

ANNEXURE – D

EXECUTIVE SUMMARY

0.1 PROJECT BACKGROUND

The National Highway Authority of India (NHAI) under the Ministry of Road Transport & Highways (MoRT&H), Government of India has been entrusted the assignment of study of the existing DPR/ contract provisions for 4 laning of Udhampur Banihal Section of NH-1A from Km 130 to Km 151 (Nashri to Ramban) under implementation and prepare revised DPR for identified sliding/slip zones to make project road all weather traffic worthy and safe in the Union Territory of Jammu & Kashmir on EPC mode. With a view to this, it has been proposed to conduct a **study for the identified locations in the section and prepare revised DPR to provide realignments/alternate solutions to the extent required in the form of tunnels/viaducts etc., to make such locations all weather traffic worthy and safe for operations”**.

The Project Road is shown in the Index Map (Fig 1.1) below.

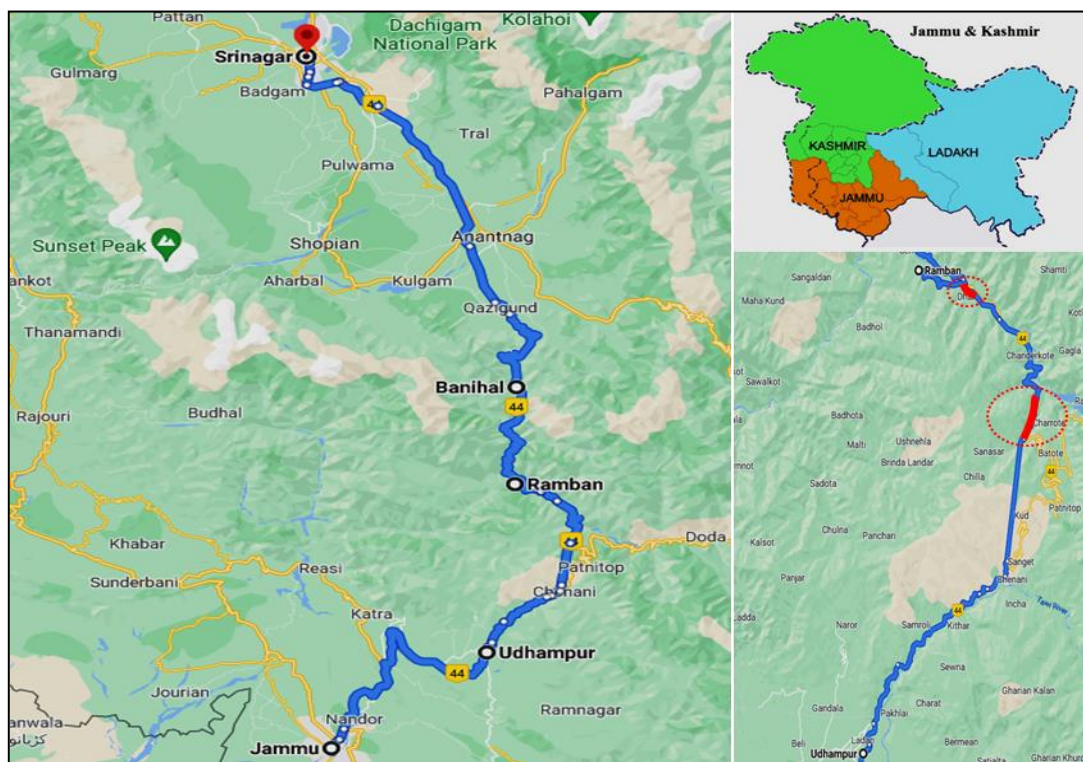


Fig 1.1: Index Map Showing the Project Road

In pursuance of the above, Intercontinental Consultants and Technocrats Pvt. Ltd. (ICT) in JV with ALTINOK Consulting Engineering Inc. have been assigned this work as variation by NHAI under the consultancy agreement for the services signed on 17th September 2020 for the section from Km. 151 to Km. 187

NHAI has asked the Consultants to commence the consultancy services immediately vide its letter no. NHAI/11019/22/ 2020RB/DPR dated 21st September 2020. Accordingly, Consultant vide letter no. ICT/NHAI/RAMBAN-BANIHAL /851/4357 dated 22nd September 2020 agreed to commence services from 22nd September 2020 in accordance with the Conditions of the Contract and


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in due course of this assignment in addition as a variation for 5 no's of sinking/slide area locations in Nashri to Ramban Section from Km 130.00 to Km. 151.00 vide NHAI/PIU – Ramban/2019-21/11005/27 dated 13th July 2021 were also awarded. Work for the assignment of 5 no's of sinking/slide area locations were also taken up during the month of June -July 2021.

