GOVERNMENT OF INDIA
MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Indian Academy of Highway Engineers (campus),
A-5, Sector-62, Noida – 201301.

No RW/NH-34072/1/2015-S&R(B) **Dated: 21.06.2016**

OFFICE MEMORANDUM

Sub: Circulation of recommendations of the Expert Committee on "Best Practices in Road Construction" for action and compliance - reg.

Sir,

Please find enclosed herewith the approved recommendations of the Expert Committee on "Best Practices in Road Construction" for further necessary action and compliance. The concerned zones, who are requested to take necessary actions or to issue requisite circulars, make amendments in the relevant documents etc. as the case may be within a month of issue of this O.M. However, the Standing Panel of Experts will be set up by June, 2016 by S&R(B) zone itself. The full report of the Expert Committee is already available on Ministry's website.

Yours faithfully,

(Sanjay Garg),
Superintending Engineer (B) SR&T,
For Director General (RD) &SS.

To,

1. DG(RD)&SS,
2. Chairman, NHAI
3. MD-NHIDCL
4. ADG-I
5. Coordinator-I/II/III
6. CVO of MORT&H
7. JS(LA)/JS(T)/JS(Admin.)
8. C.E. S&R(B)/ C.E. S&R(R)/ C.E. (EAP)/ C.E. (Planning zone), and C.E. (Road Safety cell).

Copy also forwarded to:-

1. PS to Hon'ble Minister(RTH&S)
2. PS to Hon'ble Minister of State(RTH&S)
3. PPS to Sccrelary(RT&H).

Encl.: As above

Annex "A"

Best Practices in Road Construction: Report of the Expert Committee

Chapter 2 - Measures to promote Innovative Technologies, Materials and Equipment

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.2.1 and Cl. 2.4.1	**Principle of DBFOT and EPC Contracts:** The committee feels that there is need for the Government to declare firmly the objective and spirit of the DBFOT and EPC contracts viz.: ***"the principle of allowing the Contractor the complete liberty to design the projects; within the limits set forth in the concession agreements/ contracts/manuals/specifications"***. It must be made clear that the drawings accompanying the tender documents are only indicative and the contractor/concessionaire is free to design the project components such that the design meets the parameters prescribed in the tender documents and that there is no questionof asking for a rebate or paying extra for the alternative designs conforming to the requirements.	Agreed. For PPP projects, the manual generally provides for design and construction as per IRC codes/Ministry's specifications. Where the concessionaire intends to use an alternative material or technology to these Standards and Guidelines for delivering an equal or better product, he shall be permitted to use such alternative subject to certain conditions.	S&R (B) and EAP zone
Cl. 9.2.2 and Cl. 2.5.1 to 2.5.3	**Constitution of standing Panel of Experts:** The Committee recommends that a standing Panel of Experts needs be constituted at the national level to facilitate expeditious approvals to the proposals of using innovative technologies/materials etc. The concessionaires or contractors, who seek approval of alternative technologies or materials from the Independent Engineer / Authority's Engineer (as the case may be) and meet with disapproval or where the response is not provided in a definite time frame, should have the liberty to take these matters with this Panel of Experts. The Panel of Experts would be expected to examine such proposals and give their approval/ refuse approval within a definite time frame (e.g. one month). The arrangement of such a Panel of Experts would, in the opinion of this Committee, provide for a method of collective decision at the national level and help achieve expeditious approvals and promote the use of appropriate technologies/ alternative materials. Dispute between the concessionaire/ contractor and the Independent/ Authority's Engineer regarding technical matters (e.g. Design methodology, interpretation of code etc.) should also be referred to the above panel for giving decision.	Agreed in principle, however, recommendation of Standing panel of experts should be approved by competent authority.	S&R (B) and EAP zone

Chapter 2 - Measures to promote Innovative Technologies, Materials and Equipment

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.2.2 and Cl. 2.5.4	**Composition of standing Panel of Experts:** The chairman of the Panel of Experts should be a reputed professional with proven experience/background in construction and designs of highways. Out of the other members one member of the Panel of Experts could be an expert in Highway Engineering / Pavement Technology, another could be drawn from the field of structural / bridge engineering and the member secretary should be drawn from the Government e.g. Chief Engineer of the MORTH/ NHAI.	Agreed in principle.	S&R(B) zone
Cl. 9.2.2 and Cl. 2.5.5 to 2.5.8	**Functioning of standing Panel of Experts:** **i.** The Panel of Experts should meet frequently preferably once a month to deliberate on the matters referred to it. **ii.** The Panel of Experts should have the power to decide on the matter referred to it by the Independent Engineer/ Concessionaire (or Authority's Engineer/ contractor in EPC contracts) as regards dispute if any, arising out of the decision of the Independent Engineer in implementation of innovative technologies, materials, equipment in accordance with the above clause. **iii.** The Concessionaire/ Contractor who wishes to adopt a new, innovative technology in accordance with the above clause should have the liberty to refer the matter to this Panel of Experts with adequate details e.g. specifications, applicable codes/ guidelines, laboratory results, field experience, literature on the matter etc. The concessionaire should have the liberty to make a presentation to the Panel of Experts. The committee should hear the Independent Engineer also. **iv.** The Panel of Experts should have the liberty to seek advice from other experts (e.g. tunnels etc.) as may be required. The expenses towards such expert advice should be borne from funds made available to the Panel of Experts and the Chairman should have the freedom to approve and incur these expenses. The expenses of additional tests etc. could be borne by the concessionaires/ contractors.	All are agreed in principle.	S&R(B) zone

Chapter 2 - Measures to promote Innovative Technologies, Materials and Equipment

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.2.2 and Cl. 2.5.9	**Functioning of standing Panel of Experts ... contd.:** v. Being in the realm of highly technical matters, the Panel of Experts should enjoy the status and immunity of a panel of arbitrators as per the Arbitration and Conciliation Act. This arrangement would enable the Panel of Experts to take decisions swiftly and purely conforming to its professional mandate.	Agreed in principle.	S&R (B) and EAP zone
Cl. 9.2.2 and Cl. 2.5.10	vi. The Panel of Experts would have the power to decide disputes relating to the technical matters (including interpretation of code, design procedure etc.) pertaining to the operation and implementation of the above clause. The decision of the Panel of Experts should be binding on all the parties	Agreed in principle which requires a change in existing contract agreement.	S&R (B) and EAP zone
Cl. 9.2.2 and Cl. 2.5.11	vii. The Committee wishes to reiterate the importance of speedy decision making and recommends that the Panel of Experts should provide their decision within a definite time frame (e.g. one month) from the time the matter is referred to them. The time could be extended suitably only in exceptional cases.	Agreed in principle.	S&R (B) and EAP zone
Cl. 9.2.2 and Cl. 2.5.12	viii. The Panel of Experts should also provide guidance to the authorities in the approvals and implementation of the research schemes of the Government.	Agreed in principle.	S&R (B) and EAP zone
Cl. 9.2.2 and Cl. 2.5.13	ix. Besides according approvals to the proposals of innovative technologies/ materials (under Clause 1.9 of the Manual as referred in the Paragraph above), the Panel of Experts as above should also be entrusted to examine various alternative technologies when individual proposals from proponents of technology/ alternative materials/ equipment are placed before them. The Panel of Experts should be empowered to approve the technologies/materials to be used either on trial stretches in appropriate cases or approve them for use in construction of highways solely based on their assessment. The technologies/ alternative materials approved by the Panel of Experts for use in construction of highways should be permissible.	Agreed in principle subject to approval of competent authority.	S&R (B) and EAP zone

