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Upgrading The Safety In Road Infrastructure

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INTRODUCTION:-

Road Accidents and Fatalities:-

- Accidents and the fatalities on road are the result of interplay of a number of factors.
- Road users in India are heterogeneous in nature, ranging from pedestrians, animal-driven carts, rickshaws & tractor trolleys, to various categories of two/three wheelers, motor cars, buses, trucks vehicles etc.
- The vehicles population has been steadily increasing with the pace picking up significantly since the Eighties.
- More than 1.25lakh people were killed & more than 5lakh were injured in about 5lakh reported road accidents in the country during the year 2009.

Summary of the accident data for the last ten years:-

YEAR	ALL ROADS			NATIONAL HIGHWAYS		
	Accidents	No. of Persons killed	Persons Injured	Accidents	No. of Persons killed	Persons Injured
2000	391449	78911	399265	110508	30216	124600
2001	405637	80888	405216	115824	32108	119592(P)
2002	407497	84674	408711	131738	33621	132707
2003	406726	85998	835122	127834	33153	131102
2004	429910	92618	464521	130265	34723	143140
2005	439255	94968	465282	129994	35439	145582
2006	460920	105749	496481	140158	39820	152807
2007	479216	114444	513340	138922	40612	154880
2008	484704	119860	523193	137995	42670	149693
2009(P)	486384	125660	515458	142511	45222	152816

Causes of Accident:-

- Drivers' fault (**78.5%**).
- Pedestrian fault/fault of passengers (**2.2%**).
- Mechanical defect in vehicles (**1.8%**).
- Bad roads (**1.3%**).
- Other factors like bad weather, cattle coming in the way, fallen trees, road blockage, absence of rear reflectors, road signage, non functioning of road signals etc. (**16.2%**).



Engineering Measures to control accidents:-

- National Highways constitute 70,934 km out of the total length of about 4.1 million km in the country.
- Road safety is an integral part of engineering design at the Project Planning stage.
- Road safety specifications/designs are incorporated in the planning as well as during execution stage of projects meeting all relevant geometric and safety standards which includes provisions of:



Engineering Measures to Control Accidents:- cont..

- Flyovers.
- Grade Separators.
- By passes.
- Railway over/Under bridges.
- Bus / Truck lay-byes.
- Service roads.
- Junction improvements.
- Overhead signs.
- Cautionary/regulatory/informatory retro-reflective sign boards.
- Crash barriers.
- Medians.
- Thermoplastic road marking.
- Traffic lights and delineators etc.



Major challenges pertaining to Engineering measures:-

- The road network historically developed from the point of view of providing accessibility rather than mobility.
- With economic growth and development, the mobility, particularly on trunk routes, has assumed a very high priority.
- Given the historical road deficiencies, it is extremely difficult to provide all the desired safety features on the existing network.
- Challenges increase due to deficiency of funds.

Major challenges pertaining to Engineering measures:- Cont...

- Available funding for maintenance and repair of National Highways Network which is only 35-40% of the estimated fund requirement as per the norms of maintenance of National Highways.

Year	%Shortfall
2004-05	69.94
2005-06	65.00
2006-07	67.16
2007-08	56.07
2008-09	57.28
2009-10	57.64
2010-11	26.53
2011-12	63.31



Major challenges pertaining to Engineering measures:- Cont...

- In the absence of system of scientific recording, analysis and documentation of crash investigation, various improvement measures taken up are at times ad-hoc and without inter-se prioritization and justification from the road safety point of view.



Present Policy Regarding Engineering Measures for Road Safety:-

- MoRT&H issued guidelines dt. 27-04-2010 for framing all central and centrally sponsored projects keeping in view the specified safety measures as applicable to specific site conditions.
- Suggestions primarily pertains to: **Geometry of the road, Separation of local traffic, Pedestrian facility, Bus bays, Illuminations, Development of junctions, Signages, Traffic calming and Safety management measures, Bridges/CD Structures, Conduction of road safety audits** at all stages of road development, operation and maintenance etc.



Conducting road Safety Audits- Present scenario:-

- IRC recently published road safety audit manual i.e IRC-SP-88:2010
- Safety audit is being undertaken by NHAI for all PPP projects of NHDP.
- Safety audit is also being undertaken for OMT stretches of NHDP.