Presently four laning of Nashri to Ramban Section of NH-1 A (Now NH-44), from Km 130.00 to Km. 151.00 is under implementation through an on-going EPC Contract in the Union Territory of Jammu & Kashmir on EPC mode.

Under the on-going contract certain sections were subjected to severe sinking leading to severe landslides and failure of slopes due to which works could not be taken up fully and already executed works were also affected due to these failures. On account of issues pertaining to critical locations detailed investigation studies were required to make all weather traffic worthy and safe for operations. Based on the outcomes from the studies for these critical locations alternate suitable solutions were provided.

For a better understanding, since the existing kilometre stones are not traced on ground, the on-going EPC Contract design chainage is referred as “Existing Chainage” for the North Bound (NB) and South Bound (SB) carriageways and Revised Design Chainage as “Design Chainage” for the North Bound (NB) and South Bound (SB) carriageways

After discussion held at RO Office Jammu and NHAI HQ, the critical sections from Km 130.00 to Km. 151.00 have been identified and finalised are detailed as below:

S. No. (Slide Zone No.)	Slide Location
1	Ch.: 130590 to 130750 (NB)
	Ch.: 130550 to 130750 (SB)
2	Ch.: 131170 to 131763 (NB)
	Ch.: 131204 to 131774 (SB)
3	Ch.: 132580 to 133185 (NB)
	Ch.: 132560 to 133168 (SB)
4	Ch.: 133590 to 133743 (SB)
5	Ch.: 145900 to 146600 (Near Cafeteria More-Box Structure NB)
	Ch.: 147877 to 148715 (Near Cafeteria More- Single Tube Tunnel SB)

0.2 OBJECTIVES

The main objectives of the Consultancy services are given below:

- To prepare the Documents so that the project road critical locations identified shall be all weather traffic worthy.
- To integrate the work already carried out at site with the proposed arrangement in the documents as far as possible.


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- The Document should include the Designs of Highways, Pavement, Structures, Detailed Cost Estimates, Environmental & Social Assessments including the EMP and RAP and also adequate Bid Documents to be prepared for tendering the Project on the Commercial basis for International/Local Competitive Bidding.

0.3 PROJECT DESCRIPTION

Four Laning of Udhampur to Ramban Section of NH-1A (Now NH-44) from Existing Km 67.000 to Km 89.000 and Km130.000 to Km 151.000 is under implementation through an ongoing EPC Contract in the Union Territory of Jammu & Kashmir on EPC mode.

Under the ongoing contract certain sections between Km130.000 to Km 151.000 could not be taken up on account of issues pertaining to critical locations which needed detailed study. To make such critical locations all weather traffic worthy and safe for operations, alternate solutions are provided. In this package construction of Four Laning of part of Udhampur to Ramban section of NH-1A (now NH-44) is taken up in the Union Territory of Jammu & Kashmir on EPC mode. The details of the 5 sections to be developed are given in table below:

S. No.	Existing Chainage		Length (m)	Design Chainage		Length (m)
	From (Ch.)	To (Ch.)		From (Ch.)	To (Ch.)	
1.	130+590 (NB)	130+750 (NB)	160	130+590 (NB)	130+750 (NB)	160
	130+550 (SB)	130+750 (SB)	200	130+550 (SB)	130+750 (SB)	200
2.	131+170 (NB)	131+763 (NB)	593	131+170 (NB)	131+763 (NB)	593
	131+203 (SB)	131+772 (SB)	568.5	131+204 (SB)	131+774 (SB)	570
3.	132+582 (NB)	133+190 (NB)	608	132+580 (NB)	133+185 (NB)	605
	132+560 (SB)	133+175 (SB)	615	132+560 (SB)	133+168(SB)	608
4.	-	-	-	-	-	-
	133+591 (SB)	133+742 (SB)	150.2	133+590 (SB)	133+743 (SB)	153
5.	145+900 (NB)	146+600 (NB)	700	145+900 (NB)	146+600 (NB)	700
	147+877 (SB)	148+635 (SB)	758	147+877 (SB)	148+715 (SB)	838

Presently widening works are under progress at all the above sections. In some sections works are taken upto GSB level, some to WMM level and some locations to DBM levels with all in deteriorated/ dismantled condition. The proposed pavement at all the above existing locations is flexible pavement type.

