

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय)
National Highways Authority of India
(Ministry of Road Transport and Highways)
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OFFICE MEMORANDUM

NHAI/Bharatmala/EC/DPR/2016/

Dt.:14.05.2018

To,

All Consultants engaged for Bharatmala Pariyojana

Sub.: Design principles for various category of roads under Bharatmala Pariyojana including Economic Corridors and cost optimization for Highway Construction.

Ref: (i) Economic Corridor Policy Circulated vide letter no. NHAI/Planning/EC/DPR/2016 dated 03.01.2018

Sir,

In continuation of Economic corridor policy referred above, please find enclosed herewith OM No. NHAI/Planning/EC/DPR/2016 dated 03.05.2018 issued by MoRT&H regarding design specifications for various category of roads under Bharatmala Pariyojana including Economic Corridors and cost optimization for Highway Construction. The design principles mentioned in the aforesaid OM shall supersede the Economic corridor policy, wherever applicable. All Consultants engaged for DPR preparation of various highways under Bharatmala Pariyojana shall adhere to the stipulations elaborated in MoRT&H OM No. NHAI/Planning/EC/DPR/2016 dated 03.05.2018 while designing the project Highway.

2. In addition to the above, it is pertinent to mention that At grade junction are safety hazard in view of high speed after improvement/augmentation of highways and hence it has been decided that no At grade junction is to be provisioned in the main carriageway in any category of road under Bharatmala Pariyojana being improved to minimum 4 lane standards. On non-important roads i.e. Village roads and cart tracks SVUP (refer para 5.2 of above MoRT&H OM) to facilitate crossing only can also be considered. For such crossings located in a short distance feasibility of clubbing them be explored. Alternately, gradient between two such structures be provided in such a way to avoid roller coaster effect.

Yours faithfully,

Encl: As Above.


(Ravinder)

General Manager (T) Bharatmala

Copy to:

- (i) PPS to Secretary, RT&H
- (ii) PPS to Chairman, NHAI,
- (iii) PS to Member(T)DOT , Member (P) RKP, Member(P)AKS, Member(F), Member(PPP);
- (iv) OSD to Hon'ble Minister(MoRT&H)
- (v) All CGM(T) NHAI HQ
- (vi) All GM(T) NHAI HQ: with request to circulate the OM to all Consultants engaged for DPR preparation of Bharatmala Pariyojana under their jurisdiction.
- (vii) All Regional Officers and field units of NHAI

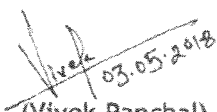
No. NHAI/Planning/EC/DPR/2016
Government of India
Ministry of Road Transport & Highways
(BP&SP Cell)
Transport Bhawan, 1, Parliament Street, New Delhi-110001

Dated: 03rd May, 2018

OFFICE MEMORANDUM

Sub: - Minutes of the Meeting held on the subject of Specifications of Economic corridors and Cost Optimisation for Highway construction under Bharatmala Pariyojana at MoRT&H on 12.03.2018 under the Chairmanship of Secretary (R, T & H)-reg.

Please find enclosed minutes of the meeting held on 12.03.2018 under the Chairmanship of Secretary (R, T & H) regarding Specifications of Economic corridors and Cost Optimisation for Highway construction under Bharatmala Pariyojana.


(Vivek Panchal)
Executive Engineer (BP&SP)

Encl: As stated above.

To:

- (i) DG (RD) & SS (M/o R, T & H);
- (ii) Shri B.N. Singh, ADG (M/o R, T & H);
- (ii) Shri I.K. Pandey, ADG (M/o R, T & H);
- (iii) Shri R. K. Pandey, Member (P), NHAI;
- (iv) Shri Niraj Verma, Member (PPP), NHAI;
- (v) Shri D.O. Tawade, Member (T), NHAI.