Broad Overview of NHDP

- Total length of NHs in the country - 70,934 km
- Total length covered under NHDP - 54,454 km*
- Total length completed - 15,784 km
- Total length under implementation - 10,363 km
- Total length yet to be awarded - 28,307 km

* - includes 47,054 km of NHs + 5,700 km overlapping stretches under GQ included for 6-laning under NHDP-V + 1,000 km Expressways under NHDP-VI + 700 km under NHDP-VII

National Highways Development Project (NHDP)

SEVEN PHASES

- Phase-I: **Mainly the Golden Quadrilateral (GQ) connecting major cities of the country namely Delhi, Mumbai, Chennai and Kolkata**
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- Phase-II: **North–South and East–West Corridors**
- Phase-III: **Connection of State Capitals and important places to GQ and Corridors**
- Phase-IV: **Improvement of National Highways having single/intermediate lane width to 2-lane with paved shoulders**
- Phase-V: **Six laning**
- Phase-VI: **Expressways**
- Phase-VII: **Bypasses, Ring Roads, Flyovers**

Overall Status of NHDP

As on Aug. 2011

SI No	NHDP Component	Total length (km)	Completed 4/6 lane (km)	Under Implementation		Balance for award of civil works (km)
				Length (Km.)	No of Projects	
1	NHDP Phase I	7522	7442	80	16	-
2	NHDP Phase II	6647	5302	901	80	444
3	NHDP Phase III	12109	2555	6173	82	3381
4	NHDP Phase IV	20000	-	1222	8	18778
5	NHDP Phase V	6500	652	1985	19	3863
6	NHDP Phase VI	1000	-	-	-	1000
7	NHDP Phase VII	700*	-	41	2	659
8	Misc Projects	593	166	427	5	-
9	SARDP-NE	388	-	112	2	276
	Total	55459	16118	10941	214	28401

* Stand alone projects



INITIATIVES TAKEN BY NHAI FOR ROAD SAFETY

- A Road Safety Cell has been created within NHAI functioning from March, 2009.

- Circular has been issued to designate one Safety Officer in each Regional Office of NHAI to see the safety measures during construction and O&M of project reaches.

Initiatives taken by NHAI for Road Safety Cont...

- I Engagement of IIT Delhi as independent Safety Auditor (Work zone safety auditor) for LMNHP Projects.
- II Appointment of Safety Auditor on PPP projects during design & construction Phase.
- III Safety activities under re-negotiated LMNHP World Bank loan/TA loan (under procurement).
- IV Road Safety Public Education on all 4 arms of GQ.
- V Organizing various Work Shops /Seminars on Road Safety and Work Zone Safety.
- VI Issue of Policy Circular to enhance Safety.
- VII Incident Management



Initiatives taken by NHAI for Road Safety Cont...

- I. IIT Delhi was engaged as independent Safety Auditor (March'09) for 12 World Bank Projects from Lucknow to Muzzaffarpur (LMNHP), total length 480 km. on NH-28.**
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scope

- I. Safety audit of all packages,**
- II. Review of contract documents,**
- III. Formulation of Work Zone Safety Guidelines and developing a Worksite Safety Management Manual.**

Work done so far

- **Comprehensive audit of all packages of LMNHP projects completed to the entire satisfaction of World Bank. Reports have been sent to PDs for implementation.**
- **Guidelines on Work Zone Safety formulated and approved for implementation. These guidelines have been issued to all Technical Divisions/Regional Officers and project Directors for implementation.**
- **A draft Comprehensive “WORKSITE SAFETY MANUAL” prepared and hosted on NHAI website for comments. This covers Traffic Management, Safety of road user and workers Safety during construction.**
- **For future FIDIC Contracts, inclusion of specific BOQ items for improving safety conditions of Highways which are not presently covered in Ministry’s specifications has been approved and circulated for adoption in NHAI.**

Appointment of Safety Auditors

A. Audit completed (about 6300 Kms):

- ***Safety Audit of Western and Southern corridors of GQ in a length of 2825 Km completed and recommendation compiled and disseminated as:-***
 - Short term solutions- inadequate provision of stopping site distance, signage, shoulder width, delineators, pedestrians railing railings, crash barrier, cats eye, edge marking, chevron marking, lane marking etc.
 - Medium term solutions- improvement of junctions, inadequate bus/truck lay bye, culvert parapet, lack of visibility at night safety measures for pedestrians, rest areas, culvert protection in median, shoulder consolidation etc.
 - Long term solutions-construction of service road, grade separator intersection, pedestrian and vehicular underpasses, flyovers, climbing lane for heavy vehicles at steep gradient.

