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Sub. : E-1 - Road Engineering and Management

Dear Mr. Pandey / Mr. Nirmal

As you are aware, we from IRF India Chapter, are preparing the Road Safety Action Plan of India 2022, an encompassing document covering all the 5Es, i.e.,

1. Road Engineering & Management – E1
2. Vehicular Engineering & Policy Interventions –E2
3. Road Safety Education - School and Mass Education – E3
4. Traffic Management and Accident Data Collection by the Police Department –E4
5. Emergency Trauma Care – E5

During the UN Decade of Action (2010 - 2020) on improving global road safety scenario, a number of initiatives from the 5Es named above were undertaken with focus on two or three aspects at the most in various road segments. As a result, the desired outcome of achieving 50% reduction in road traffic accidents and fatalities was not achieved by the end of the decade. The main reasons for this non-achievement was, due to the fact that all the 5Es were not addressed simultaneously, as envisaged by the UN's 5 pillar strategy.

In the extended Decade of Action for Road Safety (2021-2030), IRF-IC launched a two-pronged strategy for formulating a National Road Safety Action Plan- 2022 for India to approach Road Safety during the Decade by altering the approach to be in sync with UNs 5 Pillar strategy. As a first step, a 12 Webinars Series based on 5Es concept titled "Road Safety Challenges in India and Preparation of an Action Plan" was launched in February 2021 by the Hon'ble Minister Shri Nitin Gadkari ji. The series concluded on 15th December 2021.

Coming out of the recommendations of this international Webinar Series, we have prepared Road Safety Action plan for each E separately so that it can be brainstormed by the various participating Ministries along with experts in the profession to finalize it, so that it can then become a part of the overall Action Plan. In this context, we have prepared our recommendations on all the 5 Es. The recommendations on E-1 – Road Engineering and Management is enclosed herewith for your kind perusal.



We need to deliberate on these in a meeting wherein we should have Road Safety Experts, knowledgeable people in this field, to come together and brainstorm on each of the recommendations to finalize it.

It is, in this context, I am writing this letter to you to be the Chair and Co-Chair of this Task Force to review the road engineering component.

A few suggested people whom I propose to be invited are:

1. Prof. P. K. Sikdar, Former Director, CRRI, Former Dean, IIT, Mumbai and Advisor, IRF India Chapter
2. Mr. Mahabir Singh, Member Technical, NHAI
3. Mr. H. M. Naqvi, CGM, NHAI
4. Mr. Atul Kumar, Director (Engineering), NHIDCL
5. Mr. V. K. Rajawat, Chief Engineer (Road Safety), MoRTH
6. Dr. Rohit Baluja, President, Institute of Road Traffic Education and Director, College of Traffic Management
7. Prof. Satish Chandra, Former Director, CRRI

With best wishes & regards,

Yours truly,

(K. K. Kapila)

Encl. : *Recommendations on E-1 – Road Engineering & Management (24 Pages)*

CC (along with enclosure):

1. Mr. Giridhar Aramane, Secretary, Ministry of Road Transport & Highways, Parliament Street, E-mail : secy-road@nic.in
2. Mr. Mahmood Ahmed, Joint Secretary, Road Safety, Ministry of Road Transport & Highways, Parliament Street, E-mail : mahmood.ahmed@nic.in
3. Mr. Sanket S. Bhondave, PS to the Hon'ble Minister of Road Transport & Highways, Parliament Street, E-mail : ps-morth@nic.in

INTERNATIONAL ROAD FEDERATION – INDIA CHAPTER

NATIONAL ROAD SAFETY ACTION PLAN - 2022

E-1 : ROAD ENGINEERING & MANAGEMENT

A: Road Safety Management Capacity, Funding, Inter-Departmental/Inter-Ministerial Coordination & Institutional Developments (E0)

Sl. No.	Road Safety Issue & Action Plan	Responsibility	Timeframe & Budget
(a)	Creation & Empowerment of Central and State Level Authorities		
1.	Status: The Parliament has approved the Bill to constitute the National Road Safety & Traffic Management Board. The notification of the same has also been issued by the Nodal Ministry of Road Transport & Highways; but the Board has not been constituted till now. The Apex Body of Road Safety is required (as National Road Safety Board: NRSB) for effective implementation of road safety programme in a projectized manner. Action Plan: The National Board should be constituted with independent authority for country-wide coordination, with full authority like an independent Ministry of the Government, and necessary independent sweeping powers for performance at all levels. The Ministry of Road Transport & Highways will also frame Rules and Regulations and operating instructions for the Board. This Board (NRSB) shall identify the policy and strategy of road safety for the country with short-term (0-2 yrs), medium-term (2-5 yrs) and long-term (5-10 yrs) actions/activities for improvement of safety.	MoRTH/GOI	
2.	Status: State level Road Safety Board (SRSB) or Road Safety Authority are missing in most states, and these have to be constituted/enacted, which will be the Lead Agency at the State level with full powers for coordination amongst all stakeholders of road safety to coordinate and enforce engineering, enforcement and all other safe system measures which can improve road safety of the entire road network in a State. This State Board/Authority will take directions from the National Board (NRSB) at the Centre for focused and result oriented interventions. Management of road safety involves coordination with multiple stakeholder organizations, team composition to achieve the targeted safety objectives (the vision, goals, achievable and action plan must be clearly and uniformly known/understood by all so that all activities are coordinated and results achieved). Action Plan: State Level Board (SRSB)/Authority shall be the Lead Agency and shall coordinate amongst all state level organizations (stakeholders) with complete authority and independence with necessary funding. State Level Board/	All States	

Sl. No.	Road Safety Issue & Action Plan	Responsibility	Timeframe & Budget
	Authority shall organize/coordinate and direct the District Road Safety Committees (DRSCs). This State Level Board (SRSB) shall coordinate and work on identified policy and strategy of road safety given by NRSB with short-term (0-2 yrs), medium-term (2-5 yrs) and long-term (5-10 yrs) actions/activities for improvement of safety.		
3.	Status: The road safety problem has to be addressed from grass-root level, and therefore, a bottom-up approach is required by empowering the stakeholders at the district level. Constitute District Road Safety Committees/Cells with representatives from road authorities, motor vehicles department (Transport Department), district education council, general public and a designated road safety expert. Action Plan: Create DRSCs and act on road safety problems in a coordinated way with planned interventions for targeted results.	All District Authorities/ All States	
(b)	Capacity Building in All Agencies/Organizations Linked to Road Traffic/Safety		
1.	Status: The Central and State level Road/Transport Agencies/Authorities have very poor and partial understanding of the road safety as they do not have the required capacity and skills to plan and deliver the structured interventions of road safety, which will have focussed targets. All nodal agencies of Road Safety must have requisite institutional capacity to develop data-led/evidence-based planned interventions, focussing on results. Action Plan: Launch a national capacity building programme in mission mode in Road/Transport Authorities/Agencies for enhancing both the knowledge and skills across the country (in Centre and all States) in a standard format to effectively deal with planning, design and implementation of road projects with specific built-in objectives of road safety. The World Bank's Road Safety Management Capacity triangle can be a very good guide for this – to focus on every constituent elements of road safety with definite accountability. This is required to bring a drastic change in three vital components: (i) safer road design, (ii) safety management in construction, and (iii) management of road safety using globally acclaimed safe system approach, which are based on shared responsibility between road users and system designers/providers/managers. Develop a road safety training plan applicable to varying levels of staff of Central, State and District road safety officers to impart knowledge and fundamental concept that the road, vehicle and all road infrastructure are to be designed and managed based on human tolerance level against impacts, for making the network forgiving. This mandatory training should be cleared for career progression of all government officers connected to road sector projects.	Centre/State Level Agencies for Road Transport	
2.	Status: Capacity building is required for all private sector organizations involved in providing services for planning, design and construction of road sector projects. The present understanding of road safety by all such manpower is found to be extremely deficient, which is actually causing enormous problem in delivery of safe and forgiving roads. Action Plan: Develop a uniform training plan for imparting knowledge and enhancing skills of engineers in private	MoRTH in association with accredited agencies from	