Copy to:

- (i) Chairman, NHAI;
- (ii) Sr. PPS to Secretary (R, T & H);
- (iii) PPS to AS & FA (M/o R, T & H);
- (iv) PPS to AS (M/o R, T & H);
- (v) PPS to JS (H) (M/o R, T & H).

Minutes of the Meeting held on the subject of Specifications of Economic corridors and Cost Optimisation for Highway construction under Bharatmala Pariyojana at MoRT&H on 12.03.2018 under the Chairmanship of Secretary, RT&H

The List of the participants is enclosed at Annexure -1.

At the outset, Member (P) RKP apprised about the Economic Corridors under Bharatmala Pariyojana and the need for their development to minimum 4-lane standards with full access controlled facility so as to increase the capacity of Highways and to enhance the safety of road users. Thereafter, detailed presentation was made on discussion points. Deliberations and discussions took place on the subject and decisions taken are as under:

1. Alignment of Corridor and development strategy

- 1.1 There are 50 Economic Corridors, including 6 National Corridors, identified for development/ improvement under Bharatmala Pariyojana. There is an option to develop these as Greenfield/ Brownfield corridors. Greenfield alignment could be shorter, entail least shifting of utilities and tree-cutting and less LA cost but is expected to entail higher civil cost. The decision for development of a corridor/ portion of a corridor as a Brownfield or Greenfield alignment is proposed to be selected on the basis of total life cycle cost (including direct costs like Civil Construction Cost, Maintenance cost & economic costs like Vehicle Operating Cost), Traffic bearing capacity for a period of 30 years and the potential to diversify traffic and reduce distance between Origin-Destination pairs in the network. DPR consultants shall be advised to submit detailed reports on the merits/ de-merits of greenfield/ brownfield expansion in the pre-alignment finalization stage as per guidelines dated 26th February 2018 issued on the subject.

All the economic corridors are to be developed with minimum 4-lane standards and full access control. It was deliberated and decided that the end lane configuration of all economic corridors (both brown-field and green-field has to be planned for 8 lane or above, instead of the present philosophy of maximum 6 lane, as 8 lane highways have ~40% more traffic carrying capacity compared to 6 lane highways, with just the addition of 2 lanes (3.5 m each) in the carriage way while utilizing the existing common features such as median and drain. In addition, 8-Lane Highways drastically reduce the need for green-field alignments in future as these highways would be able to accommodate a 6-fold increase in traffic from present levels (equivalent to growth in India's economy from USD 2.2 Trillion to USD 10 Trillion). However, it was also decided that the end lane status shall be 6 lanes in cases where 6 laning has been developed in certain portions of the corridor or 6 lane structures have been provided during 4-Laning of the corridor or the land acquisition cost for brownfield expansion to 8 Lane is likely to be prohibitive/ very high.

A. Economic Corridor Projects:

The following guidelines were decided for end-lane configuration status and the stage development guidelines based on the present traffic including the induced

traffic (PCU) and the present lane status of the stretch:

Sr. No.	Present traffic including induced traffic (PCU)	Present Lane Status	End Lane Status	Stage development	ROW
(i)	Upto 20,000 PCUs	Upto 2L+PS	8 Lane	4 lane highway with 4 lane structures	70m
(ii)	20,000 - 30,000 PCUs	Upto 2L+PS	8 lane	6 lane highway with 8-lane structures	70m
(iii)	30,000 - 40,000 PCUs onwards	Upto 2L+PS	8 lane	8 lane highway with 8 lane structures	70m
(iv)	40,000 PCUs onwards	Upto 2L+PS	12 lane	8 lane highway with 8 lane structures + Service Roads in urban areas	100 m
(v)	40,000 PCUs onwards	4-Lane	6/8-Lane	<ul style="list-style-type: none"> Option of a Green-field alignment or 8 lane with 8-lane structures (where lifecycle cost is lower) 6 lane with 6 lane structures, in cases, where portion of the corridor has been 6 laned or 6 lane structures have already been developed on 4 lane highway or Cost of land acquisition for brown-field expansion is prohibitive. 	70 m

B. For Inter-corridors/ Feeder Routes

Inter Corridor and Feeder Routes are to be developed to a minimum 4-lane standards with partial access control. In cases where the traffic growth for such inter-corridors/ feeder routes is expected to be very high, the same guidelines as mentioned above for economic corridors on end-lane status and stage construction shall be applicable for Inter Corridor and Feeder Routes.

