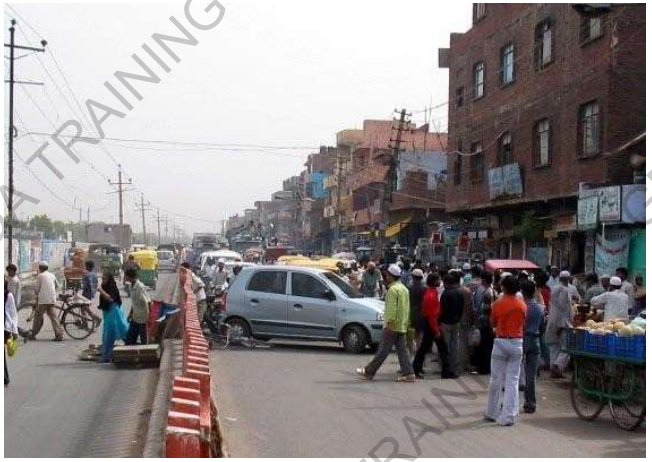
Rural Road Safety Course

Approach and Methodology to Road Safety Audit/ Audit Procedure

Road Crash ?

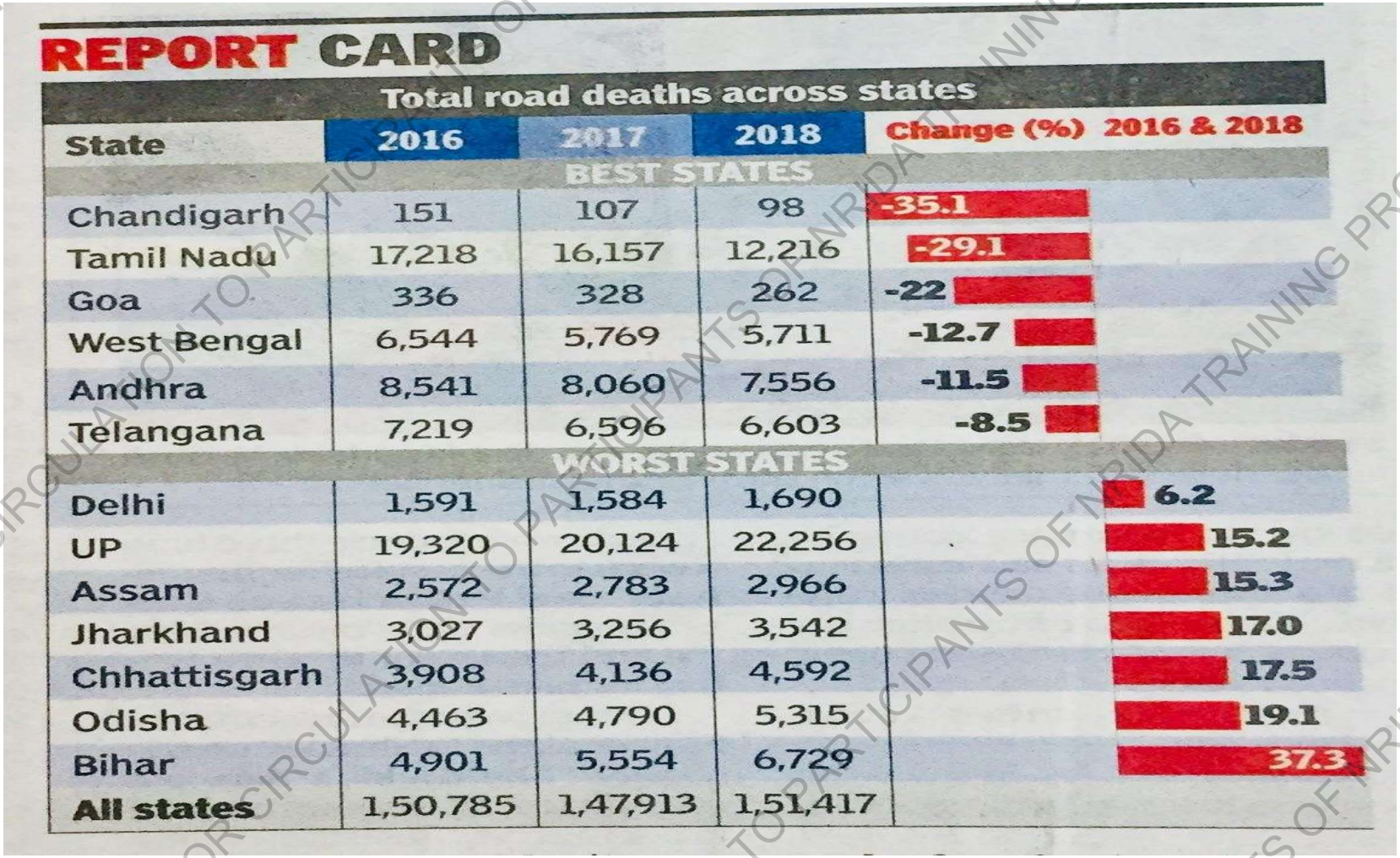
The collision of one road user with the other road user or with the fixed object lying within the roadway or running off from the roadway is termed as road crash



Causes

1. Road Engineering
2. Vehicle Engineering
3. Road User
    a. Drivers
    b. Pedestrians
    c. Passengers
    d. Animals
4. Environmental Factors
5. Natural Calamities

Road Accident Statistics (2016-18)



REPORT CARD

Total road deaths across states

State	2016	2017	2018	Change (%) 2016 & 2018
BEST STATES				
Chandigarh	151	107	98	-35.1
Tamil Nadu	17,218	16,157	12,216	-29.1
Goa	336	328	262	-22
West Bengal	6,544	5,769	5,711	-12.7
Andhra	8,541	8,060	7,556	-11.5
Telangana	7,219	6,596	6,603	-8.5
WORST STATES				
Delhi	1,591	1,584	1,690	6.2
UP	19,320	20,124	22,256	15.2
Assam	2,572	2,783	2,966	15.3
Jharkhand	3,027	3,256	3,542	17.0
Chhattisgarh	3,908	4,136	4,592	17.5
Odisha	4,463	4,790	5,315	19.1
Bihar	4,901	5,554	6,729	37.3
All states	1,50,785	1,47,913	1,51,417	

Cause of Road Accident (2015)

Condition	Accidents	Fatalities	Injured
Good Surface	**3,35,077**	**92,270**	**3,54,742**
Loose Surface	29,455	8,784	33,559
Rutted/Pot Holes	10,876	3,416	10,065
Corrugated/Wavy Surface	4,325	1,610	3,912
Slippery Surface	8,126	2,159	7,116
Snowy	147	51	344
Muddy	3,988	1,415	4,294
Oily	3.849	1,394	3,211
Road Under Repair/Construction	11,263	3,902	9,856
Speed Breaker	11,084	3,409	9,764
Others	64,817	22,594	63,085

Source: MoRT&H Annual Report 2015-16

Accidents on Intersections

Type of Intersection	Nos. of Accidents	Persons Killed	Injured
T-Intersection	63,243	19,884	59,923
Y- Intersection	41,006	12,706	40,048
Four arm Intersection	42,829	12,342	40,704
Roundabout	25,612	7,771	26,797
Rail-Road Crossing	3,314	1,326	2,915
Total	**1,76,004**	**54,029**	**1,70,387**

Urgent Requirement ?