Chapter 3 - Implementation Issues

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.3.1 and Cl. 3.2.2	**Government Officials in Charge of Implementation:** • It is necessary that project implementation is decentralized to the extent possible so that matters do not get prolonged in a to and fro movement of correspondence between project officials on the field and those in the headquarters. The Committee feels that a well thought out system based on decentralization of powers and responsibilities backed up by monitoring from the headquarters to verify and remove bottlenecks in the project implementation would be in order.	Agreed.	Planning zone and JS(admin.)
Cl. 9.3.1 and Cl. 3.2.3	The Committee felt that project decisions often get delayed due to the fear in the minds of project officials about being hounded even for bona fide decisions. Genuine or bona fide decisions should not result in penal actions as they tend to create and perpetuate a system based on inaction or aversion to speedy decisions. The Committee recommends appropriate amendments to vigilance procedures so that officials taking swift decisions in the bona fide interest of the project are protected. This will benefit project implementation immensely.	Agreed. Not in MORTH mandate. Will have to refer.	CVO and JS(admin.)
Cl. 9.3.2 and Cl. 3.2.4	Performance assessment of the officials in charge of implementation should be carried out among other things, their result orientation, in terms of the achievement of the targets set. The system should acknowledge officers who perform towards realization of project targets in the timelines set with a view to facilitate the larger objective of expeditious implementation of highway projects. It is suggested to consider a system of awards to acknowledge outstanding performances.	Agreed.	JS(admin.) and S&R(B) zone
Cl. 9.3.3 and Cl. 3.2.5	A systematic periodical monitoring/reviews at higher levels within the governmental authorities to identify and resolve issues that plague project implementation would help enhance speed of implementation. These reviews should set apart projects severely lagging behind their targets and appropriate measures taken to remove bottlenecks and to expedite them.	Agreed.	Planning zone and JS(admin.)
Cl. 3.2.6	The committee recommends that in case of a collapse of a structure either during construction or later on, before taking any penal action like arrests across the board of everyone even remotely connected with the work, there should be an inquiry through a technical committee of independent experts, to determine the probable cause of the collapse to determine the responsibility. The readiness to adopt innovative designs and methods in construction in the country will otherwise receive a great setback if action is taken without such an inquiry.	Agreed. Will have to set up and publish an SOP for this.	S&R(B) zone

Chapter 3 - Implementation Issues ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.3.4 and Cl. 3.3.2 to 3.3.4	**Consultants:** The consultants will be selected based on Quality and Cost Based Selection (QCBS) with weightage for the technical score of the consultants at 80% or more. In exceptional cases where the projects demand a high level of innovation, the Quality Based Selection (QBS) may also be resorted to. The Committee has made some recommendations towards procurement procedure regarding consultancy assignments as per Paragraph 3.4 in Chapter 3. The committee also recommends that **track record of consultants** in previous assignments should be kept in view in evaluation of their consultancy proposals.	Agreed. QCBS is already in practice. QBS system for exceptional cases may also be considered, as required. The evaluation of consultant's **track records** can also be made as part of INFRACON by Ministry. This should be incorporated in to bid documents.	S&R(B) and EAP zone
Cl. 9.3.5 and Cl. 3.3.5	The Committee recommends that the **Engineers Bill** comprising licensing of professional engineers and governing their professional conduct needs to be given due importance, and the Ministry of Road Transport and Highways may take up the matter with the Ministry of Human Resources for further action in this regard.	A matter of policy and will be taken up with M/o Human Resources & Development.	Planning zone and JS(admin.)
Cl. 3.4(1)	In case of a violation of the Integrity pact, a penal action (including criminal proceedings) against the defaulting official(s) of the consultant may be taken instead of present approach to take the actions against the consultant.	Agreed,but action may be taken against both i.e. defaulting officials as well as the consultant.	S&R(B) and EAP zone
Cl. 3.4(2)	The current eligibility criterion involves annual turnover from consultancy assignments in the past. It is suggested that a certificate by the statutory auditor about annual turnovers of the respective years flowing from consultancy assignments should feature in the format.	Agreed to the extent that a certificate by the statutory auditor for consultancy work only.	S&R(B) and EAP zone
Cl. 3.4(3)	Consultants have pointed out that the CVs are provided for the various positions in the consultancy assignment. The current procedure stipulates that in case of false/incorrect information supplied in the CV, the consultant is liable to be debarred. It is suggested that penal actions should be taken against individual officials rather than the consultants.	Agreed, but action will be taken against both i.e. defaulting officials as well as the consultant.	S&R(B) and EAP zone

Chapter 3 - Implementation Issues ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 3.4(4)	Qualification demanded for the Team Leader's position contemplates his having worked on a team leader's position in a previous assignment. How would a person get his first assignment of the team leader in view of such a requirement? Consultants have suggested that adequate experience in a Deputy Team Leader's position should also be stipulated. This is worthy of being considered.	Agreed.	S&R(B) and EAP zone
Cl. 3.4(6)	The consultancy assignment demands experience of six/ eight laning for such projects. Since there have not been many projects of this type, adequate experience of two/four/six laning may also be allowed	Agreed.	S&R(B) and EAP zone
Cl. 3.4(7)	Experience certificates from the projects have to be produced. It is regarded that this takes long. Consultants have suggested that the officials should be allowed to certify their experience with the rider that cases of experience found to be fake/incorrect, would entail penal action against the individuals. The Committee finds this worthy of consideration	Not agreed as the agreement is entered between the consultant and the client..	S&R(B) and EAP zone
Cl. 3.4(8)	Experience of construction supervision is usually demanded from individuals for the various positions. Experience of construction should also be considered admissible in addition to that of construction supervision.	Agreed in principle.	S&R(B) and EAP zone
Cl. 3.4(9)	RFPs usually ask for experience in developed countries. This could be made applicable to the top few (one or two) of technical personnel only. Experience in developing countries should be admissible for the remaining members of the team.	Agreed in principle.	S&R(B) and EAP zone
Cl. 3.4(10)	Sometimes individual positions which are not required for projects are stipulated, e.g. two-three financial analysts for EPC projects when one is enough etc. This anomaly needs to be corrected.	Agreed in principle.	S&R(B) and EAP zone
Cl. 3.4(11)	The newly introduced provision of Infracon website where CVs of individual officials are uploaded is a welcome measure. However, a person who has experience in multiple assignments e.g. highway engineer or bridge engineer should be allowed to upload his CV for multiple positions based on experience.	Agreed in principle.	S&R(B) and EAP zone

Chapter 3 - Implementation Issues ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.3.6 and Cl. 3.5	**Indian Roads Congress** Drafting of IRC codes be assigned to experienced consultants and academicians on payment basis as in several advanced countries. The Committee also recommends that dedicated and adequate fund be made available to the IRC to meet its expenses.	Agreed in principle. Viewpoint of IRC will be obtained. A separate budget line for IRC may be opened.	S&R(R) zone
Cl. 9.3.7 and Cl. 3.5.3	Revision of existing manuals for highways (two, four and six laning) at a frequency of at least once in two years based on experiences in project implementation, new developments in technology, materials and equipment etc.	Agreed as it is already in practice.	S&R(R) zone
Cl. 9.3.8 & Cl. 3.5.4	IRC publications may be available online and amenable for downloading from the website of IRC on payment basis.	Agreed and IRC will be instructed, accordingly.	S&R(R) zone
Cl. 9.3.9 and Cl. 3.6	**Pre- Construction Activities and Permits** • Mechanism for expeditious approval of environmental clearances and evolution of well-defined policy toward cutting of trees and transfer of Government lands need to be created. • The Committee also recommends delegation of powers/authority (with placement of funds) to the local project officials to enable them take decisions regarding utility shifting, land acquisition payments etc. • The Committee recommends easing of quarry permits, review of Gram Panchayat NOCs to expedite project implementation.	Agreed in principle and the matter may be looked into by LA & Establishment zone of Ministry.	JS(LA)
	• The concessionaire may be allowed to retain income out of advertisement rights in the road land, on toll structures, under passes as may be permissible as per IRC standards, avenue and median plantations, car parking and road side facilities created by him.	Agreed subject to safety of road users.	S&R(R) zone, S&R(B) zone and EAP zone
	• The Committee was of the view that the condition of not allowing well water for construction needs to be changed with a view to facilitate speedier implementation of projects.	Local issue. Links with drinking water	JS(LA)