2. Adoption of Highway/ Expressway standards

Standards for Expressways and National Highways were compared across different attributes and the standards for Economic Corridors were decided, as provided below

Attribute	Expressways	National Highway	Economic Corridor
Design Speed	120 kmph/ 100 kmph	100 kmph/ 80 kmph	120 kmph/ 100 kmph
Lane Width	3.75 m	3.5 m	3.5 m
Median Width	12 m	4 m	(a) 4 m in case of traffic < 40,000 PCU (b) 20 m in case of traffic > 40,000 PCU to accommodate future

Attribute	Expressways	National Highway	Economic Corridor
			expansion as in Sr. No. (iv) above.
Kerb Shyness	0.75 m	0.5 m	0.5 m
Shoulder	3 m Paved Shoulder	1.5 m Paved Shoulder + 2 m Earthen Shoulder	1.5 m Paved Shoulder + 2 m Earthen Shoulder
Level of Access	Fully Access Controlled	Partial Access Control	Fully Access Controlled

3. Augmentation methodology

- (i) For 2 to 4 lane widening, it was decided to keep the widening eccentric to the extent feasible, so as to gainfully utilise the already laid road assets and to minimise the disturbances to trees, utilities, habitations, etc. Realignment shall be resorted to wherever it requires the improvement to poor geometrics, kinks or to provide shorter path. The cost-benefit analysis shall be carried out for major realignment.
- (ii) For a green-field 8-lane configuration with stage development i.e. present development to 4 lane and later to 8 lane, it was decided to provide carriageway of 4 lane with 4 lane structures for the present. Two cross sections were presented within 70m ROW under this concept. Option-1 with leaving space in the median for future development and Option-2 with leaving space outside the formation width. Deliberating upon the pros and cons of both the options, it was decided to go in for option-2 as it allows for approaches in 4-Lane structures to be constructed on embankment without RE walls to the extent feasible in the first phase and RE wall can be constructed in phase-II without disturbance to existing embankment at the time of 8-laning.
- (iii) Service roads of 10 m width shall be constructed, limited to the built-up sections (both in rural and urban cases) and for connectivity of cross roads. No service roads shall be proposed to be constructed in the open rural sections. However, space shall be provisioned to construct 10 m wide service roads on both sides without disturbances to main highway along with its embankment. In rural areas, all weather connecting roads to facilitate cross movement of farmers and their vehicles shall be provided at LVUP/ VUP locations.

4. Pavement composition

It was highlighted that there are different types of pavements viz. flexible pavement, rigid pavement, cement treated base/ sub-base and perpetual pavement at present. Each pavement option has its own merits and demerits in terms of cost of construction, future maintenance, road user comfort, etc. However, no precise mathematical model is available for life cycle analysis. The

matter was deliberated at length and it was decided that the DPR consultant shall conduct a complete comparative analysis of the same and submit a detailed recommendation by taking into account both the lifecycle cost and the local conditions including soil condition, availability of material for construction, rainfall conditions, etc. The appraisal committee shall take a decision based on the details provided by the DPR consultant. However, as regards the Service Roads in inhabited areas, it was decided that would be constructed with Rigid pavements.

5. Optimization in terms of Vertical alignment design (ISD/ SSD), VUP v/s VOP, Drains and Interchanges

5.1 Vertical alignment design (ISD/SSD)

The Vertical design, specially at grade change location, such as VUP/LVUP, ROB, Bridge locations can be done using Stopping sight distance (SSD) or Intermediate Sight distance (ISD) principle. Length of approaches in case of ISD is relatively larger by about 30% but desirable in view of design speed of 100 kmph and also ISD is prescribed in new 4 & 6 lane Manual published in 2014 & 2013 respectively. The Chair agreed to the same.