Appointment of Safety Auditors Cont...

- **Safety Audit for 12 World Bank Projects of LMNHP completed. 480km (May2009- April, 10). Reports sent to projects sites for implementation.**
- **Safety Audit of Completed stretches developed on PPP mode is mandatory before COD as per Concession Agreement – 3000 km**

B. Safety Audit (Ongoing):

I. Safety Consultant Appointed (May, 10) for PPP Projects (DBFO) & Audit commenced (544km.) on following sections:

(i) Gurgaon-Jaipur (226 km),(ii) Surat-Dihsar, (239 km), (iii) Chikaluripet- Vijaywads (79 km)

2.Safety Consultant Appointed (Nov, 10) for 53 (DBFO) projects covering a total length of 4820 km, costing Rs 65 crore all over the country.

3.Further, bids for appointment of Safety consultant for 26 packages of PPP Projects on DBFO basis for 2222 km have been invited for Safety Audit during design, and construction stage which is under finalization

The scope of Safety Auditor includes

- Holding of 4 days training and Workshop at the start of the Projects and one day Workshop after every six months during Construction stage
- Development stage audit which includes review of design and drawing,
- Collection and collation of Accident data as per the IRC format for the last 2 year from primary and secondary source.
- Conduct Safety Audit during construction stage quarterly and up to COD.
- Identify the location of black spot and suggest remedial measure to reduce the accidents on the highways.
- Conduct a one day workshop after every six month where recommendation of safety consultant will be discussed with IE, Concessionaire, and NHAI. And finalized during construction stage audit.

Road Safety activities under re-negotiated LMNHP World Bank loan/TA loan (under procurement):-

- ***Appointment of Road Safety Advisor for 2 year to:***
 - **Assist NHAI to build capacity of RSC on all safety-related aspects at all stages of highway development.**
 - **Review the current system, procedures and delegation to RSC**
 - **Make recommendations to strengthen RSC functioning within NHAI including drafting of detailed procedures, delegations and resources required**
- ***Appointment of Consultant for Network Safety Management (EOI finalized and RFP issued)***
 - **To build capacity of NHAI in cost effective Network Safety Management and develop an improved “Accident Information and Management System.”**
 - **As a Pilot project of about a length of 2000 km have been identified**



- **Road Safety Public Education**

- Road Safety Public Education on all four arms (Delhi-Mumbai, Mumbai-Chennai, Delhi-Kolkata, and Chennai-Kolkata) of GQ as part of the World Bank loan was conducted by the consultants/NGOs in the **year 2008** to enhance road safety awareness among drivers and other road users. This study was designed to reduce the risk of accidents through raising the awareness among inhabitants and road users of National Highways
- Public Education Campaign through Media is planned on NHDP stretches in a length of about 3000 km under World Bank funding for Road Safety and HIV AIDS.



Work Shops /Seminars on Road Safety:-

- **Twelve Work Shops /Seminars on Road Safety Audit and Work Zone Safety including workers safety conducted by NHAI during the period (Aug, 2009 to Aug,2011) and about 400 persons participated and trained by NHAI till now.**

INCIDENT MANAGEMENT ON 24 HRS BASIS

- **Following incident Management initiative have been taken to minimize the effects of the incident and restore normal capacity and safety levels**
- **Route Patrol Vehicle** – Deployed to keep vigil on road and help those in distress. One Patrol vehicle covers average stretch of 50 Km..Total Patrol vehicles deployed 229.
- **Ambulance** - Deployed to provide first aid and shift accident victims to nearest hospital/trauma centre. One ambulance covers average stretch of 50-60 Km. Total ambulance deployed 223.
- **Cranes** – Deployed to clear accident vehicles/heavy objects from carriageway. Normally cranes are stationed at toll plazas.Total cranes deployed 198.

Policy Circulars Issue to enhance Road Safety

- To improve construction work zone safety, Work zone Safety Guidelines has been issued (26.10.2010) to all the field units and also instruction (28.01.2011) has been issued to all PIU to adhere IRC 55, 2011.
- To ensure Road Safety-Engineering measures circular (12.07.2010) as per direction of MoRT&H has been issued to all PIU for long term Road Safety on the Highways built so far.
- Circular (25.01.2011) issued that in all future DPRs/Feasibility Report, the Consultant, invariably shall give a report that all extant direction relating to Road Safety have been Complied with.