Chapter 3 - Implementation Issues ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.3.9 and Cl. 3.6.6	**Transfer of Government Lands:** The Committee was informed that several projects have been delayed for want of Government land. The Committee suggests change in the present business rules. The Committee recommends that a high-power committee under Chairmanship of retired Chief Secretary of the state or a retired High Court Judge be constituted at the state level. The committee should be equipped with powers to hear the parties, i.e., authority constructing the roads and the government department in control of the land. Based on needs of both organizations and noting the viewpoints presented by affected department the committee can pass suitable orders which will be binding on both parties about expeditious transfer of government lands for the project, so that the project progress is not hampered. The matter of compensation should be separately decided by the Committee later and not linked to the process of transfer of the government land.	This is not a major problem. A committee will not be useful. Has to be done case by case.	JS(LA)
Cl. 9.3.9 and 3.7.3	The Committee recommends that the Safety Fund should be usable for addressing local safety/road needs with powers to use these funds delegated to local project officials. The Committee suggests that the safety fund (0.25%) in respect of projects could be used for addressing items such as a creating parking area within ROW for local needs; developing Government land beyond ROW for parking/accommodating grades; parking lots for vehicles coming to local factories; improving the grades of joining roads etc. Funds could be placed with the field officers of the Authority (e.g. CGM, PD etc.) who would accord financial sanction from these funds to demands put up by local officers/public representatives. The Committee suggests that enhancement of this component (currently at 0.25% of the project cost) substantially, say 2% may also be considered to accommodate such local needs	Agreed.	S&R(B) and EAP zone
Cl. 9.3.10	**Construction completion Issue:**The Committee feels that unless safety and reliability issues are involved, withholding of COD by the Independent Engineer should not be allowed. COD need not be withheld for issues such as compliance of conditions etc. for which a bank guarantee of an appropriate value for timely compliance of conditions could be obtained from the concessionaire and the COD approved. The matter of compensation if any could be settled in due course. This will help avoid adverse financial consequences to the concessionaires (and prevent the possibility of projects turning into NPAs).	Agreed as it is already in practice.	S&R(B) and EAP zone

Chapter 3 - Implementation Issues ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.3.11 and Cl. 3.8(1)	The Committee recommends suitable amendments to provisions of concession agreements/ issue of circulars to improve implementation of projects as under– The independent Engineer should be appointed early in the development period as a Condition Precedent.	Agreed. All efforts are made to appoint the independent Engineer well in advance. But, it cannot be made as a Condition Precedent. However it may be ensured to appoint the independent Engineer well in advance.	S&R(B) and EAP zone
Cl. 3.8(3)	It could be seen from the interaction with representatives of concession/ contracting companies, that there is a lack of clarity about the exact manner in which DBFOT/EPC agreements are to be interpreted towards freedom allowed to the individual concessionaires/contractors. To avoid multiple interpretations at variance with each other, it would be suitable if the Government issues a circular clarifying the rational of the DBFOT/EPC to enable all appreciate the underlying philosophy of DBFOT/EPC in this regard. This would facilitate uniform interpretation on this aspect in the field	Agreed. A circular needs to be issued.	S&R(B) and EAP zone
Cl. 3.8(4)	Concessionaires pointed out that steel railings are stipulated on the footpaths. These are prone to thefts and a suggestion was made that concessionaires/contractors should be allowed to use concrete for railings since these have to be maintained during the operations period. Even in case of EPC projects authority might find concrete railings suitable in view of this. The Committee recommends this suggestion for consideration	Agreed.	S&R(B) and EAP zone
Cl. 9.3.11.2 and Cl. 3.8(2)	The Committee felt that having due regard to the freedom allowed to the Concessionaire/Contractor in the DBFOT/EPC contracts, the Schedule B should mention clearly the mandatory scope allowing the concessionaire/contractor to design the project in accordance with these mandatory requirements. The recommendation of the Committee arose since the Committee was informed of instances where there was insistence in following the FRL mentioned in the typical cross sections circulated in the Draft Concession Agreements negating spirit of freedom for design in DBFOT.	Agreed. For DBFOT contracts, it is already in practice.	S&R(B) and EAP zone

Chapter 3 - Implementation Issues ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.3.11.3 and Cl. 3.8(5)	The Committee was informed about the non-uniformity in practice of reference to HFL especially in non-flood zone areas. HFL refers to water bodies, streams, rivers etc. only and cannot be applicable beyond the flood zone. For areas beyond the flood zone, the bottom of the subgrade could be kept sufficiently above, say 0.6 m above ground level.	Agreed partially. For stretches beyond the flood zones, ground level or ponding level needs to beconsidered for deciding HFL.	S&R(B) and EAP zone
Cl. 9.3.11.4 and Cl. 3.8(6)	The Committee was informed that load tests of superstructure of one span, exceeding 15m, for all new structures is obligatory as per the terms of Concession Agreement. The Committee suggests that load test could be made mandatory only for unusual structural arrangements or where any doubt exists about quality of construction or any other problem is apprehended.	Agreed in principle and the issue needs to be carefully reviewed for its repercussion to amend the contract agreement.	S&R(B) and EAP zone
Cl. 3.8(7)	Clause 20.1 of IRC SP 13 requires bed protections at culvert / minor bridge locations only if the stratum is erodible. The Committee was informed that this is generally insisted upon for all structure just because type drawings incorporate the same without any reference to aforesaid provision. Erosion of stratum depends on amount of flow, Velocity of the flow and type of stratum. Balancing culverts, culverts with very small or undefined catchment like in plane areas, with hard soil as bed stratum, with very weak or better rock as bed stratum do notrequire any bed protection. In such cases bed protection could be dispensed with. The Committee recommends that the drawings should make a reference to this provision in IRC SP 13 and designs should necessarily be done accordingly and suitable to the site conditions of culverts/ minor bridges.	Agreed.	S&R(B) and EAP zone
Cl. 3.8(8)	The Committee agreed with the suggestion that the project milestones and project schedule stipulated in the Draft Concession or EPC contracts should be realistic and appropriate for the project. They must take into account the time required for initial preparation, mobilisation, design etc	Agreed in principle.	S&R(B) and EAP zone
Cl. 3.8(9)	The Committee also agreed with the suggestion that Liquidated Damages (LD), if any levied for not attaining the intermediate milestones should be refunded if the subsequent milestone is achieved as per schedule.	Agreed in principle.	S&R(B) and EAP zone