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	organizations thereby enabling them to deliver safe and forgiving roads. This is to be done through a certification plan for the design engineers, road safety auditors, highway construction engineers and quality control engineers. There shall be general training for engineers on road safety for about two weeks with a uniform syllabus and the road safety training can be carried out widely through many academic and research institutes to increase the awareness level among the practicing engineers along with definite knowledge and skills on road safety for the works they deliver.	both Government and Private Sectors including MDBs	
3.	Status: The Central Ministries connected to road safety domain, Road Authorities, State Road Authorities, State Departments like Transport, Health and Police Departments do not have the requisite technical knowledge for actual traffic engineering and consequently also about the nuances of road safety problems, and their specific roles to ameliorate the situation. The Urban Local Bodies (especially the Corporations/Municipalities) also face similar situation. All these organizations/agencies/departments operate like administrative units without any detailed technical know-how of road safety, as a result of which the traffic management and road safety issues are rarely considered/perceived in all their activities. Action Plan: All organizations/ agencies involved with road traffic in any manner, having road safety elements in their projects, should establish a specialised Road Safety Cell or Traffic Engineering Cell as appropriate, and this Cell should ensure that all activities of these organizations involving road traffic in any manner shall be scrutinized by this Cell for ensuring the road safety elements of the projects	All Central & State Government Ministries & Departments connected to Road Safety (Road, Transport, Health, Police, ULBs and Others)	
4.	Status: There is no Police or any other enforcement system till date to manage the traffic enforcement functions of National and State Highways. Accordingly, there is no legal enforcement and traffic management system at all for the network of highways across the whole country to enforce the traffic rules and regulations. Till an accident takes place, there appears no responsibility of State Police to carry out any enforcement along the highways. As per the MoRTH data (for 2019), this situation has actually caused more than 60% of all fatalities and a much higher level of all injury accidents on NH and SH network out of the total fatalities and injuries that had taken place in the total road network of the country. Action Plan: Similar to cadres like CISF (protecting industrial establishments), a dedicated cadre of Highway Police Patrol System (HPPS) with a distinct hierarchical structure and set of rules and regulations is required to be created by the Central Ministry of Home Affairs. This new force should be used by all States and the Central Agencies like NHAI, MoRTH, NHIDCL, State PWDs and other relevant agencies for managing traffic and enforcements on the highways. No NH, SH and Expressways shall be opened to traffic without engaging the HPPS. The HPPS should be equipped with the State of the Art equipment, carefully designed operating procedures to enforce road safety and law & order with highest level of strictness along the highways. HPPS can start with 25% of the 300,000km highway network and gradually increase to 50%, then 75% and finally 100% length within next 5 years.	Central Govt., Home Ministry and Finance Ministry	

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5.	Status: Traffic Police is given the responsibility of a lot (rather than the whole lot) of traffic engineering functions in cities/towns across the whole country, and therefore, it is necessary to create Road Safety/Traffic Engineering Cell in each District and city HQ of the Police Department, which should handle such requirements with requisite knowledge and skills. The present implementation of traffic control measures by police (e.g. especially traffic signal installation, timings for peak and off peak hours, installation of traffic management/calming measures etc.), which are deficient/wrong in large number of cases, and can be challenged in the Court of law. In addition, the traffic police units of the Police Department in each State is required to be trained in various aspects of traffic and road safety in general so as to develop their interest for the aspects of road safety, which never was a priority in their work culture. Action Plan: MoRTH is to work in collaboration with Ministry of Home Affairs and State Home Departments for the training of traffic police personnel on the relevant laws (M. V. Act and others) as well as modern enforcement and traffic management techniques, which are expected to be much beneficial for better and safer management of traffic.	Central/State Governments, Home Ministry	
6.	Status: The country has shortage of capacity for auditing the NH, SH and Expressway network being developed at a fast pace. IRF (India) and ARRB developed a course curriculum, with contents from established courses of FHWA, ARRB and EU and aligning some details with "Manual of Road Safety in Road Design" prepared by MoRTH&H. A six-week long course was also prepared jointly with ARRB and conducted by IAHE. Later, MoRTH has prepared a 15-Day course through IRC, which is being conducted now by many IITs and NITs in India. IRF/ARRB/CRII course trained 300 and IAHE course trained 80 certified auditors and MoRTH/IRC courses have trained some 500 auditors by now. Now, an accreditation/certification system is required to maintain a system of approval and certification of the trained auditors along with various terms and conditions for the certification/accreditation of the group of auditors, and a register will have to be maintained for updating/re-training the auditors. Action Plan: The candidates for auditors' course should have "Civil Engineering and/or post-graduate degree or diploma in Traffic Engineering/Highway Engineering/Transportation Engineering etc with minimum 10 years of experience in highway design/construction/planning/management". Each project should be audited by a team of at least two trained auditors, one of whom will be the lead auditor or team leader and the other as team member. This number will vary depending on the size of the project to be audited, and it may be based on the guidelines provided in RSA Manual of IRC. The Accreditation/Certification Body is to be created by MoRTH&H through the proposed Road Safety and Traffic Management Board (RSTMB). The quality and credibility of a large number of the auditors now used for the audits are far from satisfactory. There shall be two types of training; (i) Training for engineers on road safety of around two weeks and ii) Certification for road safety auditor of 8 weeks duration. The certified auditor shall pass through rigorous and thorough training of longer duration. There shall be a prequalification for candidates to join the certification course, and also there shall be thorough/rigorous testing to award certification. The certification of road safety auditors shall not be considered as	MoRTH & State Governments	

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	training to engineers on road safety for two weeks, which is required to raise the road safety engineering concept among the engineers of consultancy and contracting industry; but certification of road safety auditor shall be altogether a different training with prior experiences and by proving the candidates' capability during the certification training course of minimum 8 weeks. Though the road safety training can be carried out widely through many academic and research institutions for increasing the awareness level among the practicing engineers to understand the relevance of road safety in their normal works, but the certification of road safety auditor shall be done and organized centrally by the Ministry/NRSB through IAHE maintaining a registry. While the existing 15 days training using the common syllabus should continue widely throughout the country, IAHE to develop a curriculum for certification for road safety auditor for 8 weeks duration with prequalification criteria for joining the course, and also a detailed and rigorous framework for testing and evaluation before award of the certification to successful participant as auditor.		
7.	Status: Transport Department in the States are totally ignorant and indifferent about the linkage between all their routine activities and the road safety outcomes in the state. The driver licensing, vehicle registration and certification, road safety education & awareness programmes, etc delivered by the Transport Department have serious consequences on road safety. The responsibility of a major part of the entire road safety scenario in a State lies with and is directly linked to various functions of the Transport Department. Thus, a modern Transport Department with advanced knowledge and skills is required in each state to implement the globally accepted safe system approach in all their activities. Action Plan: The Transport Department in the State needs complete revamping in its structure, function, responsibility and transparency in operation with measurable performance indices linking to road safety outcomes.	State Governments	
8.	Status: All highway and traffic engineers with Civil Engineering background, involved in development of road infrastructure in any capacity, need to be trained to develop safety culture and be equipped (trained to be skilled) to tackle various road safety problems as part of their normal works. The present structure of the curriculum for the undergraduate and post-graduate programmes, existing in the Institutions as per AICTE norms, does not have mandatory and sufficient coverage of road safety with any clarity. Action Plan: Make formal road safety engineering training a mandatory requirement as a certification for consulting engineers and contractor's personnel. A structured curriculum on road safety is to be developed for implementation through all the technical institutions in the country having the traffic & transportation discipline as a specialisation. Implement sustainable (bi-annual) training in road safety and construction safety as a mandatory requirement for engineers and technicians of consulting and contracting firms involved in design and construction of highways. The Civil Engineering curriculum taught in the country at undergraduate level maybe amended through AICTE/UGC for inclusion of a specific core subject/course on road safety to develop specific interest and necessary basic knowledge and skills from the	Central & State Governments, MoRTH	

