

APPLICATION OF VISION ZERO CONCEPT TO NHDP PROJECTS

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I. PREAMBLE

Highways contribute a major share of deaths (1%) in India. In fact the number of deaths due to accidents are 7.6% (1) of total accident fatalities in road sector (world) and 21.5% of total road deaths in Asia.

Indian government has initiated the ambitious NHDP Project with a view to provide high-speed corridors with good safety arrangements for unlocking the true development potential of India. The NHDP Projects designed for 100kmph design speed with partial access control has to undergo multi stage safety audit procedure. The safety audits have not been that successful basically due to inherent design and safety issues. In this paper the author proposes application of new concept to NHDP projects, which is becoming increasingly popular in western countries aptly named as “VISION ZERO”.

II. INTRODUCTION

Vision zero concept originated in Sweden and it proposes zero fatalities and zero serious injuries. The basic premise of this concept is that *“It can never be ethically acceptable that people are killed or seriously injured when moving within the road transport system”*.

This concept puts the major onus on to the design engineers who have the responsibility of ensuring no fatalities. The major stakeholders in such a concept are Road Designers, Road Contractors, Implementing Agency, Maintenance Providers, Road Users and Vehicle Manufactures. The Road Designers have a major role to play and it is their duty to invoke such a site-specific design procedure that ensures accidents with minor injuries. It is the road designer’s responsibility to ensure the road is designed with the speed, which will not cause any deaths.

III. WHY VISION ZERO??

One study (2) shows that the drivers’ fault accounts for 83.5 per cent accidents. Other contributory causes of road accidents are: mechanical defects in the vehicles (3.0 per cent), fault of pedestrians (2.3 per cent), fault of passengers (2.4 per cent), bad road (1.1 per cent), bad weather (0.9 per cent) and other causes (6.8 per cent) like cattle, fallen trees, road blockage, sudden

failure of vehicles ahead, absence of rear reflectors, non-functioning of signals and absence of road signages etc.

It is never justified to have indirect life penalty for a simple calculation error while driving (83.5% deaths due to driver error). A study by the Planning Commission in 2002 estimated the social cost of road accidents in India at Rs.55, 000 crore annually (2000 prices), which constitutes about 3% of the GDP (such a huge economic loss). The mortality rate (deaths/10000 vehicles) in India is nearly 14% as compared to less than 2% in developed countries.

One report (WHO -2004) forecasts that without any increased effort and new initiatives, the deaths are expected to increase by as much as 80% low-income and middle-income countries. In fact a latest government report (Committee on Road safety and Traffic Management-2007) acknowledges the threat of high accidents and projects the total number of deaths in year 2015 to 154600.

A simple analysis was carried out to enlighten the importance of National Highways safety improvement as shown in table1. The percentage share of the accidents in NH is varying from 26 to 32% whereas the percentage share of persons killed is varying from 35 to 39.7%. Such a high share of accident fatality may be due to lack of proper hospitalization facilities near the accident spots as the national highways majorly traverses through rural stretches. One of the other prime reasons of high death share is high speed, which is proved by comparatively less share of injured percentages. High accident share and fatality rates calls for urgent need in improving the safety of National Highways. The concept of VISION ZERO has the potential to liberate the country from the accident deaths in National Highways.

Table1: Accident Scenario of India

Year	All Roads			National Highways			Analysis		
	Accidents	Persons Killed	Persons Injured	Accidents	Persons Killed	Persons Injured	% share of NH (Accidents)	% share of NH (Persons Killed)	% share of NH (Persons Injured)
1999	386456	81966	375051	103839	28713	98427	26.87	35.03	26.24
2000	391449	78911	399265	110508	30216	124600	28.23	38.29	31.21
2001	405637	80888	405216	115824	32108	119592	28.55	39.69	29.51
2002	407497	84674	408711	131738	33621	132307	32.33	39.71	32.37
2003	406726	85998	435122	127834	33153	131102	31.43	38.55	30.13
2004(P)	429910	92618	464521	130265	34723	143140	30.30	37.49	30.81

Source:MoSRTTH,2006

This concept proposes a policy, which would reduce the total accident deaths to zero. This concept does not guarantee zero accidents as commonly understood by many but ensures the roads designed, executed and managed in such a way that fatality and serious injuries are zero.

It is not a short-term policy, which would guarantee immediate results. It is a sort of trial and error kind of arrangement where the designer varies the design and thus operating speed and geometric policies in order to achieve zero fatalities.

