

Unit 2

Safety in Road Design:

→ Safety in road design:

→ Road accidents result in injuries, death & property damage.

→ The main factors influencing road accidents are vehicle design, speed of operation, road design & road environment.

main factors responsible for road accidents

- heavy traffic
- rash driving.

→ Operating the road network for safety

Shaping the road network for road injuries prevention is one of the major steps to be provided.

Improvements in the conditions of the road has a great influence on reducing the number of accidents.

i) Safe speed:- (Classifying road based on their utility & setting up speed limit is important for road safety)

National highway (NH), state highway (SH), etc.,

ii) Speed on curves The speed at which a vehicle can take a curve depends on radius of curvature of curve.

sharp curve low speed
large curve high speed.

hence then designing should be done properly.

iii) Sight Distance

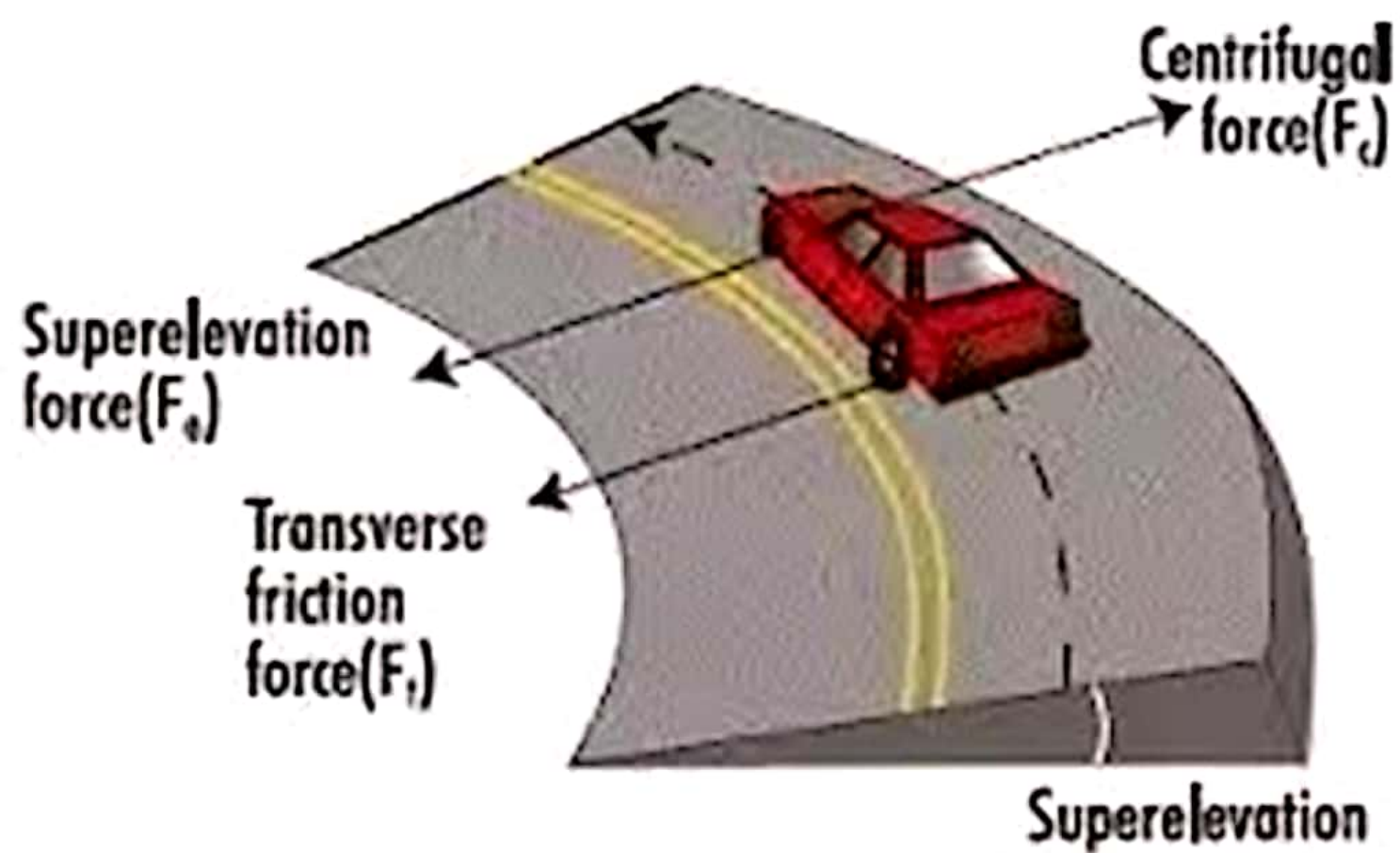
Safe stopping
sight distance
(SSD)