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	graduation level.		
9.	Status: In a very large number of cases till date, there is no scientific test done for driver licensing. In absence of a common comprehensive and automated driver testing/licensing procedure, and also due to missing capacity of the motor vehicles departments (i.e. Transport Departments in the states), the licensing procedures implemented are primitive and highly damaging to the cause of road safety. Action Plan: De-link the driver licensing procedure from the general RTO functions, and create a centralised driver license processing unit in all States with specially trained inspectors assigned/authorised for the automated and scientific test at district level. Develop a unified automated testing/licensing procedure to be adopted by all licensing authorities in the country uniformly. Revise policy & law to make it mandatory to renew the licenses procured/issued before 2021, by going through the newly developed testing standards. Also, develop a common computerized test in English and all regional languages for the aspects of safety and hazard perception for all applicants of driving license (for car, truck, bus and 2-wheeler), which may be made mandatory to pass for all licensed drivers.	State Governments, Transport Departments	
(c)	Funding for Road Safety		
1.	Status: The funding has been a serious issue for all types of road safety related actions and interventions, like road safety education, campaign, implementation of audit recommendations, or any other road safety action, etc. The Global Plan for second UN Decade of Action (2021-2030) also has identified the sustainable funding as a most important requirement. Action Plan: Create a dedicated and sustainable non-lapsable Central Road Safety Fund (CRSF) at the Centre (may be called as National Road Safety Fund: NRSF) and similarly in States (maybe called State Road Safety Fund: SRSF) with budgetary supports as well as regular contributions from CRIF, motor vehicle registration/tax, penalties and fines, surcharge on insurance premium, state level cess on petrol and diesel, and a share from all other road transport related revenues. Also review and examine the fund opportunities from other public as well as private sector organizations, including possible contributions from philanthropists and as part of CSR with tax benefits. Constitute a 'Safety Credit' system – and the states showing progress in the effectiveness of safety measures (by decrease in the number of fatalities & accidents) shall be provided with additional funds to improve the safety in its road network. A Fund Management Committee shall administer the funding at Centre and State levels for total transparency and facilitating monitoring by general public as well.	Central Govt, Finance Ministry and State Governments	
2.	Status: The RSA recommendations during design, construction and O&M stages never get implemented as these can be implemented only with additional cost, to be allocated from special reserves. This is because the TPC is calculated based on a deficient design and the contract is awarded with design deficiencies with lower costing, and in the competitive bidding this becomes even much lower than the TPC. The aspects missed in the design (for a safe and forgiving road) will have an	MoRTH, NHAI, NHIDCL, NRIDA, State PWDs, Finance Ministry	

Sl. No.	Road Safety Issue & Action Plan	Responsibility	Timeframe & Budget
	impact on the safety situation during construction as well as during entire O&M period with serious adverse safety outcome. Action Plan: As per Article 18 of MCA, there should be a Reserve Fund for road safety provisions required as per the recommendations of the RSA made at different stages. It is proposed that 5% of CRIF should be allocated to this specific requirement for enhancing safety of the high speed road network developed in the country (NH, SH and Expressways). As per globally accepted norms the MDBs recommend 10% of project cost for road safety frtunes.		
(d)	Updating Legal System for Traffic		
1.	Road Traffic Act (RTA) or Road Safety Code (RSC) needs to be enacted to define the responsibilities of all different road users on the road without any ambiguity and discrimination. This means that the Road Safety Code is a law to be obeyed in letter and spirit for the reasons of avoiding any road safety risk, and this is likely to make or obligate the road users to behave more responsibly. This Law is likely to change the vehicle insurance regulations to be more logical making it more optimal and compatible with the western world. At this time, the fault or a deliberate wrong use of the road is treated as ignorance, which is a bliss. At present, the rules under the M. V. Act and IPC can be applied by the Police in any way to penalise an innocent road user, while even the contraflow traffic is also not totally illegal. Even the MVAA 2019 has not been possible to be implemented yet fully because of not being able to shift to technology as an enabler to make any significant and real difference in road safety outcome. Action Plan: Enact the law to make the road traffic (individual road user) more responsible, civilised and more accommodative in behaviour for use of the road. This will also make it mandatory and self-enforcing about wearing of helmets, seatbelts and high visibility safety jackets for all motorcyclists, vehicle drivers, and others to comply with the relevant specifications of the law. This will ensure that Police will also not be able to penalise unduly under any circumstances and no road user will have to plead for ignorance. Also, the law shall truly and transparently enable the Enforcement Agencies to penalise any violation of road users on non-compliance of instructions given through traffic control devices like signs and markings.	MoRTH, IRC, Law Department in Central Govt.	
2.	Status: Large number of drivers, especially the truck drivers in the country have multiple licenses issued from different places/states, which makes it difficult for the Police to suspend the license of the unsafe drivers, as he/she uses another license and continues to drive. Just like the Credit Cards, which are registered in a Centralized National Centre (as a result of which we can use it anywhere in the country/world as the unique identification), the driving license when issued must be registered centrally by a Central Agency/Body and biometric details need to be included in the chip which will show and prevent if there is any duplication anywhere in the country. This is an urgent requirement to clean up the driver licensing system of the country, which may be taken up by the Apex Body NRSB, which when actually created, will take the bull	MoRTH and State Governments	

Sl. No.	Road Safety Issue & Action Plan	Responsibility	Timeframe & Budget
	(road safety issue) by its horn, thereby paving the way for a major improvement in the driving behaviour in India. Action Plan: A countrywide centralized driver license register is required to be prepared (with biometric database) as one single database for the whole country, similar to a Credit Card System. A collaboration between proposed National Road Safety Board (NRSB) and Insurance Information Bureau of India (IIBI) will be required to bring in several such reforms for improving road safety scenario. Also, the Aadhaar Card with its biometric database should be linked to the driver license to eliminate the possibility of duplication anywhere in the country, which may create a much better skilled driving community for enhancing road safety. To facilitate linking of Aadhar to Driving License of existing drivers along with ensuring appropriate knowledge and skills for driving, NRSB and IIBI should develop a 2-3 hour long online Computer Based Training (CBT) for which a small fee may be charged, through an established Road Safety Expert Organization, for issuance of new license duly linked to Aadhaar along with special benefits in the insurance premium. Existing license should be considered invalid without CBT certification within a specified time duration, say 1 year.		

B. Development of a Common Robust Crash Database System for All States (E0)

Sl. No.	Road Safety Issue & Action Plan	Responsible	Time Frame & Budget
1.	Status: State Crime Records Bureau collects accident data through police personnel of police stations, which is actually only a crime record (not an accident record) and surely not a comprehensive database for determining road safety interventions to be targeted. Accident data recording system is to be adopted uniformly across all States (not as crime records through FIR) for roads in urban and non-urban areas in a standard format, for making it possible for use simultaneously for accident investigation, accident reconstruction, and also adjudication of the accident cases. Therefore, a comprehensive road accident database management system is required to be developed, which will facilitate realistic causal analysis of the accidents to effectively guide the concerned departments, district road safety committee and the State Road Safety Board to plan, design, implement, monitor and evaluate the targeted road safety interventions. Without reliable continuous data for longer period and a data-led diagnosis and management of the leading road injury problems, there will be no significant reduction of the road safety problem by reductions in accidents, as well as crash risks or severity of crashes. We require a common system and data structure across all states for country-wide data compatibility and compilation. There is an inescapable requirement to have standard accident analysis module for accident investigation and adjudication to be uniformly used across the country. Action Plan: Develop a smart database system using modern method of data collection using hand-held electronic devices,	MoRTH & State Governments	

Sl. No.	Road Safety Issue & Action Plan	Responsible	Time Frame & Budget
	like that of RADaR, iMAAP and iRAD. The data shall be collected as per a standard/improved format like IRC:53, allowing easy analysis for producing a detailed annual report and also to be used simultaneously by Police, Works Department, Transport Department, Insurance Agencies and Health Department to help develop and implement required road safety interventions. It should be sharable to any other agency involved in accident research and road safety education. The responsibility for collection and management of Crash Data must rest with the Police only, who will be trained with the modern method of data collection as well as database maintenance and management. Crash Database system shall be useful for the road engineers, to identify accident blackspots and to develop countermeasures; Police to carry out targeted enforcement measures; Transport Department and NGOs, to determine focus areas for the road safety education and campaign, and so on.		