How to reverse the trend of road accidents and unnatural Deaths

Global Road Safety Plan 2011-20

I call on Member States, international agencies, civil society organizations, businesses and community leaders to ensure that the Decade leads to real improvements. As a step in this direction, governments should release their national plans for the Decade when it is launched globally on 11 May 2011.

Mr Ban Ki-moon, UN Secretary-General

UN Initiative

- Incorporating road safety features into land-use plan
- An effective integrated urban planning and transport planning
- Designing safer roads
- **Conducting independent road safety audits for new construction projects**
- Improving the safety features of vehicles
- Promoting public transport
- Use of traffic-calming measures
- Effective speed management by police
- Enforcing use of seat-belts, helmets and child restraints
- Enforcing strict control on Drunken Driving
- Improving post-crash care for victims of road crashes
- Public awareness campaigns for safety
- Penalties for breaking the law

SAFETY AUDIT – A Definition

AUSTROADS 2001

Safety audit is a formal examination of road traffic project in which an independent, qualified, team reports on the project's potential

IRC SP88: 2019

Safety Audit is a formal, systematic and detailed examination of a road project by an independent and qualified team of auditors that leads to a report of the potential safety concerns in the project

History of Road Safety Audit (RSA)

- RSA began in late 1980 in a County in England when questions were raised on the increasing number of Accidents on new roads built in County
- A Policy was developed to check all new road designs in the County and approved for Safety by Road Safety Engineers (RSE) team prior to construction
- Similar procedures and policies spread throughout other British Road Agencies and the first “Road Safety Manual” was published by the Institution of Highways and Transportation (IHT) in late 1990s to guide and encourage the new process
- RSA expanded initially in Australia, New Zealand and Denmark and after that to other countries like Malaysia, Singapore, South Africa, India, etc

Why Safety Audit ?

- Recognize the importance of safety in Highway
- Design to meet the needs and perceptions of all type of road users, and to achieve a balanced safety solution thereto
- Reduce the long term cost of scheme, bearing in mind the overall cost effective safe solutions
- Improve the level of awareness of safe design practices by all involved in the planning, design, construction, maintenance and operation of roads
- Minimize the risk and severity of accidents on road
- Minimize the risk of accidents occurring on adjacent roads as a result of operation and maintenance of National Highways / Expressways

What is Safety Audit ?

- A formal process (not just an informal check)
- Conducted by persons who are independent of the design
- Conducted by persons with appropriate qualification, training and experience
- An assessment of road safety issues in a road design, a Traffic Management Plan for road works, a newly completed road scheme, or it can also be the identification of safety concerns on an existing road

What Safety Audit is Not ?

- A check of compliance with standards
- A substitute for regular design checks
- A crash investigation
- An opportunity to re-design a project
- A name for a more detailed site inspection
- A way of assessing or rating a project as good or bad

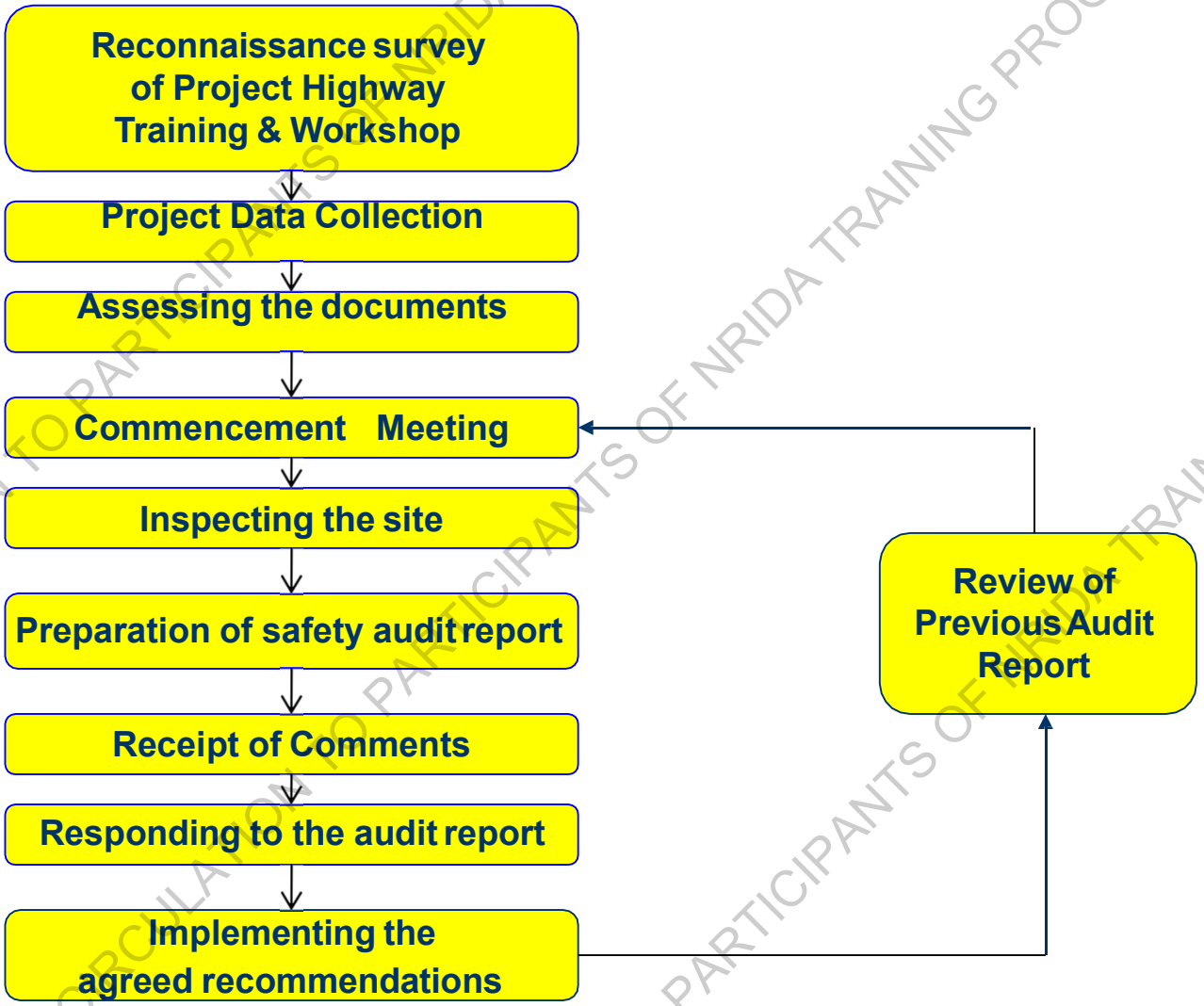
Safety Audit Vs Crash Investigation

- Road safety audits are proactive – they try to identify safety issues in a road design. The objective here is accident / crash prevention
- Road crash investigations are reactive – they examine known crash sites and use crash data to develop cost-effective countermeasures. The objective here is accident / crash reduction

A Good Safety Audit

- Focus is on road safety issues only
- Keep relevant standards and guidelines in mind while remembering that audit is more than compliance check with standards
- Consider the needs of all road users (including pedestrians, two/three wheelers, animal drawn vehicles, depending upon their presence and proportion in the traffic) in all weather and lighting conditions
- It is thorough and comprehensive
- It is realistic and practical in findings
- But do not rule out options because of cost - it is the road authority that will decide whether the investment can be justified
- Produce audit report promptly - usually within four weeks of the audit inspection

Safety Audit Procedure Flow Diagram



Types of Road Safety Audit

Audit	Tollways / Expressways	National Highways	State Highways	Major District Roads	Urban Arterial, Sub Arterial and Collector Roads	Local Streets, Rural Roads
Planning	✓	Optional	Optional	Optional	Optional	N/A
(DPR) Design*	✓	✓	✓	✓	✓	✓
Construction	✓	✓	✓	Optional	Optional	Optional
Pre-opening	✓	✓	✓	Optional	✓	Optional
Existing Roads	According to local policy and resources					

Planning/Feasibility Stage Audit

An audit on completion of the planning or feasibility study stage will examine features such as

- Design standards
- Route choice and continuity with the existing adjacent network
- Horizontal and vertical alignments,
- Cross sections
- Interchange/intersection layouts
- Careful auditing at this early design stage can help to reduce the costs and lost time associated with changes that may otherwise be brought about during later audits

Why Planning Stage Safety Audit ?