0.4 SOCIO-ECONOMIC PROFILE OF THE PROJECT INFLUENCE AREA (PIA)

The project influence area of the proposed project traverses in the district of Ramban in the Union Territory of Jammu and Kashmir.

Ramban is one of the 20 Districts in the Union Territory of Jammu and Kashmir. Ramban is located in the lap of the Pir Panjal mountain range. It was carved out of the erstwhile Doda District on 1 April 2007. Ramban town is the district headquarters. The town is located midway between Jammu and Srinagar along the Chenab river in Chenab Valley on National Highway 44, (originally National Highway-1A (India)) approximately 151 km from Jammu and Srinagar. The boundary lines of Ramban district encompass hill station Patnitop as its southernmost point, Assar on its eastern edge, Gool to the west, and Banihal to

the north. The terrain of district Ramban is tough and hilly. District Ramban shares its boundary with Reasi, Udhampur, Doda, Anantnag and Kulgam districts.

Total Population

The population of the project influence district and Union Territory is reflected in the table below.

Population of the Affected District

Union Territory /District	Population	Percentage
Jammu & Kashmir	1,25,41,302	100
Ramban	2,83,713	2.26

Source: Census of India, 2011.

Sex ratio of Jammu and Kashmir Union Territory is 889 female per 1000 males whereas for Ramban district it is 902 female per 1000 males as per census 2011.

It is evident from 2011 census that the decadal population growth rate has decreased in the Union Territory whereas increased in Ramban district as reflected in table below

Decadal Growth Rate

Union Territory / District	1991-2001	2001-2011
Jammu and Kashmir	29.00	23.64
Ramban	26.91	31.81

0.5 ENGINEERING SURVEYS AND INVESTIGATIONS

The consultants have carried out engineering surveys and investigations that include Alignment Studies, Topographical Surveys, Road Inventory and Pavement Condition Surveys, Inventory and Condition Surveys for Bridges, Culverts and other Structures etc.

0.5.1 Existing Conditions

Terrain Classification

The Project Road for its total length traverses through Hilly terrain.

Land Use Pattern

Forest land & Govt. land are the predominant land use along the project road.

Right-of-Way (ROW)

The Right of Way (ROW) Pillars are generally not marked on the Ground but however the required ROW has been acquired for 4laning of the project road in the on-going EPC contract which varies between 30 to 60 m in general.

Major Built up Sections along the Project Road

No major Built-up section exists along these identified locations.

Geometry and Pavement Condition of the Existing Road

Horizontal Curve - Since the project road is traversing through the hill section, majority of the project section is curvilinear with many substandard curves along the existing road.



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Vertical Profile - The project road traverses through one of the tough and steepest terrains in the country. All the existing gradients cater to a gradient ranging from 3%-7% gradients with some small sections of flatter gradients.

0.5.2 Bridges and Culvert

The details of Bridges & Culverts are presented in table below:

S. No.	Side	Major Bridge		Minor Bridges		Culverts	
		UC	ABD	UC	ABD	Slab	Box (UC)
1	North Bound	-	-	-	-	7	-
2	South Bound	-	-	-	-	4	-
	Total	0		0		11	

Note- UC-Under Construction, ABD- Abandoned

0.5.3 Topographical Survey

The topographical survey work includes; Establishment of a suitable network of control points and Detailed topographical field survey and data processing.

Primary controls were established along the entire project sections. Primary and secondary both controls were coordinated with GPS. Levels for both the control points were assigned by carrying out levelling with Digital levels. Based on the precise x, y & z coordinates of survey control points and BM pillars, detailed topographical survey of the project road were carried out using conventional survey method using digital Total Station along specified road corridor.

All ground survey data collected by the Total Station including spot heights suitably processed to generate seamless digital map and Digital Elevation Model of the project road corridor.

0.5.4 Soil & Material Investigations

Materials Investigation:

In Ramban- Banihal section (nearby stretch) material survey was conducted to locate potential borrow soil sources and extraction sites including rock quarries, sand sources and water for use in the construction of various components of the project roads. The Udhampur-Ramban & Ramban Banihal are stretches adjacent to each other and have the same geology, hence the same results has been considered in this section also.

