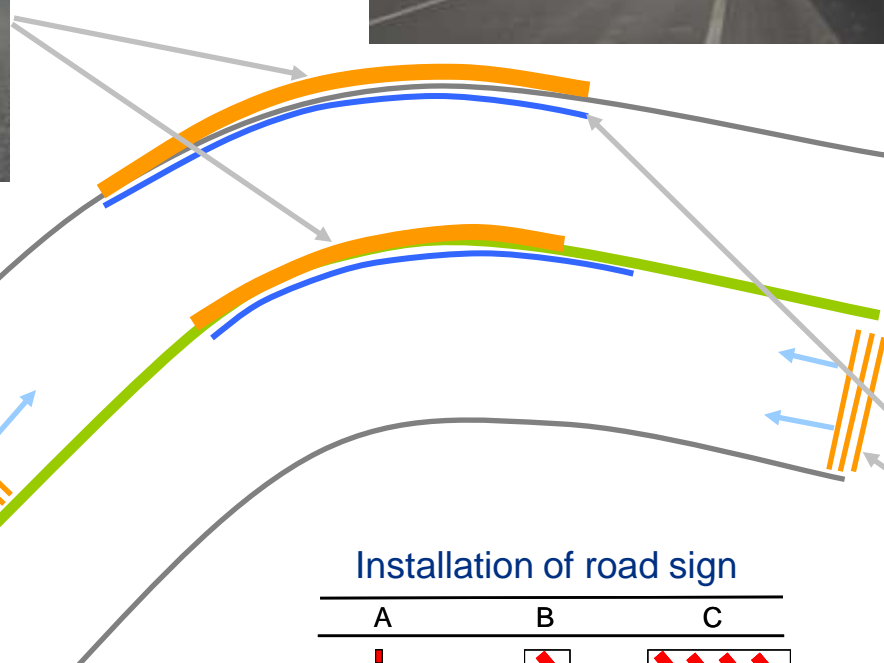


Bike Guard Barrier

Rumble Strips



Vehicle Activated Sign (VAS) on approaches



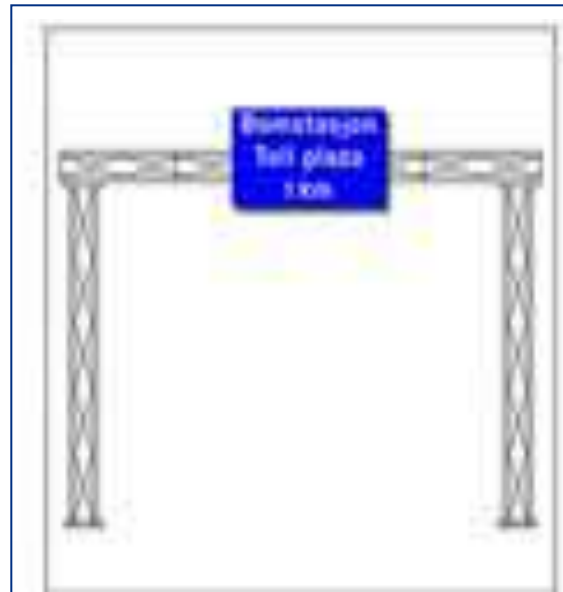
Installation of road sign

A	B	C
IRC:67-2001 14.1	IRC:67-2001 14.1	IRC:67-2001 14.1



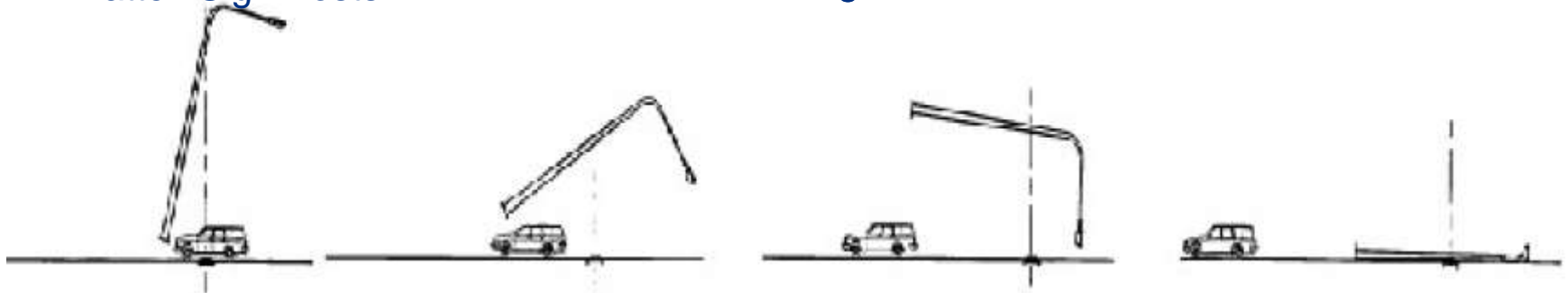
Design Features

Passively safe posts



