ROADSIDE HAZARD MANAGEMENT

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What is a Roadside Hazard?

➢ A roadside hazard is any roadside object or feature located on or near the roadway
   ➢ May adversely affect the safety
   ➢ Diameter > 10 cm
   ➢ Likely to create a danger to occupants / riders of any vehicle leaving the carriageway
Roadside Crashes

➢ Causes: driver fatigue, speed, alcohol, distraction, inexperience, ice, snow, heavy rain, or other weather conditions, vehicle failure, poor geometric design, sudden change in traffic conditions

➢ Types of Crashes
  ➢ Run-off
  ➢ Single vehicle
  ➢ Head-on collision
Types of Hazards

➢ Point Hazards
   • Trees (Dia>10 cm),
   • Bridge End Posts
   • Non-breakaway Signposts (Dia>10 cm)
   • Interchange Supporting Piers
   • Driveway Headwalls
   • Culvert Headwalls
   • Utility Poles (Dia>10 cm)
   • Solid Walls
   • Pedestrian Overpass Piers and/or Stairs
### Types of Hazards

**➢ Continuous Hazard**
- Rows and Forests of Large Trees
- Uncovered Longitudinal Drains
- Retaining Walls
- Steep Embankments
- Rock Cuttings
- Cliffs
- Waterbodies (depth＞0.6 m)
- Unshielded Hazards (Such as Cliffs) Beyond Clear Zone and Within Reach of an Errant Vehicle
- Curbs with a Vertical Face＞10 cm High on Roads with Operating Speeds ＞80 Kmhp
- Fences with Horizontal rails that Can Spear Vehicles.
Clear Zone (CZ)

➢ Area beside a road (measured at right angles from the edge line or the edge of the nearest traffic lane) that needs to be kept free of fixed roadside hazards.

➢ Factors influencing CZ:

1. Operating speed (not the design speed)
   ➢ 60 kmph → CZ = 3m; Speed 100 kmph → CZ = 9m
2. Traffic volume
3. Curve radius of the road
4. Steepness of the side slope
   ➢ Case 1: Recoverable → 1V:4H or Flatter
   ➢ Case 2: Non-Recoverable → Between 1V:4H and 1V:3H
   ➢ Case 3: Critical → Steeper than 1V:3H
     ➢ Needs to be flattened or provide hazard shields (e.g., barriers)
Roadside Safety Management Strategy

➢ Roadside safety management assists in:
  ➢ Reducing the likelihood of a crash
  ➢ Reducing the severity of a crash

➢ Five Steps:
  1. Keep vehicles on the road
  2. Remove the hazard
  3. Relocate the hazard
  4. Modify the hazard
  5. Shield the hazard

When steps 1, 2 and 3 are not feasible, reduce severity.
1. Keep Vehicles on the Road

What keeps vehicles on the road?

Road signs (IRC 67)  
Road markings (IRC 35)
1. Keep Vehicles on the Road

➢ Object Hazard (IRC 35, 2015)

NH 34: Several culvert/bridge Headwalls

Reflective marker

Safe road design:
- Horizontal vertical curves
- Sight distance
- Lane width
- Shoulder width
- Sight distances
2. Remove the Hazard

➢ Remove all existing roadside objects that are fixed and with Dia > 10 cm
  ➢ Trees (environmental damage)
  ➢ Rocks
  ➢ Cover pits

➢ Develop policies that will avoid the placement of new potentially hazardous objects on the roadside.

➢ When designing a new road, avoid locating any new hazardous objects within the clear zone.
3. Relocate the Hazard

➢ Relocating further from edge of road
➢ Relocating from outside of a curve to a location on a straight section of the road
➢ Relocation of even a few meters will reduce risk, even if it is not possible to place it outside the clear zone

➢ Common examples:
  ➢ Signposts
  ➢ Delineators
  ➢ Trees - not practical to relocate
4. Modify the Hazard

➢ Alter (or redesign) roadside hazard to reduce its potential for severe injury or death during a crash

➢ Common Examples:
  ➢ Modifying open longitudinal drains by piping them or covering them with a **drivable cover**
  ➢ Modifying end walls of driveway culverts to make them drivable
  ➢ Redesigning rigid signposts/columns to provide **frangible (breakaway) posts (Impact-absorbent)**
  ➢ Flattening a steep fill slope
5. Shield the Hazard

- Three types of barriers (IRC 119)
  1. Flexible (Cable)
     - Wire Rope Safety Barrier (WRSB)
  2. Semi-rigid (Steel)
     - Open box beam
     - W beam
     - Thrie beam
  3. Rigid (Concrete)
     - F Profile
     - New Jersey
     - Vertical
     - Constant slope

Proper transition between these barriers is important.
5. Shield the Hazard

➢ Rigid Barriers

- F-profile or New Jersey are better
- F-profile is better if smaller vehicles are involved
Hazard Management Strategy

Determine the clear zone distance

1. Are there any hazards within the clear zone?  
   Yes  
   No  

2. Can hazard be removed?  
   Yes  
   Remove hazard  
   No  

3. Can hazard be relocated at least to edge of clear zone?  
   Yes  
   Relocate, preferably beyond CZ  
   No  

4. Can hazard be modified to reduce its crash frequency and/or crash severity risk to road users?  
   Yes  
   Modify or redesign hazard to remove or reduce the danger.  
   No  

5. Can hazard be shielded with safety barrier?  
   Yes  
   Install an approved safety barrier (or impact attenuator)  
   No  

Has everything been done to “keep vehicles on the road” with delineation, tactile edge lines, paved shoulders, and guideposts?  

Yes  
Move on to the next run-off-road problem location  
No  
Keep vehicles on the road by signs, improving delineation, installing tactile edge lines, paving shoulders, installing guideposts
References


➢ IRC code 67 (2012) Code of Practice for Road Signs

➢ IRC code 35 (2015) Code of Practice for Road Markings

➢ Austroads (2003) Rural road design, a guide to the geometric design of rural roads, Sydney, Australia