- Works on a principle of “Prevention is better than cure”
- Aims to identify safety concerns in road design while they are still pencil lines on a piece of paper
- By making changes at the Design Stage we aim:
  - To reduce/minimize risks to future road users of that road
  - To reduce long term cost of scheme. Unsafe designs may be expensive or even impossible to correct at a later stage

Detailed Design Stage Audit

This occurs on completion of the detailed road design (the final DPR) but before the preparation of contract documents. This stage will examine features such as

- Geometric layout
- Pavement markings
- Signals
- Lighting
- Road signages
- Intersection/Interchange designs
- Clearances to roadside objects (Crash barriers)
- Provision for vulnerable road users

Construction Stage Safety Audit

This takes place during construction of the road works. This stage will examine features such as

- Safety of the traffic management plans for each phase of construction for large road projects (i.e. before the works begin)
- Inspects the provisions for road safety at the road work site during the construction period
- Provisions for pedestrian safety
- Advanced warning zones, adequate transition zone lengths
- Worker safety
- Effective numbers of reflective signs
- Safe delineation

Construction Stage Safety Audit

- Speed limits
- Temporary crash barriers
- Lighting
- Diversions Geometric layout
- Pavement markings
- Clearances to roadside objects (Crash barriers)
- Provision for vulnerable road users

Pre Opening Stage Audit

This audit involves a detailed inspection of the new road project immediately prior to its opening. This stage will examine features such as

- Although most road projects are constructed “under traffic” there is a time just before the Contractor hands over the project when the project is almost complete and when a preopening stage audit is undertaken
- The new road should be driven, ridden and walked (as appropriate) by the audit team to ensure that the safety needs of all road users are provided for.
- A night-time inspection is particularly important at this stage to check installation and visibility of signs, markings, delineation, lighting and any other night time/low light related issues.

Safety Audit of Existing Road

- The audit of existing road aims to ensure that the safety features of a road are compatible with the functional classification of the road

- It also aims to identify any feature that may develop over time into a safety issue (such as a tree blocking sight lines at an intersection

- Safety Audit with/without crash data

Audit Team

As per IRC SP 88

- Senior Road Safety Auditor
- Road Safety Auditor
- Road Safety Assistance/Apprentice

As per NHAI and Site Requirements

- Senior Road Safety Auditor cum Team Leader
- Traffic Engineer/ Transport Planner
- Bridge Construction Engineer
- Mechanical Engineer

Senior Road Safety Auditor

- Graduate in civil engineering with more than 10 years' experience in design, construction and maintenance of roads
- Completed an approved road safety audit training program of at least two weeks duration
- Minimum 3 years practical experience in road safety, and
- Completed at least five road safety audits. At least three of the five audits must be at a design stage

Road Safety Auditor

- Graduate in civil engineering with more than 7 years' experience in design, construction and maintenance of roads
- Completed an approved road safety audit training program of at least two weeks duration
- Minimum 2 years practical experience in road safety, and
- Completed at least three road safety audits

Road Safety Assistance/Apprentice

- Graduate in civil engineering with more than 2 years' experience in design, construction and maintenance of roads

- Completed an approved road safety audit training program of at least two weeks duration

Why Audit Checklists

- Checklists to reduce the risk that important safety concerns not overlooked during an audit

- Checklists remind audit teams to always consider the safety needs all road users i.e. vulnerable road users (pedestrians, bicyclists, rickshaw pullers and three wheelers) and motorised road users (car, truck and bus users).

Types of Audit Checklists

- ★ Checklist for Planning/Feasibility Stage
- ★ Checklist for Detailed Design Stage
- ★ Checklist for Construction Stage
- ★ Checklist for Pre-opening Stage
- ★ Checklist for Audit of Existing Roads
- ★ Checklist for rural roads with low design speeds and low volumes of traffic

Use of Prompt Lists

- Should be used in a way that best meet each auditor's needs
- There is no single best way to identify safety issues and to utilise prompt lists
- Should always be treated as prompts only
- They are **not a substitute for knowledge and experience**

Selected Items of Checklist

General items

- Horizontal and Vertical Alignment
- Cross Sections and Side Slopes
- Sight and Stopping Distances
- Traffic lane Safety and Visibility
- Street Lighting, Roadworks Signs

Traffic Signs and Pavement Markings

- Signs, Location/Placement
- Day /Night, Winter/Summer Requirements
- Delineation and Reflective Markers
- Pavement Marking

Selected Items of Checklist

Traffic Signals

- Temporary Traffic Signals
- Location, Visibility
- Signals Display
- Traffic Movements

Pedestrians and Cyclists

- Paths -Continuity
- Elderly and Disabled
- Cyclists - Continuity
- Safe Grades, Warning

Selected Items of Checklist

Road Pavement

- Pavement Defects
- Skid Resistance, painting
- Loose Screenings
- Contrast (Kerb and pavement)

Traffic Speed Management

- Speed Restriction Signs
- Speed Management
- Signs Requirements

Road Safety Audit is a ?

a) Reactive measure

b) Pro-active measure

c) Traffic Management Measure

d) None of the above

Answer: b)

Road Safety Audit should be conducted during?

a) Day

b) Night

c) Day and Night

d) During Peak Hours

Answer: c)

Road Safety Audit is basically a measure for ?