Chapter 3 - Implementation Issues ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 3.8(10)	It was informed that the cost estimates for the projects were found to be unrealistic, especially when the cost estimates are not revised to account for a time gap between the DPR preparation and the bids. Sometimes many of the activities insisted from the concessionaire/contractor as part of specification/contract conditions are not costed in the estimate. This resulted in significant variance with the estimated costs creating subsequent problems in acceptance. The Committee felt that such situations should be avoided.	Agreed in principle.	S&R(B) and EAP zone
Cl. 3.8(11)	The Committee was informed of cases where the concessionaire/contractor demanded some trial stretch to adopt a new technology. The approval to such trial stretch was delayed defeating the very purpose of trial stretch in a work to complete in a short period say 30 months. The Committee feels that there should be no objection to approve such trial stretches for adoption of new technologies since construction risk/responsibility are with the concessionaire/contractor only. Further the withholding of permissions for trial stretches for new technologies would work against development of new and modern technologies in construction of highways.	Agreed.	S&R(B) and EAP zone
Cl. 9.3.12 & 3.9.2	**Equipment:**The Committee recommends mandating the use of automated construction using latest equipment for concrete and bituminous works.Reimbursement of royalty charges should be considered. In any case changes in royalty rates should be reimbursed.	Agreed.	S&R(B) and EAP zone
Cl. 3.9.3	The Committee suggests that the use of such equipment for medium and large national highway projects is easily affordable in view of the size of the project and recommended so that the construction is carried out using such equipment capable of achieving impeccable quality and durability. Use of such equipment would also necessitate change in specifications to incorporate the benefits flowing from such use (e.g. increased layer thickness for embankment/pavement construction etc.). In some cases, such special equipment may not be in the list of approved equipment of MORTH or in the specifications. However, the same should be allowed on the basis of such proposal from the concessionaire.	Agreed.	S&R(B) and EAP zone
Cl. 9.3.13	**Need for Vocational Training of Skilled Workmen:**The Committee recommends that construction related National institutes e.g. Central Institute of Mining and Fuel Research, Roorkee and National Institute of Construction Management and Research be encouraged to conduct courses for developmentof multi-trade skills.	Agreed & need to be included under "National Skill Development Mission" of Ministry of Skill Development and Entrepreneurship.	Planning zone and JS(admin.)

Chapter 3 - Implementation Issues ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 3.11	**Issues pertaining to Road Safety**		
Cl. 3.11.2	The Committee, concerned with the increasing number of accidents and fatalities on the highways in this country, realized that rash driving was one of the chief reasons contributing to accidents. The Committee felt that introduction of CCTV cameras at frequent intervals on the highways and monitoring of speedy driving and levying deterrent fines could be considered to reduce accidents due to over-speeding. The deployment of drone technology involving drones with cameras to carry out surveillance of the highways could also be considered. The Committee also recommends that the Highway authorities should provide funds to the police authorities to procure equipment such as speed guns etc. to enforce traffic discipline. The income received out of imposing fines can be retained by Highway Authority.	Agreed in principle. JS(T) and Road safety Zone may take appropriate action in the matter.	JS(T), Road Safetyan d EAP zone
Cl. 3.11.3	The Committee felt that some measures such as providing anti crash barriers along the approaches to a tunnel to lead traffic into the carriageway inside the tunnel should be scrupulously ensured to avoid vehicles crashing against ends of the tunnels/footpaths/ kerbs. The photograph below shows an arrangement of such anti crash barriers, whose face should be flush with the face of the crash barriers/wall in tunnel.	Agreed. A circular needs to be issued.	Road Safety and EAP zone
Cl. 3.11.4	The design of concrete anti crash barriers with pipe railing on top should be such as to provide a smooth sliding surface without obstruction to avoid damage to a vehicle which crashes and slides along the crash barrier. The arrangement in use presently is deficient from this angle (Fig A). The accompanying photograph (Fig B) also shows the desirable arrangement (which should be adopted to take this aspect into account).	Agreed. A circular needs to be issued.	Road Safety and EAP zone
Cl. 3.11.5	Protective mesh on the overpasses provided for cross roads over the high speed roads help prevent objects falling from the cross road on the high speed road with a potential of causing serious accidents. The Committee recommends provision of such protective meshes.	Agreed. A circular needs to be issued.	Road Safety and EAP zone
Cl. 3.11.6	Proper pier protection for piers in median prevents fatalities in case a vehicle loses control and heads for the piers. One type is shown in the photo above. Another can be seen in the photo below. The committee recommends that a suitable pier protection be provided.	Agreed. A circular needs to be issued.	Road Safety and EAP zone
Cl. 3.11.7	No plants which develop thick inflexible trunks should be allowed in the median or anywhere near the carriageway since they pose a danger of instant fatalities in case of a vehicle hitting them.	Agreed. A circular needs to be issued.	

Chapter 3 - Implementation Issues ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 3.11.8	At every median break for U turns or right turns or pedestrian crossings, where plantation is carried out, the height of such plantation in the median should not exceed 600 mm above the road surface for distance of 20 metres from the break. This is to ensure clear visibility for the drivers.	Agreed. A circular needs to be issued.	Road Safety and EAP zone
Cl. 3.11.9	At every median break for a right turn or a U turn, an extra waiting lane of adequate length must be provided to keep the fast right lane in the carriageway obstruction-free.		
Cl. 3.11.10	In ghat sections [hilly roads] it is advisable to provide an extra lane for climbing side of the carriageway where the traffic is heavy.		
Cl. 3.11.11	While designing signage and information boards for national highways [in fact for any high speed roads], it must be remembered that they are meant to be read by the elderly driver of a very fast moving vehicle. [not by the passenger]. Too much information or too many destinations on a single board should be avoided for the same reason.		
Cl. 3.11.12	Name of a flyover, under which there is a cross road or a U turn, should be displayed at least 120 m before the start of the flyover so that a driver who has to take the turn has sufficient weaving distance to move to the side road.		
Cl. 3.11.13	Every hard object in the median or by the roadside must be provided with impact attenuators or crash barrier to prevent instant deaths for passengers of vehicle hitting them.		
Cl. 3.11.14	At every Y junctions prominent marking and signage as well as impact attenuators should be provided. Photographs below illustrate the point.		
Cl. 3.11.15	Distance markers i.e. kilometers should be displayed prominently so that drivers of high speed vehicles can read them easily. A sample photograph below illustrates the point		
Cl. 3.11.16	Liquor shops along the highways should be discouraged.		
Cl. 3.11.17	National Highways should be made "forgiving roads", so that injuries and fatalities in case of accidents are minimized.	Agreed.	Road Safety and EAP zone
Cl. 3.11.18	National highways should be subjected to road safety audit periodically.	Agreed.	

Chapter 4 - Rigid (Concrete) Pavements

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.4.1 and Cl. 4.2	Concrete pavements should be a preferred option in high density corridors and for highways in high rainfall zones, where bituminous pavements, prone to damage in such conditions, involve high maintenance costs and efforts.	Agreed. Vide Ministry's circular no. RW/NH-3044/31/2014/ S&R(R)(Pt.) dated 04.08.2014, concrete pavement is made a default pavement option.	S&R(R) zone
Cl. 9.4.2 and Cl. 4.3	**Continuously Reinforced Concrete Pavements (CRCP)** CRCP technology with designs based on the AASHTO software should be used instead of IRC:118-2015, since AASHTO has brought out a design methodology based on the Mechanistic Empirical (ME) approach, which also results in the thickness of CRCP working out to about 20% lower in comparison to the conventional jointed pavement/CRCP design as per IRC:118-2015.The AASHTO design software based on the ME approach is based on extensive research and the Committee recommends that the funds should be provided to enable procurement of this software by institution such as the IIT Kharagpur with in-house capacity of research in concrete pavement.This software could then be used by the construction industry with the help of IIT Kharagpur for the design of the CRCP. The Committee recommends to evaluate the performance of the CRCP near Pune.	Not agreed unless it is substantiated by the field studies conducted under Indian conditions. A research study needs to be carried out accordingly which also include the performance evaluation of CRCP near Pune.	S&R(R) zone
Cl. 9.4.2 and Cl. 4.4	**Prestressed Concrete Panels (PCP)** The technology is successfully used in many countries and the Committee recommends adoption of this technology in India. However, the Committee recommends that thelarge scale adoption of this technology could be taken up after a trial stretch of about 15 km is taken up and constructed preferably in a National Highway project to be taken up in immediate future. The Committee interacted with the research scholars and academicians from the Visvesvaraya National Institute of Technology, Nagpur who are engaged in research on this subject. **The Committee suggests therefore, that a stretch in Maharashtra near Nagpur which is already proposed/ about to be proposed in the immediate near future for execution could be identified for this trial.** The performance of the PCP could be observed for a period of 2 years and the technology taken up for large scale adoption in the National Highways. The Committee recommends constitution of a technical committee to guide the Ministry to prepare the consultancy document and guide the performance monitoring. The Committee suggests that the same consultant be appointed for the pre-construction / construction and post construction stages.	Agreed.	S&R(R) zone