Regarding borrow area soil, it has been observed during investigation that on-going road construction on the Nashri – Ramban and Ramban-Banihal road section, subgrade and embankment is constructed mostly from the material obtained from cutting. In Ramban-Banihal section some of the borrow soil area was selected from these hill cut areas, samples were collected and tested. The CBR (97% compaction) of the borrow area soil varies from 40.5% to 52.0% and all the identified borrow areas can be used for subgrade and embankment construction. Hence same has been considered for this stretch also.

It has been observed that in the on-going construction works of Nashri – Ramban and Ramban-Banihal road sections, the cut materials from the project road have been used by contractor for construction of road works after crushing to appropriate aggregate sizes. The consultant had sampled from crushers which were used for crushing aggregate from cut materials were collected for testing in the Ramban-Banihal section and tested, It was found that the aggregates can be



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used for permanent work also. As the Ramban-Banihal & Udampur-Ramban sections are in the same vicinity, hence material from cutting have more or less same properties and can be used in construction work in this section also.

0.5.5 Existing Pavement Investigation

Considering all the improvement proposals would be involving Viaduct/tunnel proposal the need of carrying out the existing Pavement Investigations was not required. It is understood the pavement for the approaches of the proposed structures Viaducts/tunnels shall be proposed with the designed flexible/rigid pavement thickness configuration in this section.

0.5.6 Subsoil & Geotechnical Investigations for Slope Stability

There are natural slides along the Project Road. A report on investigation & testing has been received from client which was submitted by M/s. Gammon India having Geophysical /ERT testing details & results, same report has been reviewed by the Geologist & Geotechnical expert and proposed the slope protection measures.

Surveys and Investigations for Tunnel

Nashri - Ramban area belongs to the Lesser Himalaya which comprise mainly unfossiliferous, low to high grade metamorphic rocks of Proterozoic age, besides rocks of Early Eocene age (Wadia 1975). This area from Kashmir-Chamba appears to be the NW extension of Lesser Himalayan zone of Kumaon, Garhwal, and eastern Himachal. It thus forms a broad NW-SE trending belt between lower Tertiaries to the south and central crystalline to the north. This belt narrows towards the northwest from Shimla hills to the Jammu area of Kashmir, although the lithostratigraphy and major structural units of the zone have been established, a lack of fossil control has given rise to divergent opinions about the age and stratigraphic positions of various lithostratigraphic units. The Lesser Himalaya in the project area represents a linear zone of rocks characterised by the presence of two major tectonic plates i.e., Murree Thrust in the south and Panjal Thrust in the north, running in close proximity with each other. The Lesser Himalayan rocks are intensely folded, faulted and sheared. Most of the strata in the project area have a regional strike of NNW –SSE, NW-SE with moderate to steep dip in either direction. The rocks belonging to this tectonic unit are, therefore available in the region for the geotechnical investigation.

0.6 TRAFFIC STUDIES AND ANALYSIS

To capture traffic flow characteristics and travel pattern of vehicles passing through Nashri - Ramban sections of project roads the primary traffic survey data conducted in the adjacent section of Ramban – Banihal had been considered

The primary traffic surveys including Classified Traffic Volume count, Origin - Destination survey, Intersection turning movement count, Axle load survey and Pedestrian count survey were conducted in the adjacent Ramban – Banihal Section.

Since there is no major diversion of the traffic between Nashri – Ramban – Banihal section observed it is proposed to consider the same traffic using the Nashri – Ramban section.

0.6.1 Identification of Homogeneous Sections

Since there are no major dispersal nodes along the stretch, the project road has been considered as one homogenous section for further analysis.


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0.6.2 Axle Load Survey

The axle load survey provides data to enable the assessment of the damaging effect of the heavily loaded commercial vehicles. The survey conducted in the adjacent section of Ramban-Banihal is being used for this section also. The survey was carried out using the electronic static axle load pad on the project road at Km 165+000 at Khooni Nallah on NH-44. After analysis of the data collected from site, the VDF factors worked out are presented in table below:

Vehicle Type	Vehicle Damage Factor (VDF)	
	Up	Down
LCV	0.03	0.02
2-axle Truck	3.90	2.54
3-axle Truck	5.85	4.68
MAV	6.96	4.94

Note: UP = Ramban/ Nashri to Banihal, DN = Banihal to Nashri/Ramban.

0.6.3 Existing Traffic

The AADT (without COVID-19 Correction) traffic data on the Ramban – Banihal section is presented as below.