a) Accident Investigation

b) Accident Prevention

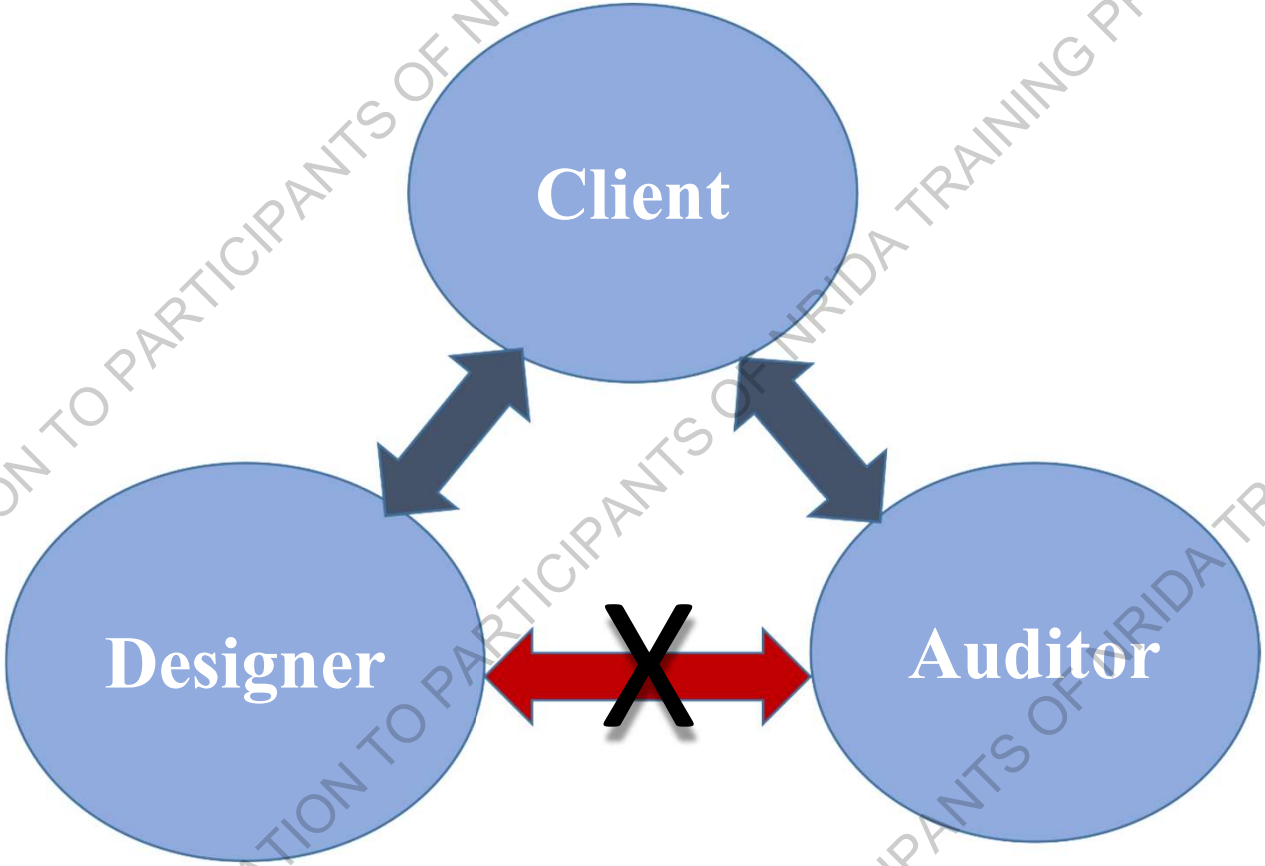
c) Accident Removal

d) Accident Investigation and Prevention

Answer: b)

Safety Audit Process

- Partners in the audit process



Audit Thought Process

- Is the proposed cross section suitably safe for the road classification?
- Do the horizontal and vertical alignments commensurate with design speed ?
- Will the new road be easily understood by the road users (motorised and non motorised)?
- Do any parts of the design present direct risk to any group of users?
- Are any roadside hazards obvious?
- If adequate provisions made to ensure safety of vulnerable road users – moving along as well as across the new road?
- Will weather conditions present any safety issues?
- Will the new road be safe at night?
- If any of these trigger a potential safety concern, suggest /propose alternative in the design now in a positive manner to improve safety?

Audit Thought Process

- **Warnings** to Road Users can be given by signs, pavement markings or rumble strips
- **Information** to Road Users is best provided in small amounts, and drivers are not overloaded. Direction signs and lane direction arrows are examples of providing necessary information to drivers/riders
- **Guide** Road users such as where their route changes direction unexpectedly. This occurs often at road work diversions and at sharp curves on hill roads
- **Control** on traffic movement on intersections is a necessary part of a safe road network
- **Forgiving Roads** to reduce the risk to the occupants of vehicles that leave the road. Has the roadside hazard management strategy been applied? Barrier should be your last option.

IRC Reference Codes for Audit

- IRC 73 Geometric Design Standards for Rural (Non Urban Highways)
- IRC 86 Geometric Design Standards for Urban Roads
- IRC 35 Code of Practice for Road Marking
- IRC:38: Guidelines for Design of Horizontal Curves for Highways and Design Tables
- IRC 65 Guidelines For Planning & Design of Roundabouts
- IRC 67 Code of Practice for Road Signs
- IRC: 80 Type Design for Pick-up Bus Stops on Rural (Non Urban) Highways
- IRC 99 Guidelines for Traffic Calming Measures in Urban & Rural Areas
- IRC 103 Guidelines for Pedestrian Facilities
- IRC 119 Guidelines for Traffic Safety Barriers
- IRC SP 73 Manual of Specifications & Standards for 2-Laning of Highway
- IRC SP 84 Manual of Specifications & Standards for 4-Laning of Highway
- IRC SP 87 Manual of Specifications & Standards for 6-Laning of Highway
- IRC SP 23 Vertical Curves for Highways
- IRC SP 41 Guidelines for Design of At Grade Intersections in Rural and Urban Areas
- IRC SP 55 Guidelines for Traffic Management for Work zones
- IRC SP 85 Guidelines VMS
- IRC SP 88 Manual for Road Safety Audit

List of Safety Drawings to be Audited

- Plan & Profile of Project Highway with HAR & VAR Report for main highway and Service Road
- Typical Layout and Details of Median Opening Locations
- Typical Cross Sections with their applicability chainage wise
- Detailed Layout Drawings of Intersections/Interchanges
- GADs of all Major & Minor Bridges; Flyovers/VUP/PUP/ROB
- Typical Layout Plan and details of Toll Plaza showing Traffic Aid Post, Medical Aid Post, Weigh Batcher, Public Toilet facilities, etc; Truck Lay bye; Bus Bays & Bus Shelter, Rest Areas
- Road Furniture Plan showing details of traffic signage and pavement Markings
- Details of Highway Drainage, Slope Protection Works,
- Details of Protection Works- Fencing/Metal Crash Barrier/Rigid Barrier, etc
- Details of Highway Lighting and their location specific positions
- Advanced Traffic Management (ATMS)

Stages of Road Safety Audit

New Construction

• During Feasibility Study	Stage 1 Audit
• During Preliminary Design	Stage 2 Audit
• Completion of Detailed Design	Stage 3 Audit
• During Construction Stage	Stage 4 Audit
• Completion of Construction (Pre-opening)	Stage 5 Audit