C: Engineering of Roads – Planning, Design, Construction, and Operation (E1)

Sl. No.	Road Safety Issue & Action Plan	Responsible	Time Frame & Budget
(a)	Planning & Design of Road		
1.	Status: The planning for the roads, especially the major roads like NH, SH and Expressways have to be rigorous about the true need of the road and the extent of the development required (i.e. 2-L, 4-L, 6-L or Expressway standards), which is at present quite adhoc and unsystematic. This should be governed by pure developmental objectives. The country does not have a 5-year or 10-year or even 20-year road development plan identifying the O-D pairs to be provided with better/higher category of road based on the projected traffic demand or other development objectives. Each state's separate independent expressway development plan is a clear example of this, leading to non-coherent, sub-optimal and wasteful network development. They are trying to hasten the network development quite often, by shortening the legitimate time for planning and even execution of the construction activities, resulting in innumerable problems of road safety in all such developments. Result of incomplete investigations for road projects due to fast-tracking the planning and design phase eventually result in excessive time and cost overruns in such projects. A 10 year Road Development Plan should be prepared to guide the road development in the country. Action Plan: The planning of road is a very exhaustive exercise. One needs to examine all possible options and then optimize the development for the true need of the beneficiaries. This in turn entails exhaustive investigation and preparation of design details. When design is undertaken on this basis, the construction shall be completed in all respect without time and cost overrun.	MoRTH, NHIDCL, State PWDs, NRIDA, Concerned CIVIC Body	

Sl. No.	Road Safety Issue & Action Plan	Responsible	Time Frame & Budget
	All designs must provide for self-explaining and forgiving roads, as per the best know-how and research results, available from within the country as well as around the world. These are expected to minimize consequences (severity) of all accidents. Due to the fact that highways in India are used by vulnerable road users as well, all requirements of different types of vulnerable road users must be provided for as per the standards, specifications and best practices in the world.		
2.	Status: Traffic flow behaviour (determined by the mix of traffic) controls a significant part of the road safety, that can be achieved for a road infrastructure. The safer design and operation will create safer traffic flow with minimum or no possibility of accidents. Highways passing through towns and villages (and not having bypasses) must have an urban cross-section in due consideration of all modes of traffic, that are likely to use the road in that short stretch. A large number of blackspots on highways are on such locations of the network, as high speed traffic mixes with local traffic of vulnerable modes (pedestrian, bicycle, and other NMT modes, etc). Action Plan: Review and examine the speed limits of all National and State Highways, wherever they are passing through any developed area or towns and villages, where the highway traffic is required to mix with local traffic. For all such locations/stretches of highways, provide controlled/legitimate speed limit with appropriate control measures of signs, markings and traffic calming measures, in accordance with IRC:99-2018 and best practices. Besides, while there should be consistency in design, such road stretches must have a different cross-section based on the mix of traffic, with all critical elements on the highway making them self-explaining. As physical measures like hump often becomes less safe, raised bar markings should be adopted with transition allowed, for all new developments these should be part of the initial design itself along with the gateway treatments, for such locations where legitimate speed is likely to be violated.	MoRTH, NHAI, NHIDCL, State PWDs, NRIDA	
3.	Status: Road Safety Audit is a highly established tool/technique to enhance road safety in the road network. Mandatory Road Safety Audit (RSA) should be adopted and enforced at all stages of planning, design, construction, and operations & maintenance of all categories of roads uniformly. The recommendations of RSA at any stage must be mandatorily complied to by adoption/implementation of the suggested changes/improvements. But, it is rarely seen to be so in most cases of Road Safety Audit, the findings are not appropriately addressed by the Road Authorities. Action Plan: Ensure Road Safety Audit (RSA) by certified auditors as a mandatory requirement at all stages of road development, especially at detailed design and pre-opening stage of all highway projects, and the time and cost of RSA including the implementation of the recommendations shall be added to the duration and cost of design of all highway projects managed by NHAI, MoRTH, NHIDCL and State PWDs as well as NRIDA. All steps of audit delivery including the initial meeting and audit completion meeting with the Client must be completed, with submission of audit report and exception report etc, for every road assigned for audit, as per the IRC Audit Manual (IRC:SP:88). The design stage audit shall be done by a team of auditors led by a suitably experienced auditor.	MoRTH, NHAI, NHIDCL, State PWDs, NRIDA and all other Road Authorities	

Sl. No.	Road Safety Issue & Action Plan	Responsible	Time Frame & Budget
4.	Status: The PPP projects in the country have generally been found to be left incomplete in almost every case, due to various reasons starting from design deficiencies to the project management anomalies and such other serious issues. All of these roads are found to have serious shortfall in road safety features, especially due to curtailment of those required features to make these projects viable under PPP mode of implementation. As a result of this, these roads have remained unsuitable for safe traffic movement, resulting in higher road accidents on these roads. Action Plan: All road projects (NH, SH and Expressway) delivered or under implementation as BOT/DBFOT or EPC projects are to be audited mandatorily (by adopting a special programme) for identifying any deficiency linked to potential safety hazards resulting from the shortfalls in the design and subsequent construction. MoRTH&H/NHAI to arrange required funds for implementation of the recommended measures of improvements/modifications, which were missed in the contract/concession, for making it a safe and forgiving highway.	MoRTH, NHAI, NHIDCL, State PWDs, NRIDA and all other Road Authorities	Budgetary provision should be made for mandatory audit of PPP roads
5.	Status: Every NH, SH and Expressway, as part of the primary network in all states, should be attended to for improving them in relation to road safety performance. These primary roads cater for 75% of road travel in the states. The State PWD (NH Circle and the State PWD Circle) may use the accident records of these roads to select roads for successive years for road safety related improvements in a prioritized manner. Action Plan: An operational guideline (a proper SOP) is to be prepared on road safety for each type of road being implemented or operated (2-L, 4-L, and 6-L) – NH and Expressway - only for provisions required to ensure safety of all road users covering all aspects of road safety to be adopted in development (planning and design), construction, and in operation and maintenance. These are to be made part of the Manual of Specifications and Standards of MoRTH so as to be integral part of the Concession Agreement, and all RSA recommendations that are reviewed and accepted by Independent Engineer, are to be implemented by the Concessionaire. Also, the provisions in revised/updated IRC codes and manuals (the current) shall be mandatory irrespective of the date of award of contract/concession..	MoRTH, NHAI, NHIDCL, State PWDs, NRIDA and all other Road Authorities	
6.	Status: On major highways (except the expressways), which are 4 and 6-Lane highways in India, median openings are allowed/provided for right turns and U-turns, although the 6-Lane highways are not supposed to have any such provisions without grade separations. Such provisions in highways with median of 4.5m or less/wider, when provided without turn lane or storage lane from both directions, poses very high risk for the motorists causing rear-end collision accidents. Action Plan: In all such cases, where the median is 4.5m or more wide, turn/storage lane shall be made out of the median from both the directions. In cases with narrower median, extra carriageway width shall be created with required minimum land acquisition to provide for a design of safe Median U-Turn (MUT) or storage lane from both directions at the intersections, which have proven to reduce all right and U-turn related accidents drastically. At location where land	MoRTH, NHAI, NHIDCL, State PWDs, NRIDA and all other Road Authorities	