5.2 VOP vs VUP

Various combinations of Vehicular Over pass (VOP) and Vehicular Underpass (VUP) were presented, wherein it was shown that VUP is cheaper than the VOP in conditions of no constraint/ restraint. The final call is proposed to be taken keeping in view the designed traffic, civil cost of construction, vehicle operating cost, environment cost, travel time, site condition, etc. on the basis of output obtained using lifecycle cost analysis including vehicle operating cost keeping the design life of 30 years. If the analysis results into savings, then cross roads be carried above the main highway in form of VOP. In case of VUP/ LVUP, the exposed structure base shall be kept 6 inch (15 cm) above the ground level to minimize the height of approaches and ensure that these VUPs don't become water accumulation points. However, the main highway shall be kept above the cross roads in form of VUPs at interchange locations. As 70% of the cross roads are village roads (<5.5m width), to ensure complete access-control and make cost-effective grade separation, it was decided to introduce a third smaller dimension VUP - SVUP (4m * 7m) for all cross roads carriageway width lesser than 5.5m. Thus, the VUPs would be of three grades i.e. VUP - 5.5mx20; LVUP - 4mx12m; and SVUP: 4m*7m. It was also decided to minimize the use of RE-walls in VUP/ LVUP/ SVUP by using earthen slopes, so as to minimize the cost.

6. Longitudinal Pipe drain vs. Rectangular RCC drain

The discussion started with functionality, workmanship and cost of NP3 Pipe drain vs. Rectangular RCC drain. With respect to pipe drain, it was discussed that the storm water carrying capacity of pipe drain of 0.9m dia is lesser than

1.5x1.5m wide conventional RCC drain. Further, pipe drain requires catch pit (either brick/ precast RCC panel) at 20 to 30m interval and relatively costlier than RCC rectangular drain. The chair suggested to look into this aspect again regarding functional superiority of rectangular drain vs. pipe drain keeping in view the example of road side drains in Chandigarh city and carry out rate analysis again for decision in this regard later. Till such decision, the DPR consultant should study both the options and give his considered recommendation, especially when the size of dia of the pipe has to be linked with the incidence of rainfall data in that area.

7. Selection of type of Interchanges

The type on interchanges associated with their functionality and cost were presented and it was decided that proper turning motion studies shall be conducted and full clover leaf, dumbbell interchange, diamond interchange, VUP/ VOP/ LVUP /SVUP shall be proposed based on the conflicting traffic.

8. Provision of Toe Wall on the extreme Boundary of RoW:

It was observed that encroachments on the acquired Right of Way for road corridors affects future expansion. It was decided that pre-cast Toe-walls shall be provided along the Right of Way.

9. Utility Corridors:

It was also decided that provision shall be earmarked for a 2m wide Utility Corridor at the extreme edges of the RoW on each side in all greenfield projects. Further, a separate policy shall be prepared for development, operation and regulation of utility corridors for different Utilities.

Meeting ended with a vote of thanks to and from the Chair.

List of Participants:

1. Secretary, RT&H: In Chair
2. DG (RD)&SS
3. Additional Secretary, RT&H
4. Sh. B.N. Singh, ADG
5. Sh. I.K. Pandey, ADG
6. Joint Secretary (Highways)
7. Sh. R. K. Pande, Member (P), NHAI
8. Sh. D.O. Tawade, Member (T), NHAI
9. Sh. Niraj Verma, Member(PPP),NHAI
10. Sh. Manoj Kumar, CGM(T),NHAI
11. Sh. Ajmer Singh, CGM(T),NHAI
12. Sh Alok Deepankar, CGM(T),NHAI
13. Sh Atul Kumar, CGM(T), NHAI;
14. Sh. Ravinder, GM, NHAI