is the minimum
distance visible to
driver ahead of him.
~~so that he can~~

overtaking
sight distance
(OSD).

is the distance that
should be visible
to the driver, so
that he can overtake
slower moving vehicles
safely.

iv) Superelevation: While a vehicle is
taking a horizontal curve, to counteract
the effect of centrifugal force acting
on vehicle. (outer edge raised up
than inner edge) (add img.)



v) Carriage way width: This should be 7 m for two lane road & 3.5 m for single lane road (an extra road beside existing road)

vi) Road Sign & road markings: Road signs should be placed properly so that they can inform the driver about hazardous situations ahead. Similarly marking also

do help.

vii) Junction Design: while designing the junction radius, width, entry & exit all should be considered.

viii) Pavement surface characteristics

The surface of pavement should not be slippery even when it's wet

ix) Widening of narrow bridges.

x) Street light.

→ Precaution measures for road safety

i) Tightening of safety standards for vehicles

like seat belts, power steering, anti-lock braking system etc... should be strictly used.

ii) Construction of Bypass, Flyover &

Ring roads

Traffic diversions are possible

iii) Maintenance of road: should be carried out frequently.

iv) Provision of parking facilities

IF parking facilities are not provided, then people will park on/near footpath, /on road which cause congestion.

v) Provision of proper drainage facilities

IF adequate drainage facilities are not provided then there will be pavement failure due to water stagnation.
(damage)

vi) Street lighting & Road Signs

↳ proper street lights are mandatory else driving at night will be a hard time.

proper road sign will give
info/about the path they are
traveling.
hazard

→ Counter Measures of road safety:

→ Recognizing the road environment-

an interactive

[Add from pdf]

→ Road safety audit:

[Mid 1 pdf]

→ Checklist

→ Vehicle Design Factor affecting road
safety

→ Driver characteristics Influencing
road safety

→ Add from pdf.

Countermeasures that offer significant and measurable impacts to improving road safety

ROADWAY DEPARTURE



1. Enhanced Delineation and Friction for Horizontal Curves



2. Longitudinal Rumble Strips and Stripes



3. SafetyEdge_{sm}



4. Roadside Design Improvements at Curves



5. Median Barriers

INTERSECTIONS



6. Backplates with Retroreflective Borders



7. Corridor Access Management



8. Left- and Right-Turn Lanes at Two-Way Stop-Controlled Intersections



9. Reduced Left-Turn Conflict Intersections



10. Roundabouts



11. Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections



12. Yellow Change Intervals

PEDESTRIANS/BICYCLES



13. Leading Pedestrian Intervals



14. Medians and Pedestrian Crossing Islands In Urban and Suburban Areas



15. Pedestrian Hybrid Beacons



16. Road Diets/Reconfigurations



17. Walkways

CROSSCUTTING



18. Local Road Safety Plans



19. Road Safety Audits



20. USLIMITS2

1) Road Safety Audit : (RSA)

→ RSA is the formal safety performance examination of an existing or future road or intersection by an independent multidisciplinary team.

→ It qualitatively estimates & reports on potential road safety hazards & identifies opportunities for improvements in safety for all road users.

→ The auditor or audit team report to the client project manager who will instruct the design team to respond with alternative design (if there are any issues in the old design).

→ Road safety audit: the evaluation of road schemes during design & construction.