Lattice Sign Posts

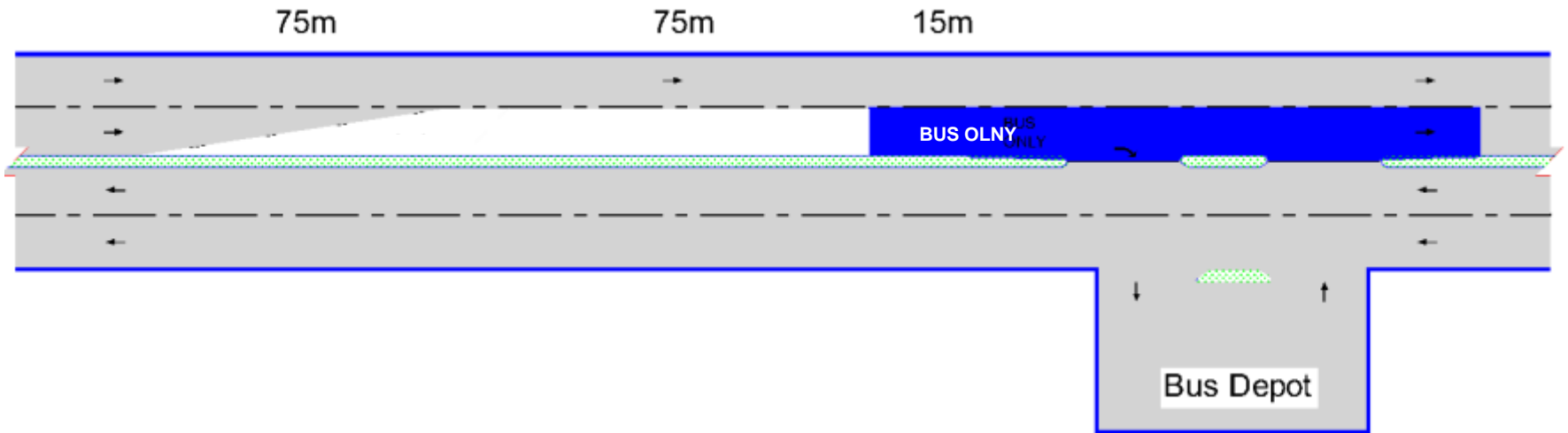
Lattice Sign Gantries



Impact absorbing Pole

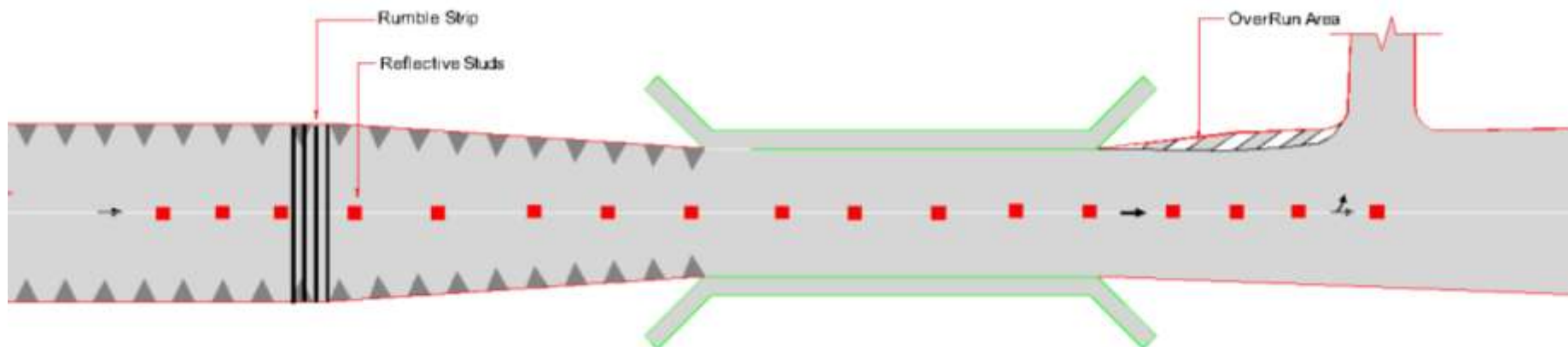
Design Features

Bus Depot Approach

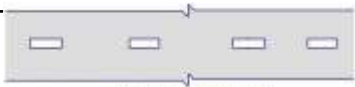

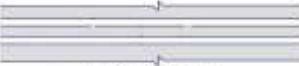



Advanced Sign post:

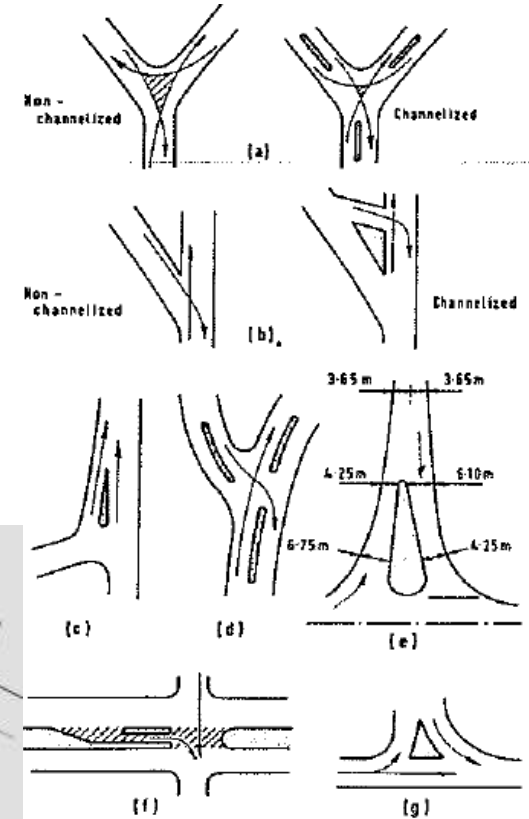
- Bridge Ahead
- No overtaking zone
- Speed limit



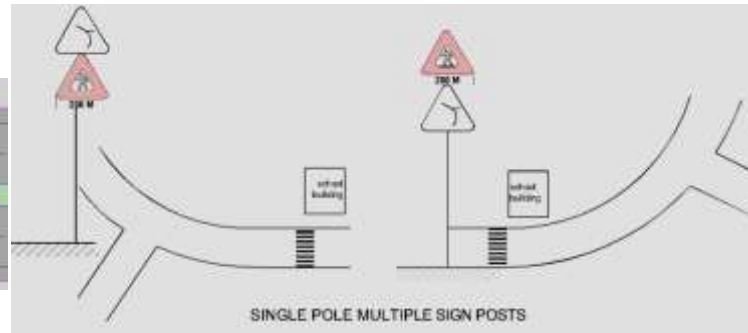
Road Markings

Type of line	Figure
Broken line	 SINGLE BROKEN LINE
Solid lines	 SINGLE SOLID LINE
Double solid lines	 PAIR OF SOLID LINES
Combination of broken and solid lines	 COMBINATION OF BROKEN & SOLID LINES