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	acquisition is extremely difficult, carriageway width of through lanes can be reduced (with proper warning and traffic calming measures) so as to widen the median, which can be utilised for providing the safe storage lane for most vulnerable users like 2/3-wheelers.		
7.	Status: Intersections of National Highways and State highways contribute to major safety risks, and 70 to 80% of all blackspots identified by MoRTH so far are found to be the uncontrolled junctions of these high-speed major highways. The Client (the Road Authorities) as well as the Consultants take little care about the intersections during preparation of the detailed design for the highways (i.e. DPRs) or even at construction stage, which result into creation of grossly substandard junctions with poor sight distance and seriously deficient geometry, resulting in repeated accidents at the intersections. This is mainly caused due to the fact that at the time of land acquisition, the land required for intersections are not estimated adequately/correctly (due to not properly designing the intersections as part of DPR), and only land for 4/6 laning of the road (only the through lanes) is acquired without the extra land required for intersections. Action Plan: As part of the detailed design (i.e. DPR) the full design of the intersections should also be done and correctly assessed land be acquired at the first place. A perspective plan shall be made for each intersection which is a proactive approach and intersection design shall be done in such a way that traffic approaching from any arm at any time of the day should not be able to travel at the normal highway speed, while passing through the intersection. It is to be ensured that the channels of movement or traffic path of every turning movement (LT, RT, ST or any other) must be abundantly clear to traffic approaching from all arms without any ambiguity, and intersection must not give a feeling of a wide area for flexibility of unwieldy movement. DPR shall be considered complete with horizontal layout and vertical profile design for the entire junction and all arms of the junction (major road for 200m and side road for 50m). 'Roundabout Junction' shall also to be considered for highways, as it provides uninterrupted flow with the highest degree of safety, when provided with clear visibility for 50 to 100m on each arm of the junctions in urban and non-urban areas. The parking or stoppage of vehicles must be totally banned, including even for pick-up/drop-off stops which could only be permitted in medical exigencies, within the roundabout and 50-100m length of each arm, with 24x7 enforcement of the highway. It is also required to identify additional/extra space at complex and large area intersections, having all traffic movement paths completely defined, and creating raised channelizing islands with beautifications and providing necessary signs and markings for guiding the traffic at any point during negotiation through the junction.	MoRTH, NHAI, NHIDCL, State PWDs, NRIDA and all other Road Authorities	
8.	Status: The country has been taking up the blackspot rectification programme (since 2015) as the only road safety activity in a vigorous format with topmost priority and unlimited funds made available. But during these 5 to 6 years and more the road safety outcome has shown a continuous deterioration in terms of increase in fatalities and injuries. A careful	MoRTH, NHAI, NHIDCL, State PWDs, NRIDA and all other	

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	analysis will show that the blackspot rectification is being done without actually required blackspot investigation/analysis and only intuitively deciding on short-term and long-term mitigation measures in an ad-hoc manner without following scientific and technical procedures required to identify the logical/appropriate countermeasures and their implementation plan. The result of this has been that the same rectified blackspots have remained as blackspots even after implementation of the ad-hoc countermeasures, and new blackspots are also being continuously developed on the newly built and upgraded roads. Action Plan: Blackspot rectification must follow the standard technical procedure of investigation and identification of countermeasures following the IRC/International guidelines. Besides, to come out of this vicious cycle of creation and rectification of blackspots perennially, there has to be better design and implementation of road projects by plugging all loopholes in the system, following the safe system approach. Further, all blackspot rectification works should be followed up with “before and after” study to showcase the benefits derived from the blackspot rectification in terms of benefit-cost ratio or first year rate of return, etc.	Road Authorities	
9.	Status: The road networks of urban areas are very poorly managed in most cities/towns with regard to the overall requirements of traffic and safety requirements in terms of cross-sections, geometry, signs, markings and other road safety appurtenances. Due to the lower urban traffic speed the severity of accidents are no doubt lower, but the road safety risks are very high in most parts of the urban networks due to higher density of traffic and major deficiencies in the provisions for vulnerable road users. The school zones are generally found to be highly unsafe due to the inappropriate speed and absence of pedestrian facilities. Urban Local Bodies are not competent, due to absence of Road Safety/ Traffic Engineering Cells, to take care of the traffic/road safety problems existing in their jurisdiction. Action Plan: All Urban Local Bodies (ULBs) are required to assess the road network through their Traffic Engineering/Road Safety Cell and establish the road safety performance levels based on the data on traffic accidents of various severity levels. Also, ULBs should initiate projects to provide wide footpaths and safe pedestrian crossings for all roads having land uses on both sides, and especially for the roads where school exits, at least to the nearest bus stops as well as along various walking routes to school, in all towns and cities. Every urban street should have viable continuous footpath and protected at-grade crossing facility.	State Governments, City Corporations, Urban Local Bodies	Dedicated non-transferable funds are required to be provided for requisite intervention.
10.	Status: The road markings currently provided in highways and urban roads show very poor reflectivity during wet conditions and at night. It has been seen that 17.3% of all road crashes in India during 2019 occurred under adverse weather conditions (like rain, fog, etc). Action Plan: Road markings can affect a reduction of 28.3% in crashes, if they are made brighter and visible during dark hours and inclement weather. As per developed country experiences, crashes shall be reduced by 25%, if road markings	MoRTH, NHAI, NHIDCL, State PWDs, NRIDA and all other Road Authorities	

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	are also provided wet-reflective. Therefore, there is a requirement to provide best reflective road marking system in highways, which can provide Lane Departure Warning (LDW). This shall prevent a large number of fatal crashes annually, with a benefit-cost ratio of 20:1. Shoulder rumble strips and/or ribbed edge line marking are already adopted in western countries as a most promising method of lane departure warning system. Some highways and expressways in India are now adopting ribbed edge line marking system, and such measures should be made a part of IRC/MoRTH standards and specifications.		
11.	Status: In India the highways are not access controlled except the expressways. Therefore, such high speed highways are also used by all types of vehicles, like 2-wheelers and other slow moving vehicles. No doubt, in some stretches the service road concept comes to save the situation by segregating the local traffic, but the 2-wheeler traffic always use the main carriageways of the highways. But, due to limited right-of-way available, there is no provision for separate segregated right-of-way for vulnerable road users such as cyclists and motorcyclists, although in some critical locations pedestrian facilities are provided. Action Plan: In the country where 80% of the motor vehicle fleet is motorcycles, it is necessary to develop policy guidelines for creating segregated 2-wheeler lanes in development/upgradation of highways, if these vehicles are required to be allowed in high speed facilities. Segregated exclusive motorcycle lanes as developed in south-east Asian countries like Malaysia and Indonesia should be adopted along inter-city roads for better safety of motorcycles. IRC also should consider developing Standard/ Guidelines for such developments in their future plan of action for road safety. Similarly, it is suggested to integrate cycling and walking into transport policy and action plan for cities by encouraging cities to adopt Sustainable Urban Mobility Plans (SUMPS), where all wider streets with certain ROW width shall be provided with exclusive segregated lanes/spaces for such sustainable modes. Besides, for all roads required to have the mixed modes for special reasons, the traffic should have a default speed limit of not more than 30 Km/h.	MoRTH, NHAI, NHIDCL, State PWDs, NRIDA and all other Road Authorities	
12.	Status: As seen in case of the most clients of road infrastructure projects, i.e. MoRTH, NHAI, NHIDCL, State PWDs and other Road Authorities, do not have capacity and skills to check the designs and DPRs (detailed designs) of the projects. Also in many cases, undue urgency results in awarding the contract for construction without the final checks even by the Client about the real requirements from the project. All such projects have been found to be seriously deficient in providing safe and forgiving infrastructure. Action Plan: As there is absence of capacity and skills for review and checking of the detailed designs of the roads by the clients of such infrastructure projects, such projects have serious and far reaching consequences and fall outs in terms of road safety risks causing unabated rise of fatalities and serious injuries from road accidents. To avoid or ameliorate such situations, a system of Third Party Proof Checking (TPPC) of the detailed designs (DPRs) must be considered, as a routine	MoRTH, NHAI, NHIDCL, State PWDs, NRIDA	