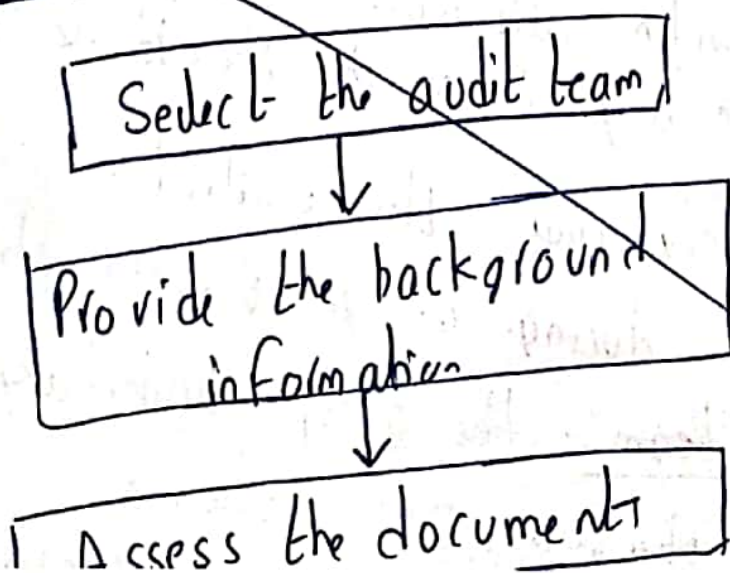
→ Design team: the group undertaking the various phases of scheme preparation & supervision of construction.

→ Audit Team: A team of a min of two persons. they comprise staff with appropriate levels of training & experience in road safety engineering, accident investigation & road safety audit, as set out by the overseeing organisation.

→ Audit team leader (ATL): the nominated person & approved as a leader

→ Design Team leader (DTL): the design leader who guide & take care of all Design part.

Steps involved in RSA Process:



responsibility of client- or designer

Designer

Audit team

Steps involved in RSA Process

The steps

Responsibility of
Client or Designer

Select the audit team



Provide the background information



Hold a commencement meeting



Assess the documents



Write the audit report



Hold a completion meeting



Write the response



Implement the decision arrived at

Designer

Client/Designer
& audit team

audit team

Inspect the site
Audit team

Audit team

Client &
Designer

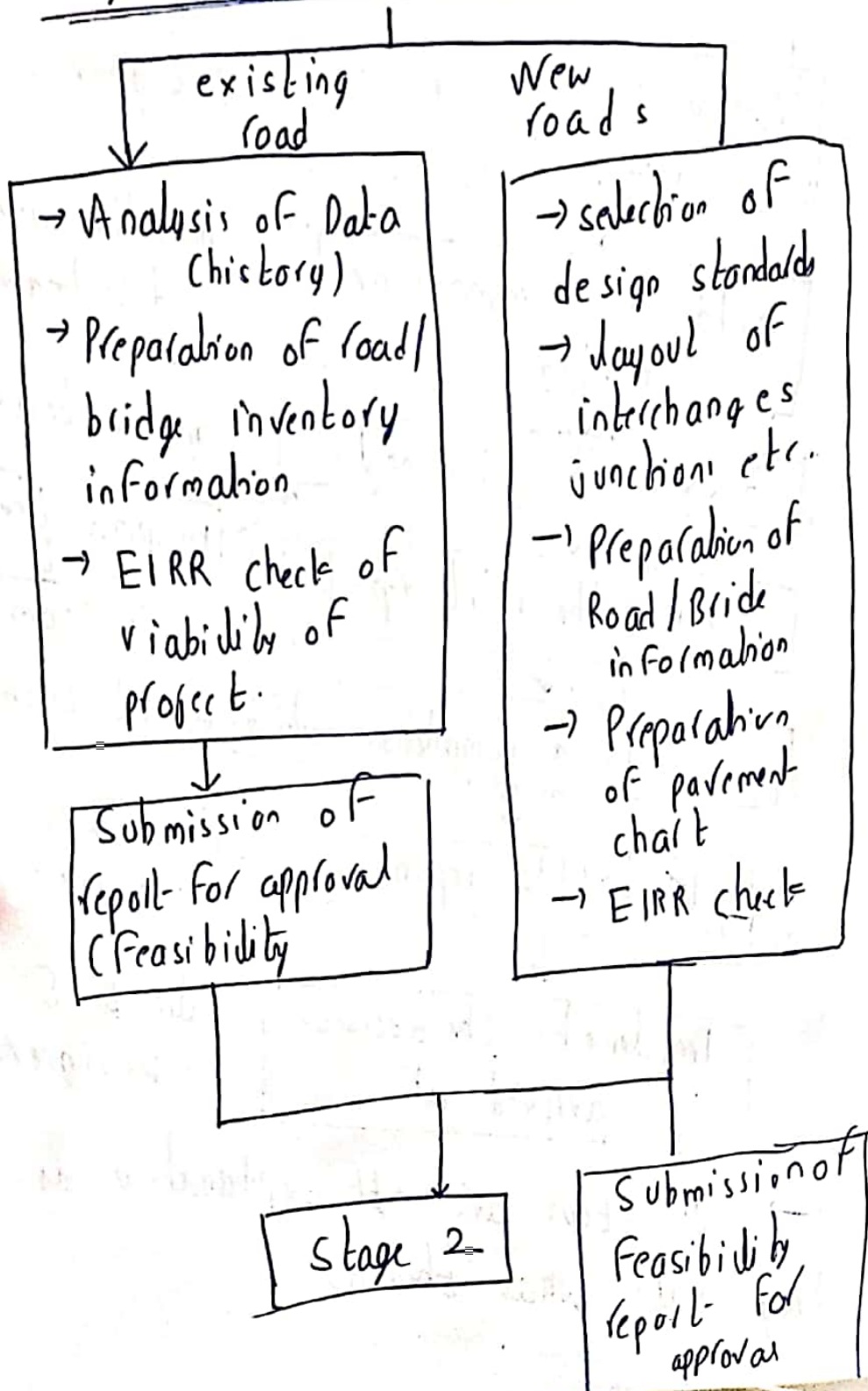
Client &
Designer

→ All steps are self explanatory as they state what they do.

Stages of Road Safety Audit:

(stages of audit) 6 stages.

Stage 1 (During Feasibility study):



audit:
study):

Stage 2 (Completion of preliminary design)

↓
Obtain Data required for Detailed Design

↓
Detailed Design of all elements

↓
Obtain all additional data for preparation of Final Drawing

↓
Preparation of land Plans for acquisition

↓
Submission of all Drawing & Details related to road / bridge

Stage 3

Stage 3 (Completion of detailed design)

↓
Check & propose amendments in road design

↓
Final decision from client

↓
~~Appr~~ Estimate of project.

↓
Submission of Final Detailed design

↓
Invitation of Tender

Stage 4

Stage 4 (During construction stage)



Adding work zone,
Transition zone etc..



Safety of workmen
& safety of road
users



Application of
traffic control devices



any other parameter



stages

Stage 5 (completion of construction / pre opening)



Check for visibility
& effectiveness of
all traffic control
devices



Final review



Proper completion
& pre opening.

~~→ At each & every step RSA
is done to take required measures
at any issue or any decision~~

→ It is a code of good practice
Checklists — Road safety Audit.

(8)

I Road Alignment and Cross section

1. Visibility, sight distance
2. Design speed
3. Speed limit, speed zone
4. Overtaking
5. Readability by drivers
6. Road width
7. Shoulders
8. Superelevation
9. Drains

II Auxillary Lanes

1. Shoulders
2. Traffic signs & road markings
3. Turning traffic

III Intersections

1. Location
2. visibility, sight distance
3. Traffic control devices
4. Layout

IV Signs & Lighting

1. Proper road lighting
2. Traffic signs
3. Sign legibility & sign supports

V Pavement Markings

1. Centre line marking
2. Lane line marking
3. Reflector marking etc

VI Traffic signals

1. Operations
2. Visibility

VII Pedestrians & Cyclists

1. General issues
2. Pedestrians
3. Cyclists
4. Public Transport

VIII Bridges & Culverts

1. Design features
2. Crash barriers

IX Pavement

1. Pavement defects
2. Skid resistance
3. loose stones or materials

X Parking

1. General Issues

XI Provision for heavy vehicles

1. Design issues
2. Pavements / shoulder quality

XII Miscellaneous

1. Landscaping
2. Temporary works
3. Road side activities
4. Rest Areas
5. Animals etc

Vehicle Design Factors Affecting Road Safety

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The following factors are considered