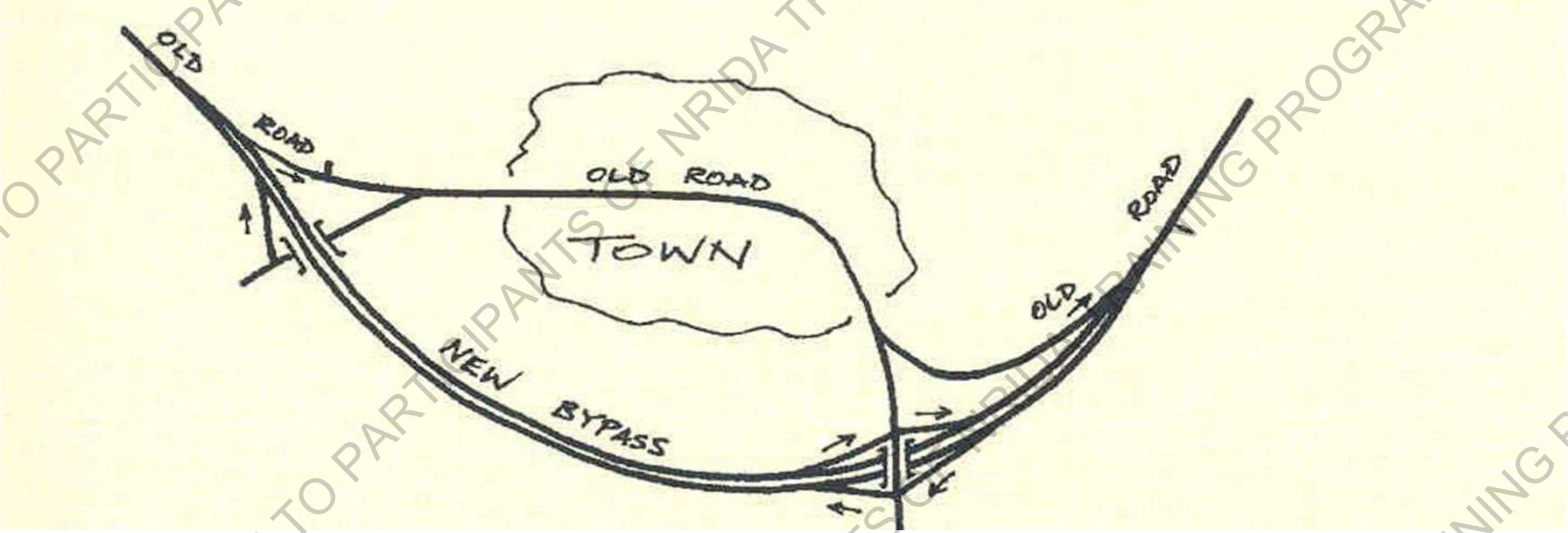
Existing Roads

• On Existing Roads (Monitoring)	Monitoring

Road Safety Audit Stages

- **Stage 1 Audit (During Feasibility Study)**
- A safety audit can influence
  - the scope of a project
  - route choice
  - selection of design standards
  - impact on existing road network
  - route continuity
  - provisions of interchanges or intersections
  - access control
  - number of lanes
  - route terminals, stage development, etc

Stage 1 Audit (During Feasibility Study)



- Understand the Concept
- Understand the Operations
- Understand Possible Conflicts
- Understand Exposures to Risk
- Possible Hazardous Spots
- Design Requirements
- Appreciate the Feasibility

Stage 1 Audit (During Feasibility Study)- CHECKLIST

1. What is the category of road for which the feasibility study has been carried out e.g., expressway, national highway, state highway or other roads?
2. Is the road intended to carry high-speed traffic or serve local access needs only?
3. What kind of traffic is likely ranging from high speed mixed traffic or for more general use, including bicycles and significant pedestrian traffic?
4. Do the chosen type of road and the standards, alignment and cross-section offer optimum road safety to all groups of road user including disabled in combination with the expected traffic density and speeds?
5. Does the project follow existing roads or is it a 'green field project' and what are the effects of this?
6. Check whether appropriate design standards have been used having regard to the scope of the project, and its function in relation to the traffic mix.
7. Check the appropriateness of the designs for the design volume and traffic characteristics.
8. Has access control been proposed?
9. Will the proposed scheme be compatible with the standard of conjoining road sections?
10. Will there be sufficient opportunities for overtaking?

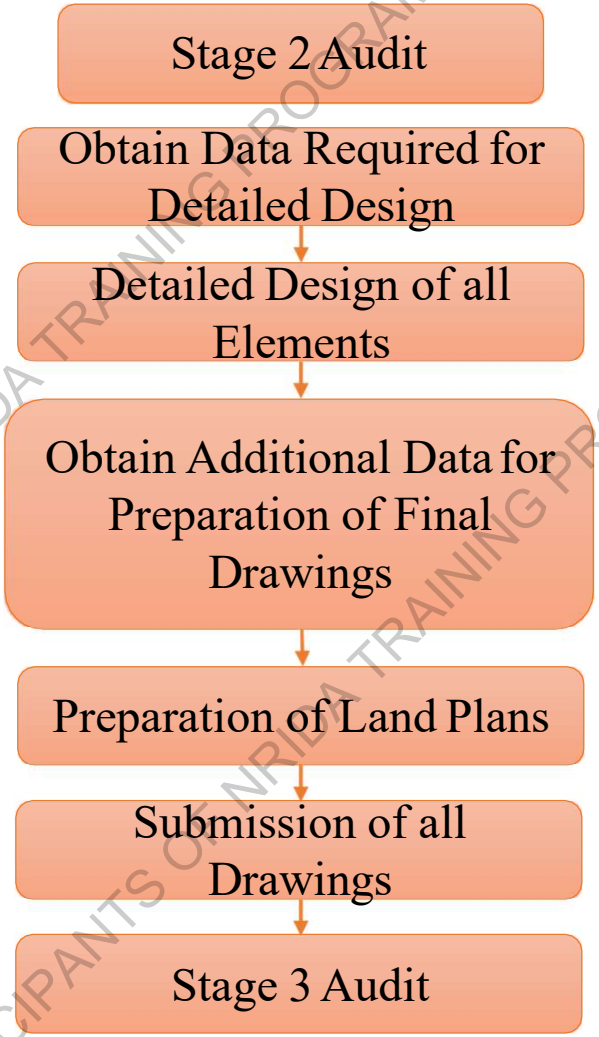
Stage 1 Audit (During Feasibility Study)- CHECKLIST

- Are the number and distribution of intersections appropriate in relation to:
  - The desired function of the new road?
  - Impact on the surrounding, adjacent and/or off-loaded road network (does the project simply move present problems?)?
  - Accessibility for public transport and emergency vehicles?
- Are junction types shown the safest available at each location, in relation to the expected turning volumes?
- Are the proposed horizontal and vertical alignments consistent with visibility requirements both along the road and junctions?
- Has lighting been planned? If so, does the lighting offer maximum safety, both on links and at junctions?
- Will the project have any effect on existing pedestrian and cycle routes?
- Does the project include measures for vulnerable road-users and if so, do these measures offer maximum safety?
- Do the available accident data for the existing/adjacent road network give reason to expect particular road safety problems in the proposed project?
- Whether non-motorised traffic is expected to cause problems?
- What is the likelihood of future widening?
- Do the gradients, curves and general design approach fit in with the class of terrain and likely weather or environmental aspects?
- Check any special events creating unusual or hazardous conditions and any other matter, which may have a bearing on safety.
- Other checks pertinent to the project at discretion of auditor or client.

Road Safety Audit Stages

- **Stage 2: Draft design**

- **Subjects of assessment includes**
  - Project changes since Stage 1 Audit
  - Alignment
  - Cross-section
  - Arrangement of Junctions
  - Any Interim Measures



Stage 2 Audit (Completion of Preliminary Design)- CHECKLIST

1) Have all recommendations from the previous stage been followed? If not, why not?

2)Is the desired speed compatible with the cross-section and other design elements and is the desired speed realistic?

3)Cross-section:

a)Has delineation of the carriageway with a kerb been proposed?

b)Is there adequate space for all groups of road users ?

c)Is there appropriate separation between various groups of road users?