AREAS FOR ACTION

- i. Standards and guidelines for Highways and Urban Roads.***
- ii. Monitoring and evaluation of road designs and traffic management strategies:- Safety Audits.***

- iii. Accident Investigation.***
- iv. Training.***
- v. Research and Development.***
- vi. National Road Safety and Traffic Management Board – To be set up.***
- vii. Availability of Resources: Funding.***



Thank you

Standards and guidelines for Highways and Urban Roads:-

Highway and Urban Road design standards and guidelines will be made consistent with the safety requirements and in tune with the international best practice.

- All existing standards/ guidelines/ manuals/ codes etc. of IRC/ MoRT&H will be reviewed for their specific relevance with road safety, and deficiencies/ shortfalls identified in relation to safety.
- New standards and manuals will be prepared for filling the gaps in the current standards.
- All road projects being delivered at present, on BOT or as EPC contracts, will be review at each stage to identify any issue related to road safety.



Standards and guidelines for Highways and Urban Roads:- Cont...

- All state highways and national highways are to be provided with the both pavement markings and road signs as per the requirements specified by the standards of IRC/MoRT&H. these shall be mandatory requirement for road safety.
- For ensuring the construction zone safety for traffic operation, there should be proper estimate prepared at the stage of detailed design, and it should be part of the total project cost like any other item in the form of BOQ items.



Monitoring and evaluation of road designs and traffic management strategies:- Safety Audits

- Encourage Institutionalization of conducting Road Safety Audits by Certified Road safety Auditors.
- An Accreditation body s required to be created for Road Safety Auditors, which will control the utilization of these trained auditors and will maintain the register of certified auditors.
- Capacity for Road Safety Audit works is to be enhanced by training and conducting certification courses for Road Safety Auditors.
- Road Safety Audit is to be carried out for the roads using the trained auditors available in the country and in accordance with the manual of Road Safety Audit adopted by IRC.
- The entire network of NH and SH are to be subjected to Road Safety Audit(RSA) in a planned manner over next three years.



SAFETY AUDIT Cont...

- MoRT&H and states will prioritize the network to be audited, and will implement the improvements recommended by Road Safety Audit.
- To carry out Road Safety Audit(RSA) for the entire primary network, required capacity is to be developed through proper training by qualified engineers, who are eligible for training.
- Teaching and research institutions including IITs, NITs, CSIR, etc. will be identified for establishing training programmes for RSA professionals.



ACCIDENT INVESTIGATION:-

- Accident data recording system is to be adopted uniformly across all States for road in urban and non-urban areas in a standard format.
- The data collection should be tech- savvy with hand-held GPS and computer interface so as to collect all data with highest precision.
- There will be standard accident analysis module for accident investigation and adjudication uniformly to be used across the country without any exception.
- Only a few specialized centers shall study selected accidents, using the accident reconstruction technique, etc. and the same data system.
- Institutionalized System of Database storage shall be developed.

Training / Research & Development

- **Training:-**

- The engineers involved in planning, design, construction and operation of roads and highways in the country are to be trained on road safety aspects covering engineering measures, safety at construction sites and hands on experience in road safety audit.

- **Research and Development:-**

- To establish about five to seven Centres of Excellence for Road Safety Research and Accident Analysis in Academic Institutions across the country in addition to the existing research institutions.
- The capacity in road safety research and accident analysis is also to be developed, for which bright young professionals are to be identified for specialized training.

National Road Safety & Traffic Management Board/Availability of Resources

- **National Road Safety & Traffic Management Board:-**
 - Government is already initiated the process of approving the Bill for creation of a Road Safety & Traffic Management Board. This Central Body is an requirement along with the counterparts in the States.
- **Availability of Resources:-**
 - Adequate funds should be made available commensurate to the requirements, especially for development and maintenance of non-NHDP National Highways Network.
 - Similarly resources provided for State roads shall have to be commensurate to the estimated requirements.