- 1) Braking System → Brakes are needed to bring the vehicles to a stop. One of the prime causes for accidents during braking is the wheels getting locked & the driver losing control of the vehicle.
- 2) Vehicle Lighting System → This consists of headlights, side lamps, parking lights, rear lights, direction indicator lights etc.
The headlight performs two functions - to provide a main beam for enabling the driver to see the road ahead & to provide a dipper beam which must avoid glare to the opposing traffic.
Rear lights give indication to the driver following a vehicle about the presence of a vehicle in front of him.
Direction indicators give adequate notice of the intention of the driver to turn or to stop.
- 3) Vehicle body - Its features
In this the factors that are to be



You

Just now



considered are

- The shape & dimensions of the drivers seat
- The arrangement of dials on the dash board
- Positioning of controls in relation to drivers seat
- visibility of driver from the seat
- Noise levels in the vehicle
- concentration of Carbon Monoxide inside the vehicle

The seat of the driver should be comfortable & adjusted to give him clear view & to secure easy access to all the controls. The controls must be easily operated & the dials must be properly visible. The noise levels & CO levels in the vehicles can cause discomfort to the drivers & should be within safe limits.

Normally the vision of the driver is obstructed by bonnet & windscreens. Hence the design should be such that there is clear vision for driver.

The doors of the vehicles should have secure locks so that the occupants are not thrown out in accidents.

Scanned by CamScanner

4) Tyres → The performance of tyres relative to puncture, vulnerability to damage by Sp & Sharp objects, are to be given due consideration while designing a vehicle

5) Vehicle Inspection & Maintenance

Periodic Inspection of vehicles identify the mal-functioning of the important parts & facilitate easy maintenance.

Items which need periodic inspection are brakes, lighting system & steering mechanism. Another features that require inspection & maintenance are tyres, suspension system etc.

Driver Characteristics Influencing Road Safety

The driver is the key factor in most of the accidents. His characteristics influencing road safety are

1) Driver judgement, skill & emotional make-up

When a driver sees a danger, he should immediately react to it. The time he takes to react depends upon his individual mental make-up & is called perception time. Skill of the driver means his capacity to

control and manipulate his vehicle under present road conditions.

2) Age of Drivers → Usually young drivers cause more accidents. Similarly old drivers cause more accidents. Hence minimum accidents are caused by middle aged group drivers

3) Marital status → Married persons were observed to be better drivers

4) Gender of drivers :- This plays a very important role in safety. Usually males have more accidents than females, but when miles driven are taken into account, this difference disappears

5) Training of drivers → Drivers should be given good training so that their performance of driving can be increased. The driving test should be conducted with a view to prevent uneligible people from acquiring license

6) Alcohol & drugs influence on driver

If the driver is under the influence of alcohol or drugs then his driving capability will be affected & this leads to accidents.

Hence periodic tests should be conducted on driver & strict action should be

taken against that driver if he is using alcohol or drugs

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7) Fatigue → When a driver is tired, due to long hours of driving, he suffers from lack of concentration which leads to accidents

8) Use of Crash helmets

Motorcyclists & pillion drivers, if they do not use crash helmets while driving then head injuries can be caused due to accidents

In India IRC has made a suggestion to the Government to make helmets compulsory for motorcycle & scooter riders

9) Use of Safety belts → One of the common causes of serious accidents is that the drivers ~~on~~ travelling at high speeds, suddenly apply brakes & they hence go & hit the steering wheel or they will be thrown out of the vehicle. Both these accidents if occur cause serious injuries to driver. Hence this injury can be minimized if safety belts are used.