



GOVERNMENT OF INDIA
MINISTRY OF ROAD TRANSPORT & HIGHWAYS

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Transport Bhawan.
1, Parliament Street,
New Delhi - 110001

No. RW/NH-35072/04/2004-S&R(R)

Dated: 27th April, 2010

To

1. Secretary, PWDs of all State Governments / UTs dealing with National Highways.
2. Engineer in Chief/Chief Engineers of all State Govts./UTs dealing with National Highways.
3. Chairman, National Highways Authority of India (NHAI).
4. Director General (Border Roads), Seema Sadak Bhawan, Naraina.
5. Secretary General, Indian Roads Congress, New Delhi.

Sub: Road Safety - Engineering Measures.

Sir,

A group of experts from various organizations including this Ministry have deliberated and suggested the engineering measures to ensure road safety. These are enclosed.

All central and centrally sponsored projects shall be framed keeping in view these safety measures as applicable to specific site situations.

Yours faithfully,

(Trivendra Kumar)

Executive Engineer SR&T (Roads)
for Director General (RD) & SS

Encl: As above

Copy with enclosure forwarded for information and necessary action to:

1. DG (RD) & SS
2. ADG
3. All Chief Engineers of MoRT&H
4. All ROs / ELOs of MoRT&H
5. IRF

Copy for information to:

PPS to Secretary RT&H

Follow-Up of 4th IRF Regional Conference Recommendations "Accident Prevention : Road Safety Measures"

Engineering Measures to Ensure Road Safety

1. Introduction

The existing road accident scenario on Indian roads is very grim and is a matter of serious concern for all stakeholders. The Ministry of Road Transport & Highways and IRF have jointly embarked on a Mission to reduce fatalities on Indian roads by 50% by the year 2012. This Mission involves a multi-prong approach combining engineering, enforcement and education measures. The multi-lane highways being built under various road development programmes are adopting the geometric standards specifications, signage, road markings, etc. as per the provisions contained in the Codes of Practice and the Standards of the Indian Roads Congress supported by the Ministry's specifications. However, accident data demonstrate that motorists leave the roadway for numerous reasons including errors of judgement. To ensure long term road safety on these highways built so far, those being contemplated to be upgraded and the ones being planned and designed, the following engineering measures are considered essential for adoption so as to help in improving road safety leading to reduction of accidents:

2. Geometry of the Road

For all future multi-lane highways where adequate land is available, it is preferable to provide wide depressed median having width of 12 m or more, but with W-beam metal crash barriers at the edges of the median.

For multi-lane highways already developed / being developed with raised median, it is essential to provide W-beam metal crash barrier in the median along both the carriageways. In case the two carriageways are at different levels, the median edge of the higher carriageway shall be provided with a W-Beam metal crash barrier. In case of narrow medians, 2m or less wide, as generally provided in urban areas, New Jersey type concrete crash barriers should be used along with anti-glare screen for avoidance of headlight glare.

In urban areas, all through lanes should be of normal width (3.5m) for maintaining uniform safety, except at the approaches to the junctions where the speed is expected to be very low, the lane width can be reduced to a minimum of 3.1 m as per IRC code for a length of at least 50 m in the approach.

It is desirable to keep lateral clearance along multi-lane highways of at least 1.5 m width from the edge of the carriageway without any obstacles. Wherever a permanent object cannot be removed for some reason, provision of fenders and hazard markers with reflectors must be made. Further, frangible lighting columns and sign posts need be used for minimizing the severity in case of collision.

In constrained situations where deep road side drains with depth of 1.0 m or more exist (including those along the central median), these should be covered by concrete or steel gratings, and should be protected by W-beam metal crash barrier to prevent the traffic from entering such deep drains.

Wherever embankment height is 3 m or more, the W-beam metal crash barrier must be provided at the edge of the formation.

For green-field projects of high speed highway/expressway, for ensuring effectiveness of recovery zone a slope of 1:4 is required to be provided, and slopes steeper than 1:4 shall be provided with W-beam metal crash barriers for safety of the traffic.

3. Separation of Local Traffic

For the safety of traffic operation, in all cases of multi-lane highways, local traffic has to be separated / segregated from the through traffic plying on the multi-lane carriageway by adoption of suitably designed 7 m wide (absolute minimum 5.5 m wide) service roads with safety fence, railings, etc. of robust and vandal proof design. To enable the traffic on the service roads to cross over to the other side of the multi-lane carriageway, suitably designed cross connections as cattle underpass, pedestrian underpass and vehicular underpass shall be provided.