In a recent article (4), government of India is contemplating to reduce the design speed of partial access controlled highways to 50kmph. Such a measure would reduce fatalities no doubt but would not guarantee zero accidents, also it would cause huge economic loss, as the major project viable part is value of travel time. The viable solution is vision zero concept, which regulates the speed until zero fatalities are achieved. The design is not one stage process in such a policy.

In the subsequent section, some of the design concepts applied in NHDP projects are reviewed in order to fit in the design related vision zero provisions.

IV. VISION ZERO DESIGN REQUISITES

1. Design Speed and Access Control

The mobility and accessibility relationship criteria are the basis of any geometric design. The NHDP projects are designed for 100kmph. The sections, which are geometrically deficient, are converted into reduced speed zones. The Implementing agency (NHAI) ensures that such sections are provided rarely. The Indian authorities use the classical definition of design speed as suggested in AASTO-1994 “Maximum safe speed that can be maintained over a specified section of highway when conditions are so favorable that the design features of highway govern”. The intersections and other conflicting zones for traffic are provided by suitable junction designs with adequate warnings (signs and markings). This concept of partial access control does not fit in with the vision zero policy. The author proposes ‘vision zero speed zone’ concept, which will ensure that the motorist gets the speed idea to traverse through the zone thus ensuring zero fatality. This speed zone concept is applicable not only to junctions but also to locations which may cause hazards such as bus stops, laybys, wayside amenities, median openings, pedestrian crossings (at grade) and other locations which may surprise the driver. At these locations 100kmph design speed may not guarantee zero fatalities. Indian highways have large number of junctions on account of being the primary arterials of the country. National Highways intersect with various nomenclatures of roads of various importances.

In addition to above, there are large number of median openings, ribbon developments, pedestrian crossings and other facilities that can cause potential hazards. If the NHAI feels that such speed concept is going to cause

economic loss than the other viable solution is full access control, which may not be implemented for the whole country for all the corridors.



* Accident waiting to happen in NH-7 (note projecting structure portions)

Table2: Speed and Vision Zero*

Type of infrastructure and traffic	Possible travel speed (km/h)
Locations with possible conflicts between pedestrians and cars	30
Intersections with possible side impacts between cars	50
Roads with possible frontal impacts between cars	70
Roads with no possibility of a side impact or frontal impact (only impact with the infrastructure)	100+

*Table extracted from *Vision Zero - An ethical approach to safety and mobility*-Claes Tingvall and Narelle Haworth. Monash University Accident Research Centre

2. Forgiving Roadside

The consultants often cite various economic, social and other reasons while neglecting the concept of forgiving roadsides.

The side slopes provided in NHDP Projects are often 2:1 as against the safety stipulations of IRC-36-1970, which indicates a slope of 4:1 (<1.5m height), 4:1 and 3:1 (<3m). In place of high embankments, IN NHDP projects consultants provide crash barriers. The slope provided does not cater for recovery zone concept. International Research has proposed slopes of 6:1 to 4:1 for reducing accidents. For zero vision policy adhering to such gentle slopes is must.

The appropriate median width along with the end treatment (kerb) plays a vital role in accident prevention. Majority of NHDP corridors have a median width of

4.5-5m with barrier kerbs to prevent vehicles from head on collision. The reason being justified by the consultants are economic (earthworks & structures) and social (ROW). It is to be noted that many accidents have started occurring due to overturning and vehicle getting airborne due to impact with kerb. The solution to such a problem is provision of medians with 6-12m width and central barriers without any kerbs. Since NHAI is going for a uniform land acquisition of 60m, such a cross-section would be a possibility.



** Reduced Median with no earthen shoulders and no recovery zone in NH-7*

Street Lights are provided in urban areas and junctions. The relevant code: IRC-32-1969, proposes the placement of such street lights at 1.5m from the edge of carriageway subject to minimum of 5m from the centreline of the carriageway for roads without raised kerbs (assumed at outer edge). Such a guideline violates the clear zone concept thus causing grievous injuries on collision.



** "W" beam crash barrier does not provide any walking space and note open concrete drains at edge*

V. CONCLUSION

In the paper an attempt has been made to highlight some of the design based issues of multi dimensional “VISION ZERO” concept. This concept can be applied to the existing and proposed corridors. This concept should be viewed along with the other safety policies as applied to India and not individually. The other design concepts having bearing on safety such as stopping sight distance, shoulder rollover etc are not highlighted in view of space constraints. It is a high time that NHAI starts pondering over application of such a concept considering the India’s dubious distinction in Road-safety. Road Design is a complex process and it should not be a single stage process. It should be satisfying the roadside environment and guarantee zero fatalities.

VI. REFERENCES

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