Chapter 4 - Rigid (Concrete) Pavements

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.4.2 and Cl. 4.5	**Concrete Overlay over Existing Bituminous Surface** • The Committee is of the view that a systematic performance assessment study should be instituted by the Ministry for the NECE road to quantify the riding quality, noise levels, traffic and axle loads etc. • The Committee is of the view that concrete overlays on the existing bituminous pavements (where the thickness of the bituminous pavement is adequate) should be considered for adoption where eminently suitable e.g. in urban areas etc. New Guidelines also allow use of this technology for new roads wherein instead of flexible pavement appropriate sub base, base and concrete overlay in such panels is proposed. The cost of such pavements being comparable to flexible pavement enable them emerge as an economical alternative for urban bypasses or even for new carriageways in four-laning project etc. • The Committee feels that stretches at the toll plazas on the national highways or truck lay byes could be provided with such panel pavements.	Agreed. Agreed. A circular needs to be issued in view of IRC:SP:76-2015 or else. Agreed in principle.	S&R(R) zone S&R(R) zone S&R(R) zone
Cl. 9.4.2 and Cl. 4.6.4	**Use of open graded friction course (OGFC)** The Committee has noted that advanced countries follow the practice of providing such open graded friction courses on concrete pavements and there should be no objection to provide such overlays on high speed concrete roads to derive the advantages referred above. The Committee therefore recommends adoption of this technology with immediate trials on some trial stretches on the existing National Highways to validate the specifications and to enable adoption of this technology on a large scale.	Agreed. A circular needs to be issued.	S&R(R) zone
Cl. 9.4.2 and Cl. 4.7	**Self-Compacting Concrete for Pavements** The Committee recommends that the technology should be deployed using trial stretches followed up by its use where suitable.	Agreed.	S&R(R) zone

Chapter 5 - Flexible (Bituminous) Pavements

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.5.1 and Cl. 5.2	Large scale use of **Gap Graded Wearing Course**with Rubberized bitumen binder for achieving reduced noise, reduced wear of tyres, enhanced skid resistance and significantly improved riding quality.	Agreed in view of IRC:SP:107 – 2015. To promote its use, a circular needs to be issued.	S&R(R) zone
Cl. 9.5.1 and Cl. 5.3	Use bituminous Concrete with Polymer Modified Bitumen.	Agreed. As per Ministry's circular no RW/NH-33041/3/2001-S&R(R) dated 22.09.2011, Modified bitumen need to be used in bituminous concrete as well as in dense bituminous concrete.	S&R(R) zone
Cl. 9.5.1 and Cl. 5.5	**Bituminous Overlay over Jointed Rigid Pavement** The conventional jointed rigid pavement usually faces criticism about riding quality, noise pollution and also tyre bursting due to high-speed and higher temperatures due to friction between tyres and the pavement surface. These problems can be addressed by providing a bituminous overlay. The technology needs to be studied on trial stretches to validate the specifications followed by large scale implementation of this technology which has been extensively used in several countries.	Agreed and a circular need to be issued.	S&R(R) zone

Chapter 5 - Flexible (Bituminous) Pavements

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.5.1 and Cl. 5.5	CSIR-CRRI has evaluated this technology with various types of warm mix additives available in the country and have studied in detail, the performance of **WMA technology** in comparison to HMA. On the basis of the work done by the scientists of CSIR-CRRI, the Indian Road Congress (IRC) has brought out the interim-specification for the use of **Warm Asphalt Mix in India (IRC SP 101: 2014).** Some field evaluation studies of WMA and also some comparisons of carbon emissions of WMA with HMA have demonstrated encouraging results. However, the use of this technology has been very limited in our country. The Committee feels that the use of environment-friendly technologiesshould be encouraged on the lines of many advanced countries. This Committee, therefore, recommends incorporation of environment friendly technologies in all the road works, which can save our non-renewable energy resources and in that light recommends that the use of WMA technology be included in the Ministry's specifications so that the technology is adopted on a large scale for road construction in India. **The Committee recommends the use of this technology where the bituminous mixes have to be hauled over long distances (e.g. in urban areas with plants located outside city limits) resulting in lower laying temperatures. WMA technology would eminently suit such situations besides providing environmental benefits mentioned above.**	Agreed as it is already in practice in view of IRC:SP:101 – 2014. It needs to be included in Ministry's Specification and meanwhile, a circular needs to be issued.	S&R(R) zone
Cl. 9.5.1 and Cl. 5.6	The Committee recommends the use of **stabilizers** in various layers of the pavements.	Agreed as it is already in practice in view of IRC:37 - 2012.	S&R(R) and EAP zone
Cl. 9.5.1 and Cl. 5.7	Functionalized polyethylene modifiers for modified bitumen (equivalent to VG 40).	Not agreed as per IS:73-2013, bitumen shall be prepared by the refining of crudepetroleum by suitable methods.	S&R(R) and EAP zone

Chapter 5 - Flexible (Bituminous) Pavements

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.5.1 & Cl. 5.8	Glass fibre polyester hybrid geosynthetic paving mats as per ASTM D 7329.	Agreed.	S&R(R) zone
Cl. 5.9	**Use of nano-technology for different aspects of road construction:**The technologies are cost effective and are not yet included in the Specifications. The limited trials of this technology have been found to be encouraging. These may be adopted after laboratory evaluation.	Agreed in principle.	S&R(R) zone
Cl. 9.5.1 and Cl. 5.10, 5.11	Cold-in-situ and hot-in-situ recycling of asphalt pavements.	Agreed as it is already in practice in view of Ministry's specification. However, the issue need a review and a comprehensive circular based on IRC:120 – 2015 need to be issued for bring the economy in pavement construction.	S&R(R) zone
Cl. 9.5.3 and Cl. 5.4.4	**Modified Bitumen** Dr. Veerraghavan at IIT Madras presented a viewpoint to the Committee that there is a need to carry out field performance under actual traffic, climate and environmental conditions to supplement and confirm the observations in the laboratory performance studies. The Committee felt that performance of national highways where modified bitumen is used could be monitored periodically, so that calibration factors to predict the performance of pavements using mechanistic-empirical pavement design procedure can be developed. Test sections constructed with different modified binders are to beselected in different climatic regions of the country catering to different magnitudes of traffic levels, rainfall etc. Monitoring of structural and functional condition of these test sections say twice/thrice every year for a minimum period of three years would help develop shift factors to predict the field performance from the laboratory test results which in turn would help evolve appropriate calibration factors for design of pavements with modified binders using mechanistic – empirical pavement design procedure. **The Committee recommends that research studies should be carried out by networking different reputed institutes of National Importance in different regions of the country and the CRRI to fulfill this objective. This will result in a large scale use of modified bitumen through the availability of a credible methodology of assessing the benefits.**	Agreed and a research scheme need to be included during current annual plan.	S&R(R) zone