Annual Average Daily Traffic (AADT)

Vehicle Category	ATCC-1 at Km 165+000 at Khooni Nallah on NH-44		ATCC-2 at Km 172+500 at Rashtriya Rifle on NH-44	
	Veh.	PCUs	Veh.	PCUs
Car / Taxi	3216	3216	3052	3052
Mini Bus	163	244	143	215
Bus	35	104	34	102
LGV 4-Wheeler	581	872	667	1000
2-axle Truck	2488	7465	2721	8162
3-axle Truck	1130	3391	1061	3183
4-6 axle Truck	659	2966	668	3005
Total Tollable Traffic	8272	18258	8348	18730
Toll Exempt Vehicles	43	109	42	115
LGV 3-Wheeler	4	6	19	28
3-Wheeler (Passenger)	4	4	3	3
2-Wheeler	77	38	92	46
Tractor	3	4	5	7
Tractor With Trailer	6	26	4	17
Bicycle	0	0	0	0

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Vehicle Category	ATCC-1 at Km 165+000 at Khooni Nallah on NH-44		ATCC-2 at Km 172+500 at Rashtriya Rifle on NH-44	
	Veh.	PCUs	Veh.	PCUs
Cycle Rickshaw	0	0	0	0
Hand Cart	0	0	0	0
Animal Drawn Cart	0	0	0	0
Total Non-Tollable Traffic	137	188	165	216
Total Traffic	8409	18445	8513	18946

The Consultant has also studied the effect of COVID-19 on the traffic and accordingly COVID-19 correction have been used after comparing the present traffic with the pre-COVID traffic data obtained from recently conducted traffic studies in Himachal Pradesh. The Comparison of AADT data with & without COVID-19 is presented below:

S. No.	AADT at Km 165+000		AADT at Km 172+500		Remarks
	Veh.	PCU	Veh.	PCU	
1	8409	18445	8513	18946	Before COVID-19 Correction
2	9245	20279	9360	20829	After COVID-19 Correction

The Construction of Jammu-Baramulla Railway link is in progress and expected to complete by year 2022. The Consultant has also carried out the diversion of traffic from the project road to Jammu-Baramulla Rail link using the OD survey data of the Project Road. A diversion of 20% for all modes has been assumed based on results arrived from the analysis. This have been added in three stages i.e. 30% in Year 2022, 30% in Year 2023 and 40% in Year 2024.

0.6.4 Projected Traffic

The projected traffic for Ramban – Banihal section (adjacent section) is presented below:

S. No.	Year	Projected Traffic	
		Vehicle	PCU
1	2020-2021	9360	20829
2	2025-2026	9682	21359
3	2030-2031	13090	28613
4	2035-2036	16750	36285
5	2040-2041	20658	44404
6	2045-2046	24629	52590
7	2050-2051	29370	62298
8	2054-2055	33820	71351


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0.7 HYDROLOGICAL INVESTIGATION

The project influence area is a part of Chenab Mega-catchment and the road runs parallel to Nashri Nallah on RHS of existing road from km. 130 to Km. 134 and River Chenab on LHS of existing road from Km. 146 to Km. 149. IRC SP 13 & IRC 5 recommendations are used for the estimation of peak discharge for the bridges & culverts planned in the stretch. For design of tunnel the important hydrological data is the surface runoff and its pattern based upon the topography, physiology, climatic conditions and estimation of glacial flows for the stability analysis of the proposed tunnel portals and the conditions of the discontinuities along and across the alignment of the proposed tunnel for the seepage analysis and its effect upon the design of internal drains, waterproofing and lining. The "Flood estimation report for western Himalayas-Zone-7" published by Central water commission of India in 1994 has been used to provide the necessary information for the purpose.

Primary data collected from Engineering Surveys are in the form of

- Hydraulic Survey for Bridges,
- Culvert Inventory and
- Topographical Survey covering the Road Corridor and river (C/S and L/S) survey.

Apart from the Primary Survey data, Desk Study of historical hydro-meteorological data, Reports on Ecology and Geomorphology of the rivers, hydro-geological characteristics of landslide areas have provided the consultants with additional information required for drainage planning of the project road.

0.8 PRELIMINARY ENGINEERING DESIGN

0.8.1 Proposed Improvement Proposals

The preferred alternative study was carried forward from the Alternative Alignment Study into preliminary design. The alignment was examined in more detail; minor local variations were made in the alignment to address safety concerns that were encountered as additional information was gathered for preliminary design.