INDICATIVE PLANS:-

- An Action Plan(Engineering Measures) showing the time frame for implementation of the various activities along with estimated cost and the agencies responsible for implementing and monitoring, is to be drawn.
- Concrete steps required to be taken within the suggested timeframe.
- The action plan suggests that within the time frame (***say five years***) all the engineering deficiencies in roads etc. would be accomplished.

Improving safety on NH and SH Network:-

- ***Road markings and signages (2years to 4years)***
 - All national and State Highways should have sign and road marking as per IRC Standards.
 - National Highways.
 - State Highways.

- ***Road Safety Audits(RSA) (3years to 4years)***
 - RSA for entire NH network to be completed.
 - RSA for entire SH network to be completed.

Note: Priority roads to be started for:

(3months to 6months)

National Highways and State Highways

Improving safety on NH and SH Network:-

- ***Implementation of RSA recommendations:-
(1 Year)***

- This has to start immediately after completion of RSA ***(4 years to 5 years)***

- National Highways

- State Highways

- ***Review of standards/guidelines of evolving new guidelines***

- To be review with safety focus of NHs and SHs. ***(2 years)***

- Developing manuals on traffic control devices ***(1 year)***



Improving safety on NH and SH Network:-

- ***Modification in Bid documentation***

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- Policy guidelines be issued that all safety related items including those during construction should be a pain item and not incidental. **(3 Months)**
 - NHs and SHs.

Improving safety on NH and SH Network contd...

- ***Implementation of the road safety engineering measures (2 years to 5 years)***
 - Speed management measures (100 settlements/year) i.e. 100 locations.
 - Provisions of service roads (100 settlements/year)
 - Provision of pedestrians/cattle crossings (50 locations/year)
 - Improvements of inter-State border check posts on NHs (20 check posts in 1st year and 30 each in subsequent years).
 - Provision of truck lay bays along NHs (100 nos. in 1st year and 200 nos. each in subsequent years).
 - Provisions of bus bays and bus shelter along NHs (100 nos. in 1st year and 200 nos. each in subsequent years).

Road Safety Audit:-

- ***Building Capabilities in RSA (6months to 3 years)***
 - 1000 number of safety Auditors to be trained. (a) Training course content: To be decided
 - (b) Training Providers: To be identified.
 - (c) Training Course : To be started.



Institutional Arrangements for Road Safety:-

- **National Road Safety and Traffic Management Board**
 - Bill already introduced in Parliament and under consideration of Standing Committee.
 - (a) Constitution of the Board after enactment of the Bill.
 - (b) Constitution of State Board: States to be advised after enactment of the Bill.

Institutional Arrangements for Road Safety:- contd...

- **Accident Recording System:-**

System of accident recording to be introduced in a formal way to assist in devising proper safety measures

- System of accident recording to be introduced in a formal way to assist in devising proper safety measures.
- (a) Data Recording System.**(6 months)**
- (b) Training of police personnel.**(3years)**

Training for road Safety:-

- **Training of Engineers (6 months to 3years)**
 - Engineer involved in planning, design, construction and operation of highways to be trained in road safety.
 - (a) Development of Training Modules **(3months)**
 - (b) Identification of Training in Engg. Measures **(6 months)**
 - (c) Training
- **Awareness Training Workshop(3years)**

Research and Road Safety:-

- **Centre of Excellence (CoE)**
 - (a) Govt. To establish CoE. **(3 years)**
 - Advance training in safety research. **(3years)**

Funding:-

- The estimate-wise requirements as indicated in the Action Plan at Annexure-III suggests that most of the expenditure will be in the initial three years. It is estimated that approximately Rs. 800 crore to Rs. 900crore will be required for the suggested Engineering Measures requiring an annual average of Rs.300crore specific from the road safety perspective alone. Funding for this has to be arranged from different sources, viz. the following potential sources.
 - 1) 1% cess earmarked from cess for road safety (Rs.90 crore annually).
 - 2) Rs. 50crore annual contribution from NHAI as a part of their corporate responsibility.
 - 3) Specific earmarking of at least about 10% of annual available allocation under National Highways for road safety measures allocation is about Rs. 400crore at present.
 - 4) Private sector contribution in the form of fully funded driver training institutes, centres of excellence, sponsored training workshops, etc.



- **Funding:- Cont...**

- The resources likely to be generated from the above potential sources are to be utilized for all road safety related activities encompassing the Four E's, viz. Education, Enforcement, Engineering and Emergency care.