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	activity as part and parcel of the planning and design of the road projects, to make sure that the design flawless is ensuring all requirements of road safety. However, to avoid falling into the trap of low quality again, only quality based selection (QBS) method be adopted for such TPPC of detailed designs.		
13.	Status: There is a standard requirement to implement the Advanced Traffic Management System (ATMS) for every high speed facility (highways and expressways), but there is no single highway (even expressway) till date having a complete and operating ATMS across the whole country. The reasons for it are well known, as the detailed design carried out for the highway (by a consultant) does not include the design of an appropriate system (i.e. ATMS), even when the detailed specifications etc are provided in a widely circulated document by NHAI in 2016 and then in 2020 and again update in February 2021. Without such a system (ATMS), the high speed highway infrastructure is likely to be highly unsafe, which is established by the data, for the country about road safety scenario, in respect of all these high speed highways. Action Plan: Advanced Traffic Management System (ATMS) should be a mandatory part of the scope of road development works in relation to multi-lane high speed highways. As seen in the past, detailed design of all such ATMS, as part of the multi-lane highways, was done by the Consultant, who prepared the DPR (detailed design) for the highways. This job should be entrusted to actual domain experts or agencies involved in implementation of such systems.	MoRTH, NHAI, NHIDCL, State PWDs	
14.	Status: The activities of the Road Authorities and Consultants, in terms of planning and design outputs, are not generally available to general public (even to the technical expert public) as per the requirement of public consultations. As per general/common experiences in India, the public consultation about road infrastructure projects are highly inadequate (found to be only a ticking requirement fulfilled without anything really done), just because of the fear of possible objections that will be created through such consultations. Thus, valuable inputs in terms of actual requirements (of the actual users) of the project are never revealed, and the built infrastructure remains deficient, unsafe and often totally unused by the public. Action Plan: There must be greater transparency and accountability for the Road Authorities / Agencies / Consultants and Concessionaires/Contractors involved in the design and construction as well as maintenance (O&M) of the road, in terms of the entire plan and design for public viewing/scrutiny and consultation as a routine requirements. Though this is an important requirement as per the guidelines. The road infrastructure, furniture, wayside amenities and other associated infrastructures must be planned and designed for serving the road users, and therefore, their actual need must be identified through detailed public consultations, which will easily eliminate all associated road safety risks.	Government of India, MoRTH, NHAI, NHIDCL, State PWDs	
15	Status : The time has come to strike a balance between mobility and safety in highway network where high speed corridor passes through urban area or a settlement, where VRUS are exposed to high speed traffic. It is also to be appreciated that if the speed is curtailed to 10 to 15kmph in a highway which normally operates at 80 to 100kmph, it is highly unsafe	MoRTH, NHAI, NHIDCL, State PWDs	

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	as well as inconvenient to traffic. This has invited criticism and made the Ministry to decide and ban road hump in all NHs. The road hump of 3.7m chord length permits passing speed of 10 to 15kmph only (IRC:99-2018). Action Plan: A road hump can be of longer chord length also as described in IRC standard (IRC:99). A hump with chord length of 9.5m facilitating comfortable passing speed of 50kmph is surely acceptable for the mixed traffic situation where the highway is passing through intensely developed urban area. Global research has established that even if a vehicle at 40 to 50kmph speed hits a pedestrian or cyclist in the controlled speed zone, the chances of death is hardly 15-20% only. Thus, for those locations, which warrants deliberate reduction of speed, this solution of speed hump of longer chord length along with raised bar markings in warning zone may be promoted. The most of the other sections can still be managed with psychological treatment using thermoplastic rumble strips (raised bar markings). Thus, there shall be withdrawal of banning of road humps on all national highways; but it shall be dealt carefully as case specific solution with sound engineering judgement and decision.	and all other Road Authorities	
(b)	Construction & the Contract for Construction		
1.	Status: In case of every road construction project in India, where an existing road is upgraded, the traffic management for general public safety is always a challenge for any construction agency. Further, in most cases of contracts for road construction projects, this arrangement required for safe traffic management is incidental to the construction activities, for which no separate/specific costs are provided in the contract. Besides, the civil works contractor has no expertise nor any interest in public safety, which is actually incidental to him anyway as part of the construction works. As a result, the public safety for operating traffic is in the peril, in absence of any established enforcing method of traffic management to be followed, in spite of the detailed provisions of IRC:SP-55-2014 being part of the contract. Action Plan: The Construction Contracts should include cost of traffic management during construction based on appropriately prepared estimated BOQ items, for the traffic management at the construction zones, prepared along with the detailed design of the project (i.e. along with the DPRs). Even with this situation, there is no guarantee of better and safer management of existing traffic, as the civil works contractor does not have the required expertise.	NHAI/MoRTH/State PWDs/State Road Development Corporations/ State Road Safety Authority	
2.	Status: Based on some of the road construction projects, even when the BOQ based cost of the traffic management tasks have been included in the awarding of the construction contract, the contractor is not able to deliver the public safety of the operating traffic (at the construction zones) by adoption of proper traffic management, as there is no expertise and interest of the civil Construction Agency for this specialised activity. Action Plan: There should be a Third Party Contractor, specialised in traffic management equipped with all required traffic	NHAI/MoRTH/State PWDs/State Road Development Corporations/ State Road Safety	

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	control and traffic management devices and trained manpower, for managing the traffic safety during the entire duration of the construction. This will be a new type of contractor for managing traffic only at the construction zones, and they will have tripartite agreement (with Civil Contractor and the Client) for the specialised job they will be doing. Managing traffic safety and steady progress in construction activities require specially designed and implemented Temporary Traffic Management (TTM) arrangements with wide range of traffic signs, markings, reflectors and barriers, etc. Well prepared TTM arrangements ensure safer environment for all road users and construction workers, and also facilitates quick/immediate detection of any incident for total safety at construction zones.	Authority	
3.	Status: The traffic control devices being implemented in India during construction stages are not of forgiving nature (mostly non-standard New Jersey type or other types of barriers located in a highly unsafe way. The fatality and injury rates from accidents involving hard barricades and other barriers during construction are very high. The warrants for logical safety barriers for construction zones are not strictly followed, which increases the accident rate. Action Plan: The manual for traffic control at construction zones (IRC:SP:55) should be elaborated to detail the requirements during various construction stages for road, culvert and bridges. The manual should also explain the various new innovations of traffic control devices of forgiving nature suitable for Indian conditions.	MoRTH, NHAI, NHIDCL, State PWDs and all other Road Authorities	
4.	Status: Most of the Road Authorities use the e-tendering procedure for procurement of contractors for construction of road infrastructure. But, many contracts are being awarded at even 40% to 50% lower than the estimated cost of the project based on detailed design based costing (following a so called competitive bidding and a selection process). Though e-tendering for all highway projects is already in vogue for quite some time in NHAI, MoRTH, NHIDCL and most State PWDs, improved transparency, stringency, rigor and impartial selection were still a far cry in the selection process of consultants, contractors and concessionaires with highest credibility and capacity for timely delivery of safe infrastructure. Action Plan: A recent Finance Ministry Notification has abolished the Least Cost based selections, and now there can be award of construction contracts at the estimated lowest viable cost only, based on Quality-cum-Cost based selection. A review and revision of the existing contracting system and arrangements (PPP/ DBFOT & EPC and all others) is urgently required to incorporate encouraging and punitive measures/clauses for improved safety measures and lack thereof respectively during construction and maintenance of all highway projects (i.e. for all types of services delivery).	MoRTH, NHAI, NHIDCL, State PWDs and all other Road Authorities	
5.	Status: A detailed review of all types of existing contracts (actually these are modified FIDIC contracts and not strictly FIDIC contracts), used by MoRTH, NHAI, NHIDCL, and State PWDs and other Road Agencies. These were taken up by NHAI through the consultants, and an exhaustive review based recommendations for necessary modifications in the respective contracts are already available with NHAI. All these contracts have glaring lacuna in terms of specific provisions required	MoRTH, NHAI, NHIDCL, State PWDs and all other Road Authorities	