The horizontal and vertical alignment for the proposed highway confirms to design speed in accordance with the Geometric Design Standards for Hill roads

For improving the horizontal geometry of the existing road and to provide a better horizontal geometry to the new 2lane carriageway, 2 project chainage systems has been provided. One chainage runs all along the Northbound (NB) carriageway (i.e. improvement of existing carriageway) and other chainage runs all along the southbound (SB) carriageway (new two lane road, generally on valley side of existing road) except at location no.5 where North Bound Carriageway is on Valley Side. The respective lengths for improvement proposal of North Bound and South Bound carriageways are given in the below table.

Detail of Proposed Improvements

S. No.	Existing Chainage		Length (m)	Design Chainage		Length (m)
	From (Ch.)	To (Ch.)		From (Ch.)	To (Ch.)	
1.	130+590 (NB)	130+750 (NB)	160	130+590 (NB)	130+750 (NB)	160
	130+550 (SB)	130+750 (SB)	200	130+550 (SB)	130+750 (SB)	200
2.	131+170 (NB)	131+763 (NB)	593	131+170 (NB)	131+763 (NB)	593

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S. No.	Existing Chainage		Length (m)	Design Chainage		Length (m)
	From (Ch.)	To (Ch.)		From (Ch.)	To (Ch.)	
	131+203 (SB)	131+772 (SB)	568.5	131+204 (SB)	131+774 (SB)	570
3.	132+582 (NB)	133+190 (NB)	608	132+580 (NB)	133+185 (NB)	605
	132+560 (SB)	133+175 (SB)	615	132+560 (SB)	133+168(SB)	608
4.	-	-	-	-	-	-
	133+591 (SB)	133+742 (SB)	150.2	133+590 (SB)	133+743 (SB)	153
5.	145+900 (NB)	146+600 (NB)	700	145+900 (NB)	146+600 (NB)	700
	147+877 (SB)	148+635 (SB)	758	147+877 (SB)	148+715 (SB)	838

0.8.2 Typical Cross Sections

Based on the site conditions and design standards the typical cross-sections applicable for various sections of the project road have been prepared. The details of the Typical Cross-Section for road section are presented below:

TCS-1	Typical cross section for Viaduct approach with varying median and protection
TCS-1A	Typical cross section for approach to Viaduct for South Bound Carriageway
TCS-2	Typical Cross section for North Bound & South Bound Viaduct
TCS-2A	Typical Cross section for South Bound Viaduct only
TCS-3	Typical cross section for Approach of Box Structure for protection from landslide for North Bound Carriageway
TCS-4	Typical cross section Box Structure for protection from landslide for North Bound Carriageway
TCS-5	Typical Cross section for approach of South Bound Tunnel
TCS-6	Typical Cross section for South Bound Single tube (Uni-Directional) Tunnel

0.9 PROJECT FACILITIES


i) Road Signs, Pavement Marking and Lighting

a) Traffic Control Devices, Road Safety Devices and Roadside Furniture

Traffic Control Devices, Road Safety Devices and roadside furniture shall be provided as per Section – 9 of IRC: SP: 84-2019:

i. Road Signs:

Road Signs include roadside signs; chevron signs; overhead signs and kerb mounted signs along the entire Project Highway and Slip/Connecting road. The road signs and overhead signs erected on the Project highway and Slip/Connecting road with regard to requirement of number of signs, type and size of sign, size of letter, color of sign, layout of sign; etc. including signs installations shall conform to Section-9 of “Manual” and IRC: 67, Code of


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Practice for Road Signs. Chevron signs shall be installed on curves and intersection. In addition to signs prescribed in "Manual" other signs such as signs showing safety slogans, toll free numbers, nearby hospital and police station facilities, lane discipline signs on gantry, headway etc. will also be provided as directed by Authority/Independent Engineer.

For Tunnels Guidelines given in Clause 14.10 of IRC: SP: 84-2019 and Section 8 of IRC: SP:-91-2019 shall be also be considered.

The final locations shall be finalized in consultation with the Authority Engineer. The height, lateral clearance and installation of the sign structures shall be as per the MoRT&H/IRC guidelines. Design and location of overhead gantry sign, route marker signs for Project Highway shall be as per the IRC: 67.

ii. Pavement Markings:

Pavement markings shall cover the entire Project Highway and shall be as per section- 9 of the "Manual" and IRC: 35. These markings shall be applied to road center lines; edge lines; continuity line; stop lines; give-way lines; diagonal/chevron markings; zebra crossing and at parking areas etc. by means of an approved self-propelled machine which has a satisfactory cut-off valve capable of applying broken lines automatically.

