Road Safety Measures for Four/Six Lane National Highways

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Two lane highways being upgraded to four lane highways:

NH 31C — NH 31D — NH 34 — NH 41
Multilane Highways

Two Lane Highway

Four Lane Highway

Six Lane Highway
Design related issues for four/six lane highways
Issues in Multilane Highways

- Balance between Access and Mobility
- Access Controlled??
- Inadequate crossing facilities
- Illegal access
- Improper facilities
- Untreated major at-grade intersections
- Improper roadside design
Accessibility vs Mobility

The Yin-Yang of Highway Accessibility and Mobility (Source: Labi, 2011)
Where does mobility conflict with accessibility?

- Access points—driveways, intersections, median openings, activities located along the highway
- Primarily locations that generate high pedestrian and bicyclist traffic
- Bus bays
- Schools
- Nearby villages
Access points- Driveways; Junctions

Haphazard median opening
Goals of Access Management

- Limit number of conflict points
- Separate the conflict points
- Separate turning volumes and queues from through traffic
Safety v. Access Points & Median Type
Goals of Access Management

- Increased Capacity

### Effects of Access Management on Travel Speed in the P.M. Peak

<table>
<thead>
<tr>
<th>Streets</th>
<th>&quot;REGULAR&quot; ARTERIALS</th>
<th>HIGHLY ACCESS MANAGED ARTERIALS</th>
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<td>ALAMEDA</td>
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<td>PARKER</td>
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<td>48</td>
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<tr>
<td>ARAPAHOE</td>
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</tr>
</tbody>
</table>

Average Running Speed MPH

* Source: "Colorado Access Control Demonstration Project" 1985
Goals of Access Management

- Increased Capacity
ROAD SAFETY AUDIT: Different Stages

- Feasibility Stage
- Preliminary/Draft Design Stage
- Detailed Design Stage
- During Construction
- Pre-opening Stage
- Existing Roads

The early we take RSA the better the countermeasure. The constraints increase as we move from Feasibility Stage to Existing Roads.
ROAD SAFETY AUDIT: Detailed Design Stage

- Geometrics
- Intersection Details
- Safe Crossing Facility
- Signs and Markings
- Lightings (urban sections)
- Roadside Appurtenances
Unauthorised Openings – Safety Issues

Illegal opening
Unauthorised Openings – Safety Issues

Illegal opening
Illegal Openings and Crossings

Illegal opening and Crossings
Illegal Openings and Crossings
Illegal Openings and Crossings
Illegal Openings and Crossings

Illegal pedestrian access

Illegal vehicular access
Issues at untreated openings

A: Material Stacked at the Exit
C: Km. 22+900

B: No Sign / Marking
D: Km. 26+380

Material Stacked at the Exit
Km. 27+970

No Sign / Marking
Km. 35+080
Median Opening—Safety Issues

Median Opening on Curve (Opening at a hazardous location)
Median Opening—Safety Issues

Median Opening on Curve (Opening at a hazardous location)
Median Opening–Safety Issues

Wide median opening

Improper storage lane
Issues at Major Junctions
Issues at Major Junctions (contd.)
Barrier—Safety Issues

Discontinuous Barrier

Barrier posing as Hazard
Barrier – Safety Issues

- Improper treatment of crash barrier with parapet wall
- Barriers placed before a kerb to protect the kerb (Wrong Practice)
Barrier–Safety Issues

No barrier / reflectors creating a hazard
Barrier—Safety Issues

Wrong Placement of Crash Barrier

Improper/Missing Crash Barrier
Edge Treatment Issues

Lack of reflectors on edge

Invisible barrier poses hazard
Minor Road Issues

Improper minor junction access to Expressway
Improper Maintenance
Lack of facilities (bus stops) forces dangerous behaviour from vulnerable road users
Misuse of Pedestrian Facility – Issues

Trucks parked on shoulders exposing pedestrians to main road
Pedestrian Crossing issue at untreated intersection

**A** Pedestrian / cyclist / SMV are crossing at main carriage without proper arrangement at Km. 38+540

**D** Pedestrian / cyclist / motor cyclist / LCV are crossing the road without proper arrangement. Also, the traffic personnel are irregular at Km. 41+690

**E** Pedestrian marking at the middle of the cross road without pre warning sign / calming devices at Km. 43+560
Pedestrian Crossing issue at untreated intersection

- Opening in median, both pedestrian and SMV crossing simultaneously without any treatment at Km. 99+330
- People crossing the highway, no pedestrian treatment noticed.
- Pedestrian cross marking are completely wiped out.
- Only the pedestrian marking is not sufficient. For school zone, treatment should be as per the recommendation.
Absence of cross pedestrian facility near School
Issues
During Construction
Construction Zone–Issues

No diversion sign or barrier
Construction Zone - Issues

- Insufficient diversion signs and barriers
- NJB spaced too far apart which may lead to safety hazard (Top)
- Insufficient barriers preventing entry to construction zone (Bottom)
Construction Zone - Issues

Haphazard Barriers

Diversion without adequate barricade
Construction Zone – Issues

No Barrier around deep excavation
No delineation

NJB spaced too far apart which may lead to safety hazard
Construction Zone – Issues

Exposed Reinforcement near construction site

Unprotected construction site/ deep excavation
Construction Zone–Issues

Working beyond work zones without delineator cones

Conglomeration of signs creating confusion
Construction Zone - Issues

- Insufficient Barriers - Gaps accessible to construction site
- Insufficient Barriers for segregating contraflow of traffic
Diversion related issues at Six-Laning

Tapering at diversion before the construction zone should be proper instead of sudden blockage.

Diversion sign at the bifurcation point raises confusion to diversion.

Construction vehicles creating contra flow on diversion.
reflectorized and absent at high embankments (\(>3\ m\))
THANK YOU

Any questions?