4)Horizontal and Vertical alignment and visibility:

Road Safety Audit Stages

- **Stage 3: Completion of Detailed Design**
  - **Subjects of assessment includes**
  - Project changes since Stage 2 Audit
  - Detail Design of junctions
  - Design of geometries
  - Cross-fall
  - Markings and Signs
  - Side drains
  - Embankment slopes
  - Presence of clear zone
  - Traffic Signals
  - Lighting
  - Interim Measures

Road Safety Audit Stages

- **Stage 3: Completion of Detailed Design**

Camber/Cross fall

Type of Surface	Camber
Bituminous	2.5%
Cement Concrete	2.0%

Super Elevation

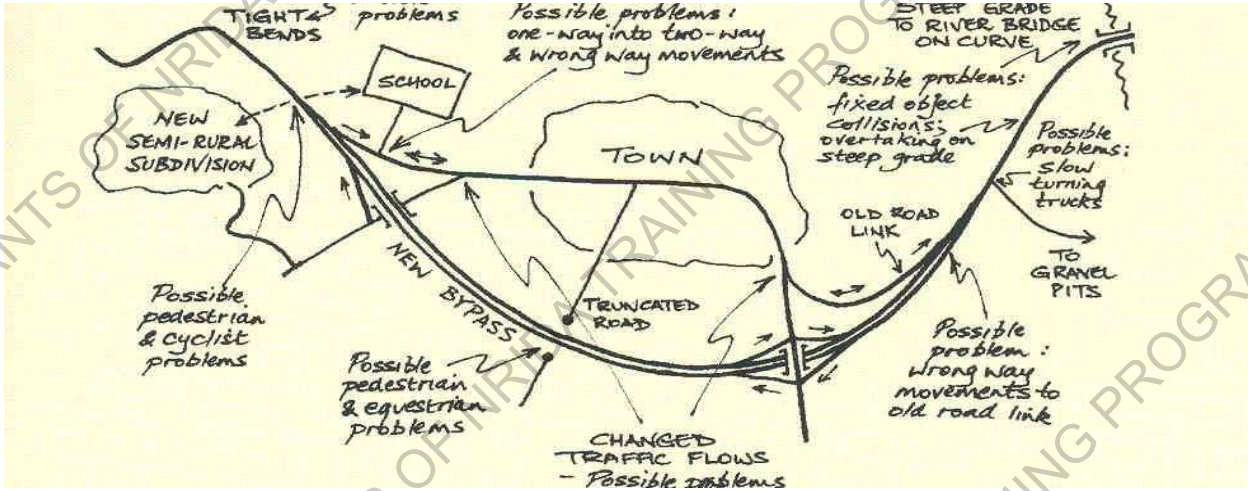
Super Elevation	Radius
7%	< Desirable Minimum
5%	> Desirable Minimum

Gradient

Terrain Type	Ruling Gradient	Limiting Gradient
Plain & Rolling	3.3%	5.0%
Mountainous	5.0%	6.0%
Steep	6.0%	7.0%

Road Safety Audit Stages

Stage 3: Completion of Detailed Design



- Understand the Design Standards
- Check the Plans for Each Section
- Members Independently Record the Short Comings
- Take Photographs of the Sites
- Discussions held amongst the Team Members
- Decisions on Criticalities of the Short Comings
- One Member Produces the Report
- The Second Member Checks the Draft Report and Edits if need be
- The Report is Finalised and Sent to the Design Team

Design Stage

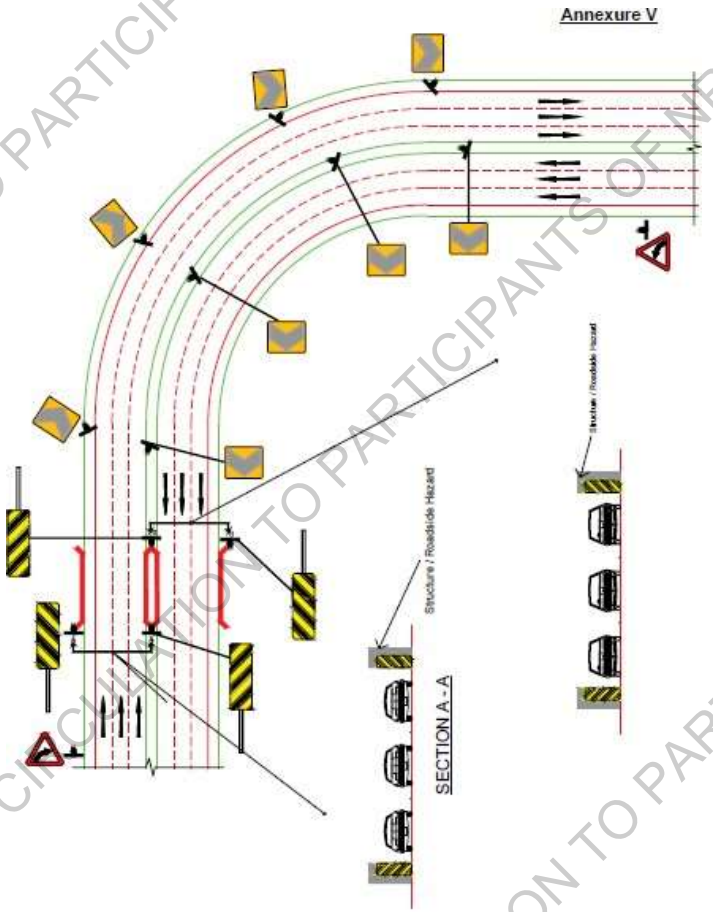
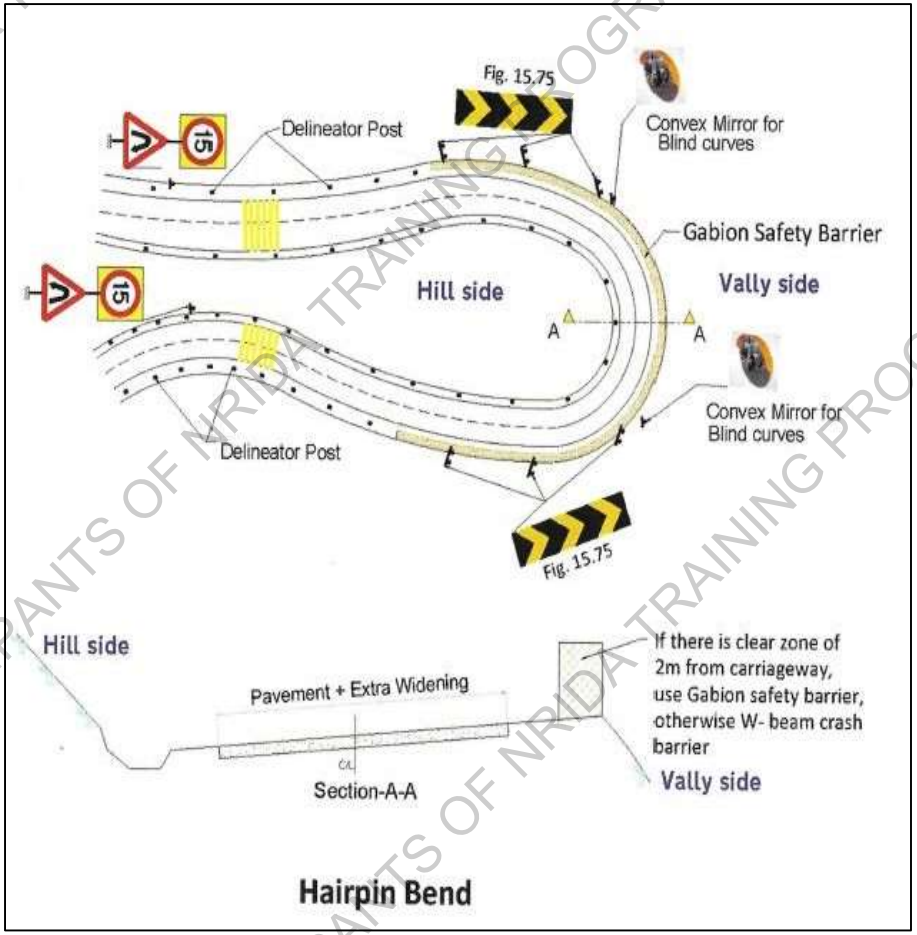