Road markings other than on main carriageway edges (both shoulder and median side) shall be of hot applied thermoplastic materials with glass reflectorizing beads as per relevant sub-clauses of MoRT&H specifications; Raised profile edge lines as per Clause 7.7 of IRC 35 shall be provided on main carriageway (both sides i.e. shoulder and median side/right lane).

For Tunnels Guidelines given in Clause 14.10 of IRC: SP: 84-2019 and Section 8 of IRC: SP:-91-2019 shall be also be considered.

iii. Raised Pavement Markers, Reflection pavement markers and Solar Studs:

Shall be provided along entire Project Highway suggested as per requirements of Section -9 of the IRC: SP: 84-2019 & Section 8 of IRC:SP:84-2019 and relevant IRC Manual specified in Schedule D.

iv. Hectometer & Kilometer Distance marker:

Shall be provided along entire Project Highway suggested as per requirements of Section -12 of IRC: SP: 84-2019 and relevant IRC Manual specified in Schedule D

v. Crash Barrier:

W-Beam metal crash barrier shall be provided along the project highway as indicated in TCS given in Schedule B and as per section-9 &Section-14 of IRC:SP:84-2019 and IRC:SP-91-2019.

vi. Delineators

Delineators shall be provided as per clause 9.4 of IRC: SP: 84-2019 and Clause 8.5 of IRC: SP91-2019. At merging/diverging areas; and their approaches; the spacing shall be reduced to 30m. The design; location and materials to be used for road delineators shall be as per IRC: 79.

b) Lighting

For Tunnel: Illumination/lighting including electrical substation (One building at entry portal) shall be in accordance with IRC: SP: 91-2019 and as defined in Schedule D.


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c) Tunnel Ventilation and Fire Fighting System

A ventilation system shall be provided for Tunnels portals (2 nos. jet fans at each portal) as defined in schedule D. Ventilation system shall be provided as per the Technical specifications and Guidelines for Road Tunnels IRC: SP:91-2019 and relevant IRC Manual specified in Schedule D.

Fire Fighting System shall be provided as defined in schedule D.

d) Substation, Utility Building and Operation & Maintenance CentersFor Tunnel

One service building including substation, Utility Building and Operation & Maintenance center shall be required to be provided at entry portal for accommodating the electrical and various equipment etc. Keeping in view the space and functional requirements for above installation, conceptual layout has to be proposed by the contractor for the portal station.

The space requirement for the buildings will be estimated based on the technology and size. However, the space requirements may have to be reviewed at the time of execution based upon the details. The minimum built up area of service building shall be 150 Sqm.

However, the portal station shall not be more than 100 m distance from the portal.

e) Pedestrian Facilities

The pedestrian facilities shall include the provision of the;

- i. Pedestrian guardrail: In built up areas as per required TCS as shown in Appendix B-1 of Schedule B and as per Schedule D
- ii. Pedestrian Crossings: as per Schedule D

0.10 NEW PROPOSED STRUCTURES**Structures****New Bridges/Viaducts**

New bridges/viaducts at the following locations on the Project Highway shall be constructed. GADs for the new bridges are attached in the drawings folder.

(a) Major Bridges

S. No.	Design Chainage (Ch.)			Structure Type	Span Length (m)	Total Width (m)	Total Length (m)
	Side	From	To				
1	NB	130+610	130+740	PSC Girder/ RCC Girder and RCC Deck Slab	(1x31+2x34+1x31)	1x12	130.05
	SB	130+570	130+740		(5x34)	1x12	170.05
2	NB	131+258	131+658		(10X40)	1x12	400.05
	SB	131+238	131+678		(11X40)	1x12	440.05
3	NB	132+600	133+110		(12X40) + 1X30)	1x12	510.05
	SB	132+600	133+100		(12X40) + 1X20)	1x12	500.05
4	SB	133+650	133+720		(2X35)	1x12m	70.05

Other Structures

(a) Box Structure

S. No.	Location	Start Design Chainage (Ch.)	End Design Chainage (Ch.)	Length of Tunnel (m)	Carriageway width including Footpath & Walkway (m)	Remarks
1	North Bound Carriageway	145+930	146+500	570	1x 9.5	Box Structure for Protection from Landslide at Location No. 5