In cases of open area without roadside developments, where there is no provision of service roads, to protect traffic from leaving the highway, it is essential to provide an additional width of the paved shoulder with edge marking and ribbed pavement of at least 0.25 m width.

In order to ensure that service roads are always available for safe movement of local traffic, it is necessary to provide requisite parking facilities for the local IPT and commercial traffic. Also, suitably designed truck layby or truck parking areas for highway truck traffic is a must to avoid parking on road side, leading to the safe operation of high speed traffic on highways.

4. Pedestrian Facility

In the urbanized sections, adequate pedestrian facilities are to be planned and designed as part of the multi-lane highway so that the pedestrians are not required to enter the main carriageway. For safety of the pedestrians, appropriately designed footpaths with robust railings shall be provided at the outer edge of the service roads with cross over facilities like underpass or foot over bridge (FOB).

All pedestrian underpasses shall have a minimum 7 m width, with a vertical clearance of 3.5m.

5. Bus Bays

In situations where passengers have to board or alight from the buses, suitably designed bus bays at desired locations shall be provided along the main carriageway, but using extra width together with approach and exit transition lanes. At such locations, the arrangement for the dispersal of the passengers have to be designed duly considering their safety, i.e. in no case pedestrian should be required to enter the main carriageway for cross over or even to move along the highway. The passengers (pedestrian) should move to the footpaths provided along the service roads, and then use the cross over facilities like FOB, underpass, etc.

6. Illuminations

Stretches of the multi-lane highways in built-up areas, the underpasses and Foot Over Bridges (FOB) shall be adequately illuminated, for which appropriate design shall be adopted so that a minimum of 40 lux is achievable with 24 hour power supply, if required, supported by solar power.

7. Development of Junction

The crossing of a multi-lane highway by a primary road (National Highway / State Highway) shall always be through a grade separator. In case of other categories of roads (MDR / ODR and VR), access shall be provided to the multi-lane highway through service roads only. In all such cases, the cross roads shall be brought to the level of the service roads and flared for appropriate length, and stop / yield line and centerline markings shall be provided. In addition, rumble strips/ speed breaker shall also be provided on each cross road with warning sign and road markings for the same. At all entry and exit, to and from the high speed highway, the merging and diverging shall be only through suitably designed acceleration and deceleration lanes. The at-grade junction below the grade separation should be designed with proper channelisation of traffic flows and to prevent undesirable movement (like wrong-way movement). The gore area shall be marked and delineated by reflectorized hazard marker sign; and wherever appropriate, to be provided with crash cushion facility also.

8. Signages

Signages and markings have to be developed in an integrated manner and shall comply to the standards laid down by the Indian Roads Congress. All signs and markings shall be of retro-reflective type only.

- (i) All curves with $R < 750$ m to be delineated on outer side of the curve from both the directions (for RH curve it will be on shoulder and for LH curve it will be on median), by chevron signs.
- (ii) All embankments with height 3 m or more shall have W-beam metal crash barriers with delineating reflectors fitted on them.
- (iii) In low embankments and flat curves, where crash barriers are not provided, these need to be delineated by 1.5 m high reflectorized delineators.
- (iv) One-way reflective road studs shall be provided on edge lines and lane lines on the approach to an intersection or a high level bridge/culvert/ROB etc with high embankment. Also, such studs shall be provided along the sharp curves.

9. Traffic Calming & Safety Management Measures

Wherever multi-lane highway passes through built up areas, designs should be such as to bring about a reduction in the speed to the level of 60 / 70 Kmph. To achieve this, repeated bar markings (raised bars with gradually reducing spacings) with hot-applied retro-reflective thermo-plastic, white paints shall be provided at the approaches to such built up areas.

10. Bridges / CD Structures

In the approaches to and exit from, bridges and other CD structures, W-beam metal crash barriers shall be provided in continuation of the parapet on both the carriageways for at-least 30 m in addition to hazard marker signs.

11. Miscellaneous

At special locations like open well or pond of the village, etc. along the highway located close to the formation of the highway, W-beam metal crash barrier shall be provided for appropriate length for the safety of traffic operation on the highway.

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12. **Road Safety Audit (RSA)**

Road Safety Audit (RSA) should be carried out at all stages of road development (planning, design, construction and operation) for all the highways. The highways, which are already built as BOT or DBFO or EPC project, should be subjected to road safety audit to identify the safety related deficiencies, if any. RSA should identify the nature of accidents from the past data to recommend specific corrective measures. All RSA recommendations should be duly considered and implemented for the roads being planned for future as well for the existing multi-lane high speed roads to make them safer highways.