Chapter 5 - Flexible (Bituminous) Pavements

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 5.12.3 and 5.12.4	**Thickness of renewal coat and type of treatment for Ministry and NHDP projects** • The Committee felt that there was a need to define appropriate criterion for determining the type of renewal and thickness of bituminous concrete. • It is suggested that whenever surface roughness exceeds the limit prescribed in IRC 82 renewal coat may be regarded as warranted. In such situations, Benkelman Beam Deflections may be obtained to verify if overlay or strengthening layer is needed, taking into account the existing crust and after assessment of traffic in the intervening period before the next renewal coat. Falling weight deflectometer results could also be used. Based on these, the decision of whether renewal coat is sufficient, or if strengthening overlay is needed could be taken if the pavement surface is otherwise free from cracks rutting etc. • If roughness measurements exceed the limits specified in IRC 82, and if the existing crust is adequate for the traffic of 15 years as per above criterion, micro-surfacing may be provided for renewal. If the existing crust is adequate only for traffic till the time for next wearing coat, 30 mm thick BC could be provided if the traffic (before the next wearing coat) is less than 50 MSA. In case the traffic is more than or equal to 50 MSA, a 40 mm thick BC could be provided. In case the existing crust is not adequate to take traffic till the next renewal coat, overlay should be provided as per requirement. If in situ cold recycling or hot in situ recycling is adopted in that case the recommended thickness would be thickness of processed layer.	Agreed. A comprehensive Maintenance guidelines needs to be framed and issued by Ministry for corrective and proactive (preventive) maintenances of pavement structures.	S&R(R) zone
Cl. 5.13	**Use of Geo-Synthetic Materials in Pavement** There is a shortage of aggregate in several parts of the country and good quality aggregate have to be hauled over long distances. In the north east region, the aggregate does not have adequate strength and get crushed under the load of roller. Geosytentic materials such as geogrids, geocomposites as filter areas or geocells can perform an important role in improving the properties of aggregate due to the confining effects, and use of such materials would help not only reduce material consumption but enable use of the local materials. **The Committee recommends that research/ trial stretches based on this technology be taken on priority followed by large scale use of this technology.**	Agreed as it is already in practice as per Ministry's Specification.	S&R(R) zone

Chapter 5 - Flexible (Bituminous) Pavements

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 5.14	**Imported bitumen** • Experts have pointed out to the Committee that the quality of bitumen produced in the country does not always meet the stipulated (IS) standards. The Committee therefore, suggests holding of a high level meeting with petroleum ministry to bring this issue into focus so as to take suitable corrective steps. • The Committee was also informed that with the revised policy for custom duty on import of bitumen, imported bitumen conforming to the stipulated standards of quality is on par with indigenous bitumen in terms of cost. Considering that Crude is also imported and treated for producing bitumen, import of bitumen may not result in loss of foreign exchange. Several major and minor projects are contemplated under the Sagarmala Project of the GOI. Imported bitumen unloaded at these ports would also result in saving in transport costs. The Committee was informed that about one lakh ton of bitumen required for the improvement of NH 17 could be imported at the ports of Dighi or Jaigad and this can reduce the average lead of transport of bitumen by 150 km. The Committee recommends that this aspect needs to be studied and considered to ensure that bitumen used on highway projects conforms to the stipulated quality	Agreed. Agreed subject to its strict conformity with stipulated BIS code.	**S&R(R) and EAP zone**

Chapter 6 - Tunnels

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.6.1 and Cl. 6.3.1.7(i)	Provision of tunnels should be made on the basis of assessment of benefits and costs. The benefits could be direct like saving in travel distance or climbing up and down or indirect such as easing of traffic or creating shortcuts in public interest. It is suggested that while framing every DPR, the possibilities of providing tunnels as an alternative to detours/ circuitous routes in hilly areas should be explored.	Agreed.	S&R(B) and EAP zone
Cl. 9.6.2 and Cl. 6.3.1.7 (ii)	The provision of artificial Cut and Cover Tunnels of adequate lengths at the location of deep open cuts, outside excavated portals at entrances of bored tunnels and potential slip zones along the alignment of roads will help to avoid blockage due to landslides and resultant hindrance to traffic (e.g. in the Himalayas). The length of such a cut and cover tunnel beyond the bored tunnel will depend on the local geotechnical conditions. The cut and cover tunnel could be in cast-in-situ concrete or prefabricated steel frames. (or corrugated steel plates). In locations where due to geological conditions, it is not feasible to provide cut and cover tunnel in front of a slip zone, a tunnel going below the slip should be provided.	Agreed.	S&R(B) and EAP zone
Cl. 6.3.1.7 (iii)	Alignment of the roadway going into and coming out of a tunnel should merge smoothly with the contour. For achieving such smooth merging, curves should be introduced in the horizontal alignment of the tunnel.	Agreed.	S&R(B) and EAP zone
Cl. 6.3.1.7 (iv)	Surface drainage above the portal and along the two sides of open cuts should be so designed that rain water running down the mountain slopes does not drain into the open cut. If possible, invert of the open cuts should be made to slope down away from the portal to prevent rain water from flowing into the tunnel.	Agreed.	S&R(B) and EAP zone
Cl. 9.6.3 and Cl. 6.3.2.5.1	Procurement of Land required for muck disposal and temporary construction camps, licenses and permits for storage of explosives and arrangements for construction power should be arranged before award of contracts, so as to avoid delays during execution on this score.	Excluding temporary construction camps, agreed for other preconstruction activities as their completion is essential for timely completion of tunnel work.	S&R(B) and EAP zone

Chapter 6 – Tunnels ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.6.4 and Cl. 6.3.3	Adoption of controlled blasting for tunnels (with appropriate noise abatement measures and monitoring during execution) should be considered even in the reserved forest areas, and special permission from the Ministry of Environment and Forests should be obtained preferably before the award of work of such tunnels.	Agreed in principle. Issue may be taken up with Ministry of Environment and Forests.	JS(LA)
Cl. 9.6.5 and Cl. 6.5	**Bidding Stage** DPR should be made available to the bidders with all the details of investigations/ geotechnical data for bidders to base their bids. A method should be provided for adjustment to the contract price due to the difference between the lengths of tunnel in the strata encountered and that expected on the basis of geotechnical data available in the DPR/ bid documents. The adjustment could be in monetary form in case of item-rate and EPC contracts and monetary form or suitable adjustment in concession period in case of the DBFOT concessions.	Not agreed, as it is against the spirit and philosophy of the EPC contracts. In item rate contracts, it can be accepted.	S&R(B) and EAP zone
Cl. 9.6.6 and Cl. 6.6	Tunnel Excavation by Drill and Blast Method is the cheapest and attempt should be made to use it wherever possible. Tunnels under populated areas and sensitive structures should be excavated by Road Headers provided, the UCS of the rock is below 120 MPa, if feasible. Tunnels under populated areas and sensitive structures may have to be excavated by Tunnel Boring Machines only if the UCS of the rock is above 120 MPa, even at a prohibitive cost, as there is no other practical method of excavation. Use of Tunnel Boring Machines should also be considered for tunnels longer than 10 km and where high speed tunneling is called for.	Not agreed, as it is against the spirit and philosophy of the EPC contracts. Under the framework of contract agreement, the contractor will decide the Tunnel Excavation method. However, the suggestion will keep in EPC agreements as reference guidance.	S&R(B) and EAP zone

Chapter 6 – Tunnels ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.6.7 and Cl. 6.7	Though provision of cladding is not an absolute necessity, cladding should be considered to make long tunnels user-friendly.	Agreed as it will enhance the comfort levels of drivers during traversing of tunnel.	S&R(B) zone
Cl. 9.6.8 and Cl. 6.8	In order to ensure user safety and comfort, stricter supervision of installation and maintenance of lighting and ventilation will be adhered specially in long tunnels and it should not be compromised for achieving economy, since it affects safety.	Agreed as they are already in practice in view of IRC:SP:91 – 2010. A circular will be issued to address the concern of expert committee.	S&R(B) zone
Cl. 9.6.9and Cl. 6.9	Mobile phone service providers should be encouraged to install transponders inside long tunnels to create connectivity.	Agreed.	S&R(B) zone