Fig V.7 Sign Plan for Curve Delineation in a Divided Highway



Auditing at Design Stage could avoid the Curves with Grade and Junction

Inherent Design Defects can't be corrected by posting signs

Stage 3: Completion of Detailed Design-CHECKLIST

- Have all recommendations from the previous stage been followed? If not, reasons thereof?
- Visibility, sight distance
  - Are horizontal and vertical alignments consistent with the required visibility requirements?
  - Confirm whether the standard adopted for provision of visibility in the design is appropriate for the ruling design speed and for any unusual traffic mix.
  - Check whether sight lines are obstructed by: Safety fences
- Boundary fences
- Street furniture Parking facilities Signs Landscaping
- Bridge abutments

Road Safety Audit Stages

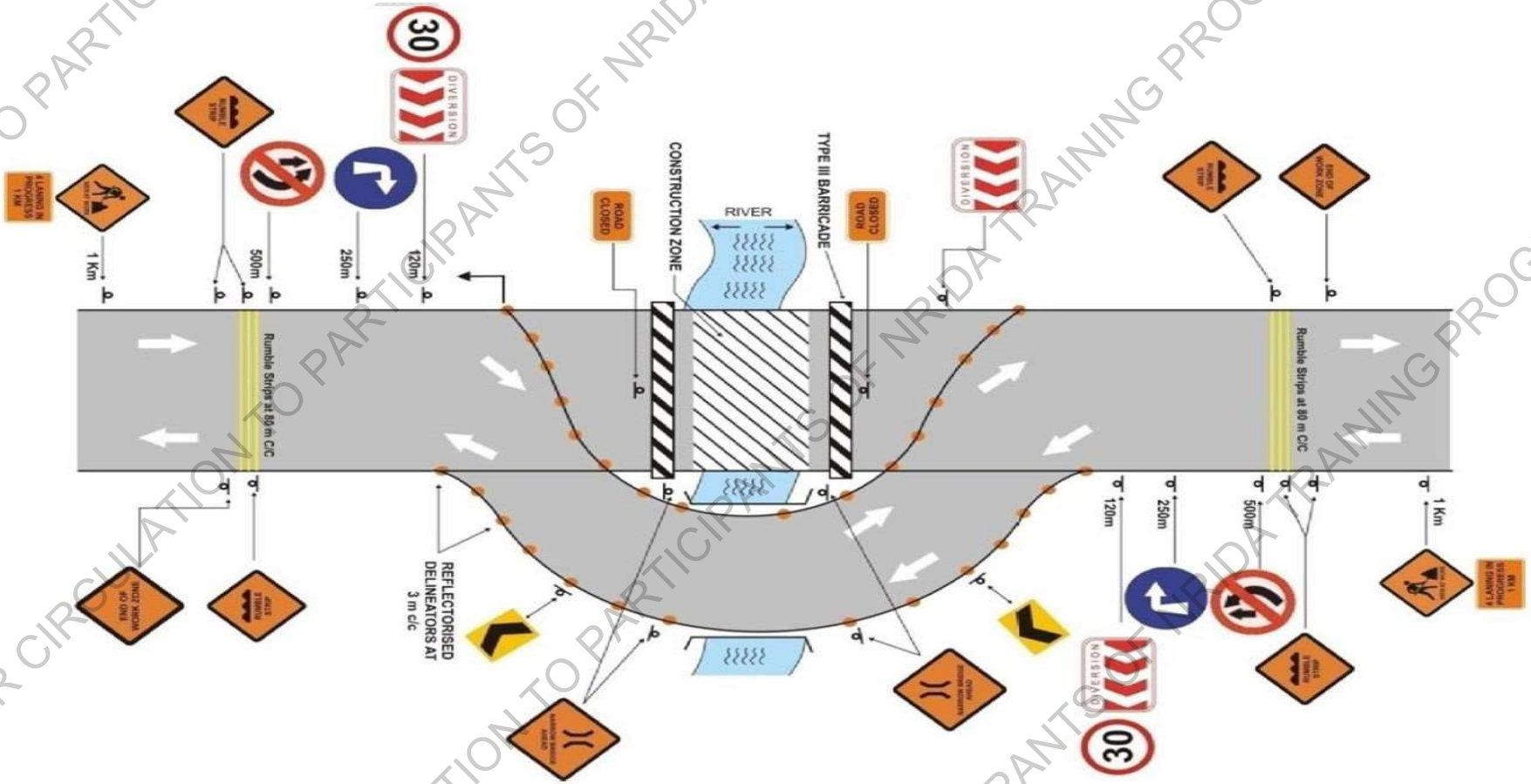
Stage 4 Audit (During Construction Stage)

Subjects of assessment includes

- Examination of Terminal Transition Zone, Work Zone, Approach Transition Zone and Advance Warning Zone with respect to safety point of view.
- Examination of safety measures adopted for workmen and road users.
- Examination of traffic control devices adopted at construction zone.

Road Safety Audit Stages- (Stage-4)

Road closed with diversion



Road Safety Audit Stages- (Stage-4)

Stage 4: During Construction Stage-CHECKLIST

- Have all recommendations from the previous stage been followed? If not, why not?
- Whether information regarding the construction zone approaching has been provided well in advance or not?
- Whether standard procedure and contract conditions provided for proper management of the construction site and road users are properly and safely accommodated?
- Whether the transitions from the existing road to the site of works safe and clearly laid out?
- Whether the width of the lanes is satisfactory for the traffic passing through the works area?
- Whether sight and stopping distances adequate at site of works and at intersections?
- Whether bus stops appropriately located with adequate clearance from the traffic lane for safety and visibility.
- Whether appropriate street lighting or other delineation provided at the road works to ensure that the site is safe at night? Check the night time visibility of traffic control devices.

Stage 4: During Construction Stage-CHECKLIST

- Check for proper education and training programme for site operators and managers, which would assist in creating and maintaining safer environment for construction workers and road users.
- For clear and sufficient information to the road user, advance warning signs installed or not?
- Is there any provision of marked lanes for safe and clearly guiding road users?
- Whether suitable measures provided through construction zones to control driver behaviour?
- Check for the adequacy of traffic control devices (such as signs, markings, cones, drums, delineators, barricades, flashing lights etc.) required for each zone i.e., at advance warning zone, at approach transition zone and at work zone? Check for placement and visibility of these control devices.
- Has permission been taken while changing the standard layouts from safety point of view.
- Whether police and other emergency services been consulted?
- Check for proper care and attention for pedestrian and non-motorised traffic at construction sites.
- Check for adequate safety provisions for the elderly and persons with disabilities.