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	for enforcing timely delivery as well as for achieving the targets of a safe and forgiving infrastructure, as each of the contract leaves a lot of loopholes in the contract, for the Contractor/Concessionaire to escape even when they do not perform. These existing contracts are not only unfair to the Contractor, but they also do not have control mechanisms for the Client to work in unison with the Contractor for delivery of the best product. Action Plan: Update all types of contracts used by MoRTH, NHAI, NHIDCL, State PWDs and other Road Agencies, which are not actually FIDIC contract in a true sense. These will require substantive modifications along with major modifications in the provisions of the MCA, which also has a large number of shortcomings.		
6.	Status: In all PPP concessions or EPC Contracts, the Road Authorities have been entrusting the implementation of the Advance Traffic Management System (ATMS) to the civil works contractor, who does not have any expertise or interest in providing the best system, even where the design is very good. It is unreasonable to include this work of ATMS in the contractual responsibilities of the civil works contractor. Experience has shown that, such a contractor has always provided non-standard cheap equipment as the components of ATMS (which are often not the outdoor equipment), which maybe meeting the specifications, but lasted for just a season (a few months) only, and all such non-functional equipment are available to be seen along many highways as the eyesore of the highway developments. None of the sub-systems in all ATMS implemented so far have worked beyond a few months to provide the services as envisaged from ATMS. ATMS is a primary requirement for enforcing the traffic discipline along a high speed highway to derive safety in the operation. Action Plan: After the detailed design of the ATMS is done by a consultant with the domain expertise, the contract must be awarded to a contractor having similar domain expertise only for the implementation. This will require a separate contract with the same civil works contractor also for supporting the ATMS contractor for the civil works required for the implementation of various electronic sub-systems of the ATMS. Such a true ATMS is likely to be with a higher cost of the highway being developed, and therefore, there has to be an innovative financing/contracting system to guarantee the working of the ATMS in a sustainable way for long periods. This is possible by a PPP contract, in which 60-70% of CAPEX will be paid upfront and rest 30-40% will be paid along with OPEX components and interests in a quarterly plan of payment over a concession period of 10-15 years. This will ensure minimum or no downtime of the sub-systems and upgrading/replacing the components and sub-systems from time to time for flaw less service delivery during the entire concession period. As majority of the accidents (e.g. head-on, run-off, pedestrian-hit, and others) are linked to high speed in one way or the other, enforcement of right speed at all times along the highway assumes priority significance, and therefore, ATMS becomes most relevant. ATMS will facilitate 24x7 real-time speed monitoring along the highway, where modern IRS vision	MoRTH, NHAI, NHIDCL, State PWDs and all other Road Authorities	

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	with VIDS (Video Incident Detection System) will be used for fast detection of all other incidents along with identification using ANPR (Automatic Number Plate Reader), which will eventually lead to behavioural change.		
(c)	Operations & Maintenance and O&M Contracts		
1.	Status: The projects of road development take several years to deliver in India with excessive time and cost overruns. The engineering finish of the roads in most concessions etc suffers from such delays in completion. For example, one requirement is that the CA or Contract Agreement mentions the IRC/BIS/MoRTH codes and standards of a particular date, say IRC:67-2001. Thus, when the project either remained unfinished (in construction) till 2012 or concession period goes beyond 2012, the road safety matters related to traffic signs, markings and all other control features MUST be as per the latest version of IRC:67 only. This is so because, the use of any older codes/standards will not be legally tenable, if an unfortunate accident takes place and damages in terms of lives and properties are caused. Action Plan: All CA/other Contract Agreements are required to mention that for roads in concession or on any form of contract or any other form of operational arrangement (i.e. O&M Contracts like TOT, etc) have to comply to the current/revised standards of IRC at any point in time for all road traffic control/enforcement standards (signs, markings, and all others) irrespective of the date of signing the Contract. This is the specific requirement to be documented and enforced for all connected standards and specifications in all types of Concession/ Contract. Further, it has to be very clearly and definitely mentioned that in case of any road safety matters, only current/latest standards shall be followed for the support of all kinds of legal requirements and associated implications.	NHAI/MoRTH/State PWDs/State Road Development Corporations/ State Road Safety Authority	
2.	Status: The principle of asset management system is not followed by any of the contractors/concessionaires for the highways, especially the high speed corridors, which have serious and highly damaging implications on road safety. Timely maintenance of the road furniture, which have direct relation to the level of service in terms of safety, is critical for most road safety appurtenances. Damaged traffic signs due to vehicle impact or due to ageing (poor reflectivity), damaged crash barrier due to vehicle hit, damaged kerbs and traffic islands, and all such deteriorations of the road furniture are not promptly repaired by the concessionaire/contractor, which has serious safety risks for road users. Action Plan: The contractual provisions in all types of O&M contracts should be completely revised with strictest possible requirements on the part of contractors/concessionaires to repair and replace the damages within the shortest feasible time, to ensure safety of road users. There should be highly punitive clauses incorporated in all O&M contracts to deter such delaying techniques of the concessionaire/ contractor, which may be even by stopping toll collection for a specified period, with required publicity for general public. All such highly punitive clauses are to be included in every O&M contract to bring in discipline in the professional service system of the operations of the highways for promoting safety.	NHAI/MoRTH/State PWDs/State Road Development Corporations/ State Road Safety Authority	

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(d)	Special/Additional Requirements for Rural Roads and Hill Roads		
1.	Status: Since 25th December 2000, the country had embarked on a giant road development programme for rural roads, which had changed the scenario of accessibility to rural India completely in next two decades. Soon after launching of the Pradhan Mantri Gram Sadak Yojana (PMGSY) the MDBs got interested and engaged with NRRDA (Now NRIDA) for development of these roads in some selected States, where all the rigors of funded projects were ensured in terms of preparation of complete DPR, road safety audit of the detailed design, as well as other stages of development of these roads. In addition, road safety was specially attended to by following a standard guidelines recommended by the MDB. But, the deliveries in all other states were not seen to be as complete as in case of MDB funded states. Action Plan: Based on the learnings from the States where rural roads, especially some parts of the PMGSY road network, were funded by MDBs and the rigor followed in all stages of developments, and especially for the road safety aspects considered in the design as well as implementation, should be adopted equivalently in case of all states.	MoRD, NRIDA, SRRDAs in States	
2.	Status: With the better accessibility created by PMGSY roads, the ownership of motor vehicles, especially motorised 2-wheelers has increased tremendously in rural India. Further, with the paved roads of 3.75m (with 7.5m wide formation width) the PMGSY roads are having possibility of reasonably high speed. But, these roads are not designed/provided with geometric features to support higher speeds. Thus, any high speed travel on these roads may be highly hazardous resulting in accidents. Action Plan: As the PMGSY roads are for rural connectivity only and these are not for high speed travel, right from the design stage itself the DPR should include gateway effect designed with frequent traffic calming measures with speed-hump within the stretch passing through the villages. Thus, speed management features along with signs and markings should be essentially and strictly implemented.	MoRD, NRIDA, SRRDAs in States	
3.	Status: The PMGSY roads have transformed the rural economy by providing the easy access and connectivity of the villages. The marketability of the rural produce has increased tremendously in last two decades, and therefore, the regular traffic on these roads has increased many folds. The two way traffic on these roads requires the shoulders in good condition for uninterrupted travels and safe negotiation of traffic in both directions. Action Plan: To ensure the safe negotiation of the two-way traffic on single lane PMGSY roads of 3.75m carriageway the shoulders of these roads must be kept in the good serviceable condition. In addition, the formation width is to be maintained along with the side slopes and drains (if any) for stability of the embankment structure for safe use of the road during all seasons. While the shoulders, formation width, side slopes and drains are important the general upkeep of the carriageway free from potholes, pavement edge breaks, etc (including any damage to the signs, markings, safety barriers	MoRD, NRIDA, SRRDAs in States	