Chapter 7 - Bridges

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 7.2.1	**Need for Advanced Technologies** Although most advanced bridge technologies are already in use in India, their use has been mainly on some selected projects. The Committee felt the need to go to an advanced level of bridge technologies for use in national highway projects. In the view of the Committee, this would mean use wherever required, of larger spans, bigger elements and more sophisticated and heavier plant and equipment for their casting, transport and erection.	Agreed, as it is the need of hour.	S&R(B) zone
Cl. 9.7.1 and Cl. 7.3.1, 7.3.2, 7.3.4	**Material** The Committee recognized the need to innovative materials, processes and construction techniques that can provide economical, durable and fast construction of bridges. Therefore, use of concrete with cementitious additives & admixtures e.g. blast furnace slag, fly ash pozollanas, plasticizers, super-plasticisers etc.should be encouraged along with the use of Self-Compacting Concrete and High Performance Concrete (HPC).	Agreed. Use of High Performance Concrete is already in practice in view of IRC:SP:70 – 2005. To initiate the use of Self-Compacting Concrete in India, necessary guidelines and specifications need to be developed.	S&R(B) zone
Cl. 9.7.2 and Cl. 7.3.3	Use **Spherical Bearing**in place of POT bearings which are not only more efficient in load transfer but also occupy less space on the pier cap.	Agreed as use of Spherical Bearing is already in practice in view of IRC:83 (part IV) – 2014. Choice of bearing is site specific and needs.	S&R(B) zone
Cl. 9.7.3 and Cl. 7.3.5 to 7.3.7	For steel bridges,**High Strength Structural Steel & high strength friction grip bolts**should be used.	Agreed as they are already in practice.	S&R(B) zone
Cl. 9.7.4 and Cl. 7.3.8 to 7.3.10	**Corrosion resistant steel bars** such as weathering steel or 'Corten' steel and **"Ready to use Rebar"** technology will be used.	Agreed.	S&R(B) zone

Chapter 7 - Bridges ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.7.5 and Cl. 7.3.11, 7.3.12	**Fiber Reinforced Polymers (FRP) composites** will be used in new construction, repairs and rehabilitation of bridge structures.	Agreed. A research scheme to develop the design philosophy & implementation of FRP decks and FRP composites for using in bridge structures need to be carried out and included in current annual plan.	S&R(B) zone
Cl. 9.7.6 and Cl. 7.3.13	Waterproofing of concrete decks is necessary especially when segmental construction is to be deployed.	Agreed. In fact, waterproofing of each bridge deck is essential and it should form an integral part of wearing coat system for all types of bridges. Ministry's Specification need to be modified.	S&R(B) zone
Cl. 9.7.7 and Cl. 7.3.14	High damping Rubber (HDR) bearings need to be introduced.	Agreed. A circular for seismic isolators, arrestor devices and associated bearings need to be issued.	S&R(B) zone
Cl. 9.7.8 and Cl. 7.4	**Codes and Standards** • Various IRC bridges codes (IRC 78, 83, 112 etc.) need a comprehensive review and revision to synchronised them with International standards and current knowhow. • Ministry's standard drawings and plans need to be revised immediately. • IRC codes will be prepared on paid basis through academicians or expert consultants instead of voluntary basis. Ministry keep a dedicated fund for it.	Agreed. IRC will be advised accordingly. The work was assigned to IRC. Current status will be obtained from IRC. Otherwise, Ministry may prepare standard drawings. However, it requires suitable manpower in S&R(B) zone which will be beneficial for the growth of department's expertise and saves thousand crores of Rupees in future. Agreed in principle.	**S&R(B) zone and IRC**

Chapter 7 - Bridges ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.7.9 to 9.7.11 and Cl. 7.5	**Superstructure:** • Continuous or jointless bridges requiring minimum bearings and expansion joints should be encouraged as they are more durable and more aesthetic. • Ground supported staging should be avoided as far as possible. Steel and steel-concrete composite bridges will be used in ROBs.	Agreed in principle.	S&R(R) zone
Cl. 7.7.3	For wide decks (greater than 15m), single cell box girders with struts supporting the tips of the deck cantilevers or breaking the deck span by introducing internal struts are useful tools that can obviate the necessity of multi-cell box girders which are more difficult to construct. Such design geometry should be encouraged in design of wide deck bridges.	Agreed.	S&R(R) zone
Cl. 7.7.6	Steel and steel-concrete composite bridges can be advantageously used in many instances. ROBs are one example where Indian Railways have clear preference for such bridges because of reduced block time for train movements during their construction.	Agreed.	S&R(R) zone
Cl. 7.7.7	Pedestrian bridges across highways, with no support at median verge of the highway (Fig. 6 and 22) are excellent examples of safe and aesthetic bridges when the selected bridge form is the arch, which can readily span upto 90-100m economically and without difficulty. The Committee recommends adoption of this approach for construction of pedestrian bridges especially in urban areas where adequate pier protection in the median is considered to be difficult.	Agreed.	S&R(R) zone
Cl. 7.7.8	Long bridges over perennial water require special technique for construction. "End-on" construction and large bridge segments floated into position and erected by floating cranes are some of the special techniques that should be considered before finalizing the actual technique for such bridges.	Agreed.	S&R(R) zone

Chapter 7 - Bridges ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.7.12/ 9.7.14 and Cl. 7.8.6	**Pre-casting** factories should be encouraged to be set up in all major states. Precast products from such factories e.g. girders, box structures for culverts etc. can be used for construction of various highway structures. Standard designs of these standard components can be got approved from MORTH for use in bridges, cross drainage structures etc., so that further design checks during construction may not be needed. A scheme for approval of design from MORTH after paying the necessary charges should be established. If these approved designs are used, then there should be no further scrutiny of structural design by either Independent Engineer or authority.	Agreed in principle subject to structural safety and overall economy.	S&R(B) zone
Cl. 7.8.6.1	Exemption may be provided from Excise duty for these factories in order to not increase the cost of the projects. In any case the precasting facilities specific to a project are exempt from Excise duty, hence there would be no loss of revenue to the Government anyway	Agreed in principle. Issue may be taken up with M/o Finance.	S&R(B) zone
Cl. 7.6.1	**Aesthetics** Special attention should be paid to aesthetics in bridge construction. The design life of bridge construction is 100 years and what we build today would last for generations.Bridges are amongst the largest and most visible man-made structures. The form and surface finishes, both play a part in the overall appearance of the structure. Slim structures, keeping in mind the scale and proportion in relation to the surroundings and of different parts of the same structure contribute to its aesthetics.	Agreed.	S&R(B) zone
Cl. 7.6.3	Construction of arch bridges where they fit into the landscape or urban environment need to be encouraged.	Agreed.	S&R(B) zone
Cl. 7.6.4	Medium span bridges in the form of extradosed bridges need to be encouraged as they enhance aesthetics without much additional cost in the span range 75m to 150m. Long span structures like cable stayed bridges where required functionally, i.e., long span, or to provide a landmark which is visible from a long distance need to be encouraged where necessary.	Agreed.	S&R(B) zone