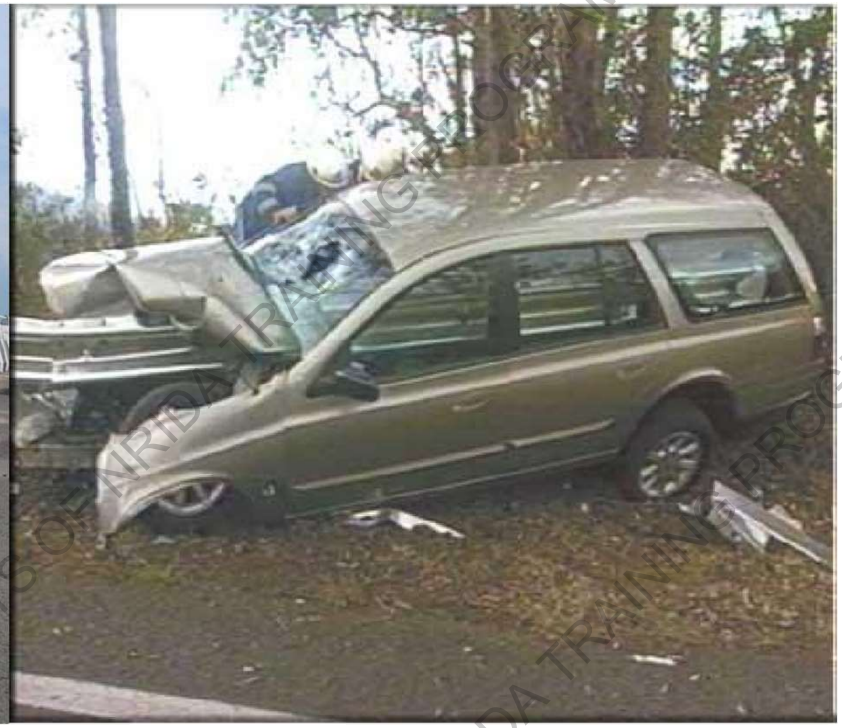
Road Safety Audit Stages

- **Stage 5 Audit (Completion of Construction) (Pre-opening)**
- Final review of the finished construction, to check from the standpoint of road safety that it is ready to be opened for traffic.
- It is particularly important to check the location and visibility of markings and other traffic control devices especially where changes were made during the construction period. The finished scheme should be assessed from the road users' point of view in daylight and in darkness.
- After opening for one or two months, the auditor should examine whether or not road users are using the project facility in an appropriate manner.

Road Safety Audit Stages-(Pre-Opening)

- **Stage 5 Audit-Pre-opening**

Improper Overlap of W-Beam and Ineffective Delineators



Parapet in the carriageway are Potential Death Traps

Stage 5: Pre-Opening Stage-CHECKLIST

- Have all recommendations from the previous stages been followed? If not, why not?
- Involve the site engineer
- Test the installations of traffic control devices as a road user: by car, by truck, by bus, by cycle and on foot - from disabled road user angle. Also in the dark/ night hours.
- Examine the carriageway for defects, especially at junctions to existing roads.
- Has the opening of the road facility been adequately publicized?
- How will the transition phase proceed?
- Check that provision for emergency vehicle access and stopping is safe?
- Check that all delineators and pavement markings are correctly in place.
- Check that at! signs and other traffic control devices are correctly in place. Check that they are likely to remain visible at all times.
- Check that the road markings as installed have sufficient contrast with the surfacing and are clear of debris.
- Check that all lighting operating is effective from safety point of view.
- Check that no roadside hazard has been installed or overlooked.

Safety Audit Report

Safety Audit Reporting

Audit findings are presented in a standard format chainage wise in each km

- ★ Name of Project
- ★ Audit Stage
- ★ Audit Duration
- ★ Audit Team
- ★ Project Background or Project Introduction
- ★ Salient Features of Project
- ★ Audit Findings : Describe with the site photographs
- ★ Safety Concerns due to
- ★ Risk : Very High/ High / Medium
- ★ Recommendations
- ★ Priority : Essential / Highly Desirable / Desirable
- ★ Report Signed by Team Leader
- ★ Client Response: MoRTH/ NHAI /NHIDCL /PWD / Concessionaire/ Contractor/ IE/P MC

Safety Audit Reporting

Risk : Very High/ High / Medium	Priority Level for Recommendations
Very High : Multiple deaths are likely due to High speed or multi-vehicle crashes	**Essential :** Recommendations shall be implemented “at any cost”.
High: A death and/or serious injuries are likely due to High/medium speed vehicle/vehicle collisions. High/medium speed collisions with a fixed roadside object. Pedestrian crashes on rural highways	**Highly Desirable:** Recommendations shall be implemented unless cost of remedial treatment is prohibitive and risk can be reduced by an alternative measure
Medium: Minor injuries only are likely due to Low speed collisions	**Desirable:** Recommendation shall be implemented to reduced risk further.

Safety Audit Reporting

Mitigation Measures	Examples
Short Term	**Non Urban Roads:** Road Signs, Speed limits/ Speed Breakers, pavement Markings, Delineators, Pedestrian Railings, Crash Barriers, Studs/ Cats eye, etc
	Urban Roads: Restriction of certain types of vehicles by time/by lanes, One way street, Reversible lanes, Bus Lane, etc.
Medium Term	Extra widening on curves, Improvement of Horizontal and Vertical geometry, Street lightings, Crash Barrier, Junction Improvements, Footpath Provisions, Sight distance Improvements, Signalization, Removing of obstructions, etc.
Long Term	Provision of Bypass, Provision of service roads, Provision of grade separated interchanges, provision of vehicular & pedestrian underpasses, provision of FoB, etc.

Audit Report

No	Safety Concerns & Audit Findings		Recommendations		Client Response
	Description (with images if any)	Risk	Description (with figures if any)	Priority	
2	**Typical cross sections**				
2.1	The drawings show a 1.5m wide unpaved shoulder along both sides of the highway. Unpaved shoulders discourage vulnerable road users from walking/riding on them as shown in picture (especially during the monsoon period). They become damaged when heavy vehicles drive on them. This can lead to deep drop-offs from the pavement which in turn becomes a hazard for small vehicles. There are many pedestrians, bicyclists and motorcyclists using this highway. They need the protection of a paved shoulder. 	High	Review the proposed cross section to provide a paved 1.5m wide shoulder along both sides of the highway for the entire project highway	Desirable	.
			If paved shoulder cannot be provided for entire project highway, provide at least for the section where pedestrians and bicyclists are predominately present like villages and settlements	Highly Desirable	
			For sections of road with predominant pedestrian and bicyclist, provide gateway measures to reduce speed with road humps, speed limi signs, and road markings as given in IRC 99 	Essential	

Audit Report

No	Safety Concerns & Audit Findings		Recommendations		Client Response
	Description (with images if any)	Risk	Description (with figures if any)	Priority	
8	**Roadside Hazards**				
8.1	There are steep undrivable roadsides in the hill section between km 130 – 134 (approx.). These are within the clear zone for this highway and they are roadside hazards. The drawings are silent about any safety improvements along this area. The slopes cannot be "softened" due to the topography . 	Very High	Provide delineation of the section between km 130 – 134 using Chevron signs, delineator posts as well as centre lines, edge lines and advanced warning signs	Essential	
			Provide paved shoulders through this section, ensuring the outer shoulder matches the super elevation of the curve.	Highly Desirable	
			Install suitable safety barrier in those locations where the side slope begins within the 5m clear zone (measured from the edge line).	Essential	

Audit Report

No	Safety Concerns & Audit Findings		Recommendations		Client Response
	Description (with images if any)	Risk	Description (with figures if any)	Priority	
3	**Signs, signals, pavement marking and delineation**				
3.1	Many of the road signs were not standard. Many were made of old material such as corrugated iron. 	Very High	Provide standard diversion boards as given in IRC SP 55	Highly Desirable	
			Traffic control devices should be placed in such way that an approaching driver could see clearly and can take appropriate action.	Highly Desirable	

Thanks!