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	and all other safety appurtenances) are to be avoided by following an asset management programme for ensuring road safety along these roads at all time.		
4.	Status: The PMGSY roads are built across the country in all states without any land acquisition, and through voluntary agreement for use of the minimum extra land that are required for developing an existing rural road as a paved road with specifications of PMGSY roads. In this process the junctions between PMGSY roads and also with other higher category of roads could not be provided with best geometry, as would be normally required for a higher category of road. But, such junctions are all reasonably and quite safe under controlled speed situation. Action Plan: It is necessary to provide the positive speed restricting devices/features in the form of road-humps (with all associated signs and markings) at all junctions of PMGSY roads with any of the other roads, to maintain safe traffic operation through the junctions. One of the safe system solutions for such junctions is to provide ‘platform junction’ as already tested and practiced in Australia.	MoRD, NRIDA, SRRDAs in States	
5.	Status: The geometries of the Hill Roads are limited by the terrain conditions, and such roads are planned and designed normally with lower specifications in comparison to plains. In most cases, even in case of the the highways, the hill roads are implemented as undivided roads for two-way traffic. With sharp curves and steep gradients being the common features of the hill roads, maintaining operating safety along these roads is a very tedious task for the Road Authorities. Such conditions generally lead to hazards of head-on collision accidents. Any deficiency in the provisions of various road safety appurtenances and traffic control measures (i.e. signs and markings) may lead to higher level of risks along the hill roads. Action Plan: Regular and systematic monitoring of all road safety features (including the signs and markings) are required to be checked and updated, as part of periodic Road Safety Audit, to avert any lapse and for maintaining the highest level of safety along the hill roads. The centre line and edge line markings with road studs are found to be very useful and are recommended on all hill roads to guide the directional traffic to remain in their lanes. In addition, the very sharp and blind curves should be provided with recently developed (or any other innovatively designed) sensor based audible (along with flashing light-based) warning in addition to standard/normal traffic warning signs and signals.	MoRTH, NHAI and Road Authorities in Hill States	
6.	Status: Road side safety is a critical area in case of hill roads due to steep slopes and deep valleys along the hill roads, which have been the causes of large number of accidents involving fatalities and injuries. In all such locations, crash barriers are required to be provided to avoid all types of run-off accidents. Investigations in most cases have revealed that, the limitations of the carriageway width and available shoulders have been the prime reasons of road accidents in hill roads, where two-way traffic is operating at higher speeds. In addition, the poor provision and maintenance of	MoRTH, NHAI and Authorities in Hill States	

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	drainage system of hill roads are found to cause damages to the road, which in turn are likely to cause the accidents. Action Plan: The road side safety in case of hill roads is of most profound importance, and therefore, a regular check on the provisions (as well as conditions) of crash barrier at various locations of roadside hazards (in reference to their proper installation and maintenance) is an inescapable necessity; with regular refurbishment/upkeep of all damaged crash barriers. Along with this, the drainage network along the hill side and cross-drainage structures (structural condition and waterway) are to be maintained regularly, without any compromise, for ensuring and enhancing safety on hill roads.		
(e)	Updating of National Standards & Codes		
1.	Status: The codes/guidelines of Indian Roads Congress are generally advisory standards; but when these are mentioned in the contracts, the compliance to these guidelines become legally binding. There are several codes/guidelines which are not followed in letter and spirit in totality, and are often seen as not complied to, in many contracts of road infrastructure. Provisions in the codes must ensure that such materials/products are made available in the country. Besides maintenance of such devices should be ensured. Action Plan: Based on the experiences gathered from across the country, the guidelines need to be made better with performance observed, and the missing provisions in the guidelines also may be added for avoiding incorrect implementation. For example, IRC:119 needs to provide guidelines with design/implementation details for suitability of different types of barriers at different sites, like elevated bridge/flyover parapet, embankment, median, gore area, terminals, joining with rigid barrier including length of barrier required on either side of rigid barrier, etc, which are not adequately and explicitly covered in the existing code.	MoRTH and Indian Roads Congress	
2.	Status: There are some issues of weaknesses, inconsistencies and deficiencies in the design codes/standards, etc. IRC and MoRTH may take up an appropriate project through suitable National/International Consultants to review the standards/guidelines/manuals/codes of IRC/MoRTH/H&BIS used for planning/design/construction/O&M of major roads in the country, specifically for the requirements of road safety, to bring out the inconsistencies, deficiencies, shortfall as per international standards. Action Plan: Update the existing standards and guidelines (from IRC, MoRTH, BIS) for safe infrastructure; and these must be updated in a time-bound manner based on research and learning from past experiences in collaboration with private sector expertise, to reflect international best practices and modern technologies. All contradictions in these standards and guidelines should also be eliminated. Besides, the planning and design shall always aim for safe and forgiving design considering the interaction of the design elements, recognizing the fact that the design values are minimum required, while safety may demand better. In particular, the following guidelines shall be given urgent priority, and there are some	MoRTH and Indian Roads Congress	

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	others: IRC: SP 41-1994 Guidelines for the design of at-grade intersections in rural & urban areas IRC: 64-1990 Guidelines for Capacity of roads in rural areas IRC: 106-1990 Guidelines for Capacity of urban roads in plain areas IRC: 70-1977 Guidelines on regulation and control of mixed traffic in urban areas IRC: 119-2015 Guidelines for Crash Barrier IRC: SP:15-1996 Ribbon Development Along Highways and Its Prevention IRC: 12-2016 Unified Guidelines for Access Permission to Fuel Stations, Private Properties, Rest Areas Complexes and Such Other Facilities along National Highways IRC: 32-1969 Standard for Vertical and Horizontal Clearances of Overhead Electric Power and Telecommunication Lines as Related to Roads IRC: 38-1988 Guidelines for Design of Horizontal Curves for Highways and Design Tables (First Revision) IRC: 41-1997 Guideline for Type Designs for Check Barriers (First Revision) IRC:62-1976 Guideline for Control of Access of Highways		
3.	Status: IRC get the codes and manuals developed through voluntary services of the Members of various Committees taken from academic institutions, industries and government bodies. It has been felt by all the members of these Committees that works of developing codes/manuals are highly professional and serious level works requiring continuous and dedicated involvement of the highly experiences experts of these subject areas. Though many members of these Committees are having expertise of the subject, the available time of such working professionals do not provide for uninterrupted engagement with this work. Accordingly, the time required for developing a code is generally observed to be a few years and then it has to go through several statutory processes of approvals. This present system of preparation or updation/revision of IRC/MoRTH codes is causing lot of inconvenience in the delivery of infrastructure project. This delay also results in use of outdated design standards and technologies in accordance with old outdated codes. The road safety and traffic engineering codes have serious adverse implications in infrastructure planning, design and implementation, if the codes/manuals are not up to date.	MoRTH & Indian Roads Congress	

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	Further, there is no evidence of proactive marketing/promoting by IRC for use of these codes, although these are being referred in all SAARC countries regularly. IRC, therefore, needs to modernise its marketing approach and to provide on-line access to the codes/manual. Besides, at present there are very few road safety engineers in India. We need to take an urgent action in creating expertise in this field. Action Plan: A team of consultants is required to be engaged to prepare all road safety and traffic engineering codes/manuals of IRC/MORTH under the supervision of the Road Safety & Traffic Engineering (Technical) Committee. Such a team is to comprise at least one international and one Indian consultant to benefit from the international knowhow in addition to all local experiences. All these codes related to road traffic and road safety may be classified in two groups as (i) Traffic Engineering (TE Series) and (ii) Road Safety (RS Series) Each of these will have appropriate branding (covers/colours/designs) along with some internal layout. These codes are to follow a logical order in terms of including its information (as per some international standard), and is to include clear photographs and Indian case studies. Even some drawings or diagrams in drawing format for commonly occurring situation should be included for practising engineers to replicate easily. In each code, four colour printing and high quality photographs, diagrams and sketches should be provided. These codes must enhance the image of IRC as a leading organization (standardization body) which is capable of the timely transfer of quality technical information to its customers.		