Chapter 7 - Bridges ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.7.15 to 9.7.18 and Cl. 7.9	**Pile Foundation** • Use large diameter piles such as 2.0 m/2.5m (or larger diameters) for speedy and reliable construction. • Use of mono piles with large diameter piles (2.0 m and above) where appropriate. • Low strain (Integrity testing) and high strain testing after proper calibration and Ultrasonic Pulse Velocity tests through pre-installed tubes for larger diameter piles should be mandatory to ensure soundness of concrete in piles. • Use of advanced piling equipment which are now available (with the capability to carry out boring into hard rock and which make it possible to install large diameter deep foundations in such strata) should be encouraged in preference to well foundations which are not suitable for sinking in such strata.	Agreed in principle subject to their structural feasibility, stability & durability and overall economy.	S&R(B) zone
Cl. 7.10.2	Well Foundations, where used, should preferably be installed with Jack-down techniques (Fig. 30) which can improve speed of construction, reduce steining thickness and result in better control during well-sinking operations.	Agreed.	S&R(B) zone
Cl. 9.7.13 and Cl. 7.12.1	**Miscellaneous** Cross drainage and Animals Crossings are required to be provided at frequent intervals along highway construction. The Committee recommends that such crossings should be provided at about 500 m. so that a crossing is available in a distance of 250 m from any point. Crossings for smaller vehicles are also required to be provided at some places.	Not agreed. They will be provided as per site requirement instead of proposed general consideration.	S&R(B) zone
Cl. 9.7.13 and Cl. 7.12.2	Use innovative technologies e.g. Corrugated Steel Plate Arches (thin steel plate arches) or thin precast concrete arches as economical and speedy alternative for small bridges or cross drainage structures.	Agreed.	S&R(B) zone
Cl. 7.12.5	Safety and security during construction needs special attention as most accidents, collapses and casualties happen at this stage. The design as well as construction procedures should be proof checked not only of the structure at the service stage but also during construction stage when the structure, being partially complete, is at its most vulnerable stage.	Agreed as it is already in practice.	S&R(B) zone

Chapter 7 - Bridges ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 7.12.6	Long circuitous road lengths, many times going up and down can be avoided especially in hilly sections by increased use of viaducts hopping across valleys and is recommended since it increases road safety and decreases road lengths	Agreed subject to structural & safety feasibility; and overall economy.	S&R(B) zone
Cl. 9.7.19 and Cl. 7.13	**Accelerated Bridge Construction (ABC)** Adoption of ABC involving use of new materials, design process, construction procedure, high-capacity materialsand new management methods. The key feature of ABC is significant reduction in onsite construction time and is contributing to a paradigm shift in the design, construction and maintenance of bridges.	Agreed. A guideline for design of structural elements and their joints used in ABC need to be developed along with creating facilities for the construction methodology, erecting system & equipments and transportation facilities etc.	S&R(B) zone
Cl. 7.13.11.10	**Typical contract conditions should be modified where required, to encourage alternate design of bridges with particular reference to Accelerated Bridge Constructions.** The contract conditions should prescribe requirements for speedy review, approval and execution of ABC designs. Since ABC typically requires large investment in construction equipment, the same should also be factored in the terms and conditions of contract so that larger mobilization or equipment advances are provided. A strong incentive package will further help meet the objectives of ABC. Government also has to play a major role in giving required facilities such as land for casting yard, labour camp, quick power connections, setting up high power interdepartmental coordination committee to address administrative issues, etc.	Agreed in principle.	S&R(B) zone

Chapter 7 - Bridges ....contd.

Ref. clause	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 7.13.11. 12	**Construction of ROBs** • Railways do not permit concrete girders on railway span and require only steel girders. However, it is noted that due to construction of several metro projects as well as several bridges where precast girders have been used, very good, safe and efficient launching systems are readily available. The use of precast concrete girders, that is produced in controlled environment and hence of assured quality should be permitted. If required, the Railways may evolve the criteria for empanelment of agencies that own good launching system and prequalify them. The Railways may also make it mandatory for the ROB contractor to only engage one of the empanelled agencies for launching of girders. By insisting on only Steel Composite girder as analternative to precast prestresseed girders the cost of an ROB is increased very substantially and nationally could amount to hundreds of crores. • The Railways currently insist that the ROB should span the entire land owned by them, and not just the span required for tracks. Particularly, near the existing level crossing, the Railways own 60m land to accommodate signal man quarters, etc. In such cases also they insist on construction of ROB spanning the entire 60m. It is noted that as per their circular, 24m span is adequate for four tracks. It is strongly recommended that the span of the ROB should be kept limited to the span required for tracks. It is well known that even if there is need of future tracks, the same can be provided by creating opening in the abutment by using box pushing technology. Reduction in span of the ROB segments will bring considerable economy in the project cost and also result in faster construction. • The RDSO has prepared standard structural designs for various spans to accommodate two tracks, four tracks and six tracks. In the RDSO standard designs, stiffeners are not provided in the steel plate girder webs, resulting in increase in web plate thickness compared to the thickness required from load consideration. This increases the quantity of structural steel and leads to considerable increase in cost of the structure. It is strongly recommended that for factory-produced steel girders, the use of stiffener plate may be permitted since these would be welded in controlled working environment in a factory and thus their quality can be assured. As an alternate to welding, stiffeners may be provided using friction bolt or riveting as permitted by IS 800 in order to meet the design requirement. The use of lower thickness of web plate can bring considerable reduction in the cost and thus economy in the project without compromising quality. It is estimated that the saving could run to hundreds of crores nationally. • In case of doubts in adoption of bolted and riveted connections for stiffener in ROB design as an alternative to welding, as already permitted by IS 800, the effectiveness of these connections may be taken up as a research project to be funded by MORTH.	Agreed and may be taken up with M/o Railway.	S&R(B) zone

Chapter 8 - Research in Highway Sector

Ref. clause	Item	Recommendation of Expert Committee	Ministry's Decision	Action to be taken by
Cl. 9.8.2 and Cl. 8.2	Materials	The Committee recommends upgradation of laboratories in the academic institutions through earmarking of funds for this purpose on an annual basis.	Agreed. Ministry need to establish a dedicated and exclusive research organisation similar to **NCHRP#** functioning in USA for providing practical, ready-to-implement solutions to all issues pertaining to Highway Sector.	S&R(R) zone
Cl. 8.3	Selection of research scheme	Research schemes will be selected through a transparent mechanism similar to as used in Deptt. of Science & Technology or Deptt. of Biotechnology.	Agreed in principle. The selection procedure will be studied and a policy need to framed for the selection of research scheme and the institution for its execution.	S&R(R) zone and S&R(B) zone
Cl. 9.8.3 and Cl. 8.4	Annual fund allocation	Annual research funding provided by MORTH should be significant and at least in the range of Rs. 150-200 crores.	Agreed in principle subject to availability of funds.	Planning zone
Cl. 9.8.4	APT	The Committee recommends that adequate annual budgetary provision be made available to CRRI to operate the accelerated pavement testing equipment.	Not agreed, as CRRI is functioning as a constituent of CSIR with primary objective of sustained development of Science and Technology Human Resources. The testing facilities at CRRI may be used by anyone as per norms of CRRI in order to comply with contract agreement conditions.	S&R(R) zone
Cl. 9.8.5 and Cl. 8.5	Indicative list of Research Schemes	The Committee recommends that research projects on problems as per the indicative list given in Chapter 8 may be taken up through the ministry.	Agreed. A detailed road map need to be prepared and implemented.	S&R(R) zone and S&R(B) zone

#**National Cooperative Highway Research Program (NCHRP)** is a forum for coordinated and collaborative research which addresses issues integral to the state Departments of Transportation (DOTs) and transportation professionals at all levels of government and the private sector. The NCHRP is administered by the Transportation Research Board (TRB) and sponsored by the member departments (i.e., individual state departments of transportation), American Association of State Highway and Transportation Officials (AASHTO), in cooperation with the Federal Highway Administration (FHWA). Individual research projects are conducted by a panels of expert stakeholders.