Channelisation



Sign Board For Fast -Slow lane

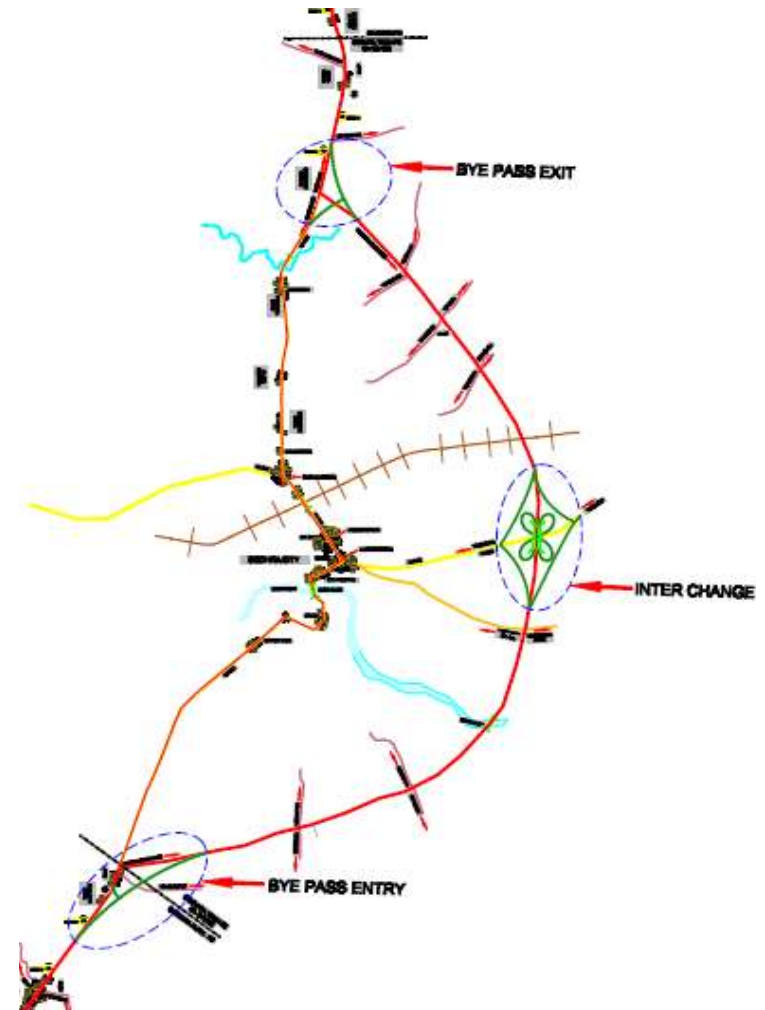


Sign post Multiple Sign

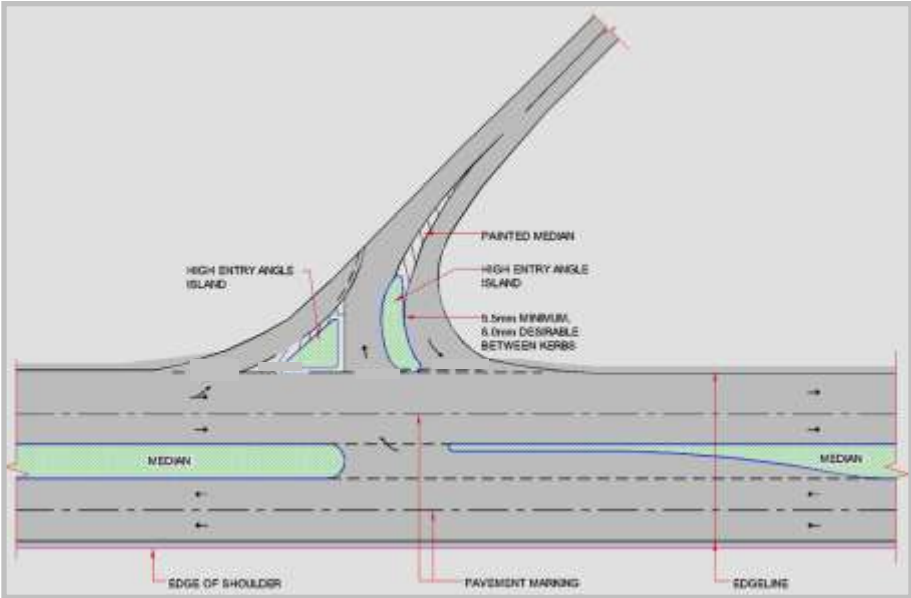
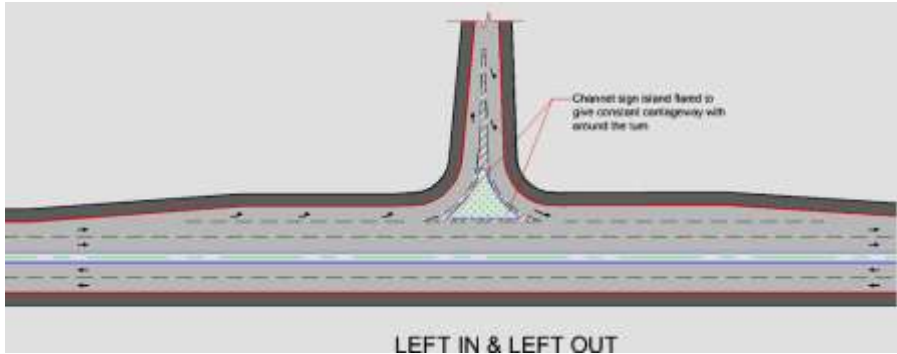
Junctions

- By-pass Alignment
- Prioritisation of movements
- Channelisation for Priority of Vehicular movement on the Corridor

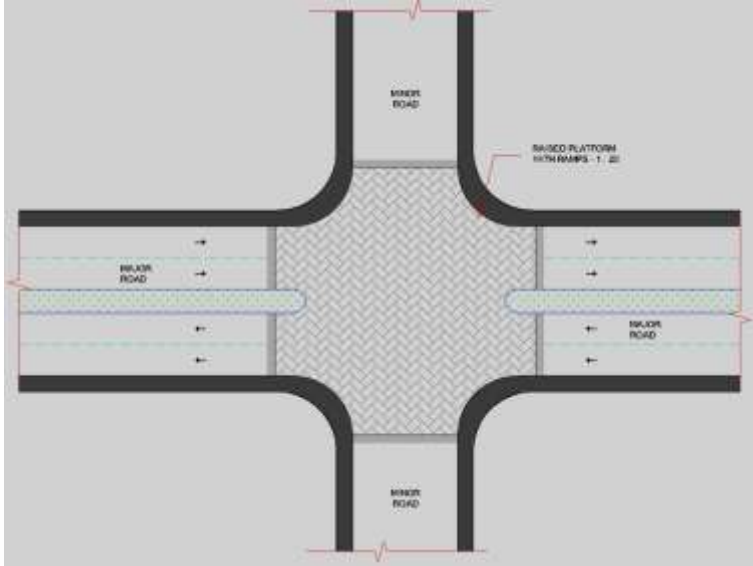
Corridor Continuity



Junctions



Junction Treatments



Conclusions

- Need to create Safety Cell to deliver Safety Engineering Functions
- Need to Improve data accuracy and develop accident database
- Need to be involved at earlier stage in design (Road Safety Audits)
- Measures need to be supported with Education & Enforcement

Final Thought.....



.....Always try and relax at the end of a long day

**Thank you for
listening**



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