(b) RCC Diaphragm Wall

The Diaphragm wall shall be provided in the following locations

(a) North Bound Carriageway

S. No.	Design Chainage (RHS)		Length (m)	Remarks
	From (Ch.)	To (Ch.)		
1	145+930	146+500	570	At location No. 5

Special Protection near Structures

The two types of Slope protection measures shall be provided as detailed below:

- The special protections near Pier & Abutments of the proposed Bridges/Viaducts on Valley side i.e. 32 mm dia Self Driven Anchors with Grouting of 12 m length & Drain shall be provided in the longitudinal direction for minimum length= pile cap length+10m extra on either side.
- Slope Protection measures for Slope on valley i.e. between existing carriageway and proposed viaducts/ Bridges shall be provided as mentioned in table below

S. No.	Ht. of Cutting (m)	Proposed Protection Measures			
		32 mm dia Self Driven Anchors with Grouting	76 mm dia Drainage holes with perforated pipes	Shotcrete & Wire Mesh	Drain
1	> 5m-25m	12m long Self Drilling Anchors at 2 m c/c	12m long at 4 m c/c	One Layer of Shotcrete 100mm thick with one layer of Wire mesh (100x100x5mm)	Drain shall be provided

The applicable Chainage are given below:



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South Bound Carriageway Valley Side

S. No.	Design Chainage		Length (m)	Height of Protection (m)
	From (Ch.)	To (Ch.)		
1	130+550 (South Bound)	130+750 (South Bound)	200	15m to 20m
2	131+204 (South Bound)	131+774 (South Bound)	570	20m to 25m
3	132+560 (South Bound)	133+168 (South Bound)	608	20m to 25m
4	133+590 (South Bound)	133+743 (South Bound)	153	10m to 15m

0.11 PRELIMINARY TUNNEL DESIGN

Horizontal & Vertical Geometry: Horizontal and vertical geometry has been designed considering IRC: SP: 91-2019 & IRC: SP:84-2019 and maximum longitudinal gradient has been considered as 2.9%.

Typical Cross-section: The Cross-section has been developed as 2 lane with having footpath on both side. The cross-section is presented in Schedule-B & Drawing Volume.

The clearance height for the traffic is 5.5m.

Proposed Tunnels on the Project Road Section

S. No.	Location	Start Design Chainage (Ch.)	End Design Chainage (Ch.)	Length of Tunnel (m)	Carriageway width including Footpath & Walkway (m)	Remarks
1	South Bound Carriageway	147+967	148+575	608	1 x 11.150	New 2-lane Single tube Uni-directional Tunnel

Other tunnel ancillary works not limited to drainage, water proofing, ventilation, tunnel illumination including electrical sub-station at one portal, one O&M Centre, furnishing, signage's, emergency facilities, etc. shall be provided as specified in IRC:SP:84-2019, IRC: SP:91-2019.

0.12 SLOPE PROTECTION WORKS**Special Requirements for Hill Roads**

The side slopes shall be protected all along the highway on Hill Side and Valley Side.

The details of protection works are given below:

(a) Gabion Walls shall be provided at the following Locations

(i) North Bound Carriageway (LHS)

Design Chainage		Length (m)	Height of Fill (m)
From (Ch.)	To (Ch.)		
132+955	133+105	150	Height Varies between 1m to 4m

(ii) North Bound Carriageway (RHS)

Design Chainage		Length (m)	Height of Fill (m)
From (Ch.)	To (Ch.)		
133+665	133+705	40	Height Varies between 1m to 4m

(b) Stone Masonry Retaining wall shall be provided at the following Locations

(i) North Bound Carriageway

S. No.	From	To	Side (RHS)	Length	Height of Fill (m)
1	130590	130610	NB	20	Varying 3-5m
	130740	130750	NB	10	Varying 3-5m
2	130550	130570	SB	20	Varying 5-10m
	130740	130750	SB	10	Varying 5-10m
3	131170	131258	NB	88	Varying 3-5m
	131658	131763	NB	105	Varying 3-5m
4	131204	131238	SB	34	Varying 5-10m
	131678	131774	SB	96	Varying 5-10m
5	132580	132600	NB	20	Varying 3-5m
	133110	133185	NB	75	Varying 3-5m
6	132560	132600	SB	40	Varying 5-10m
	133100	133168	SB	68	Varying 5-10m
7	133590	133650	SB	60	Varying 5-10m
	133720	133743	SB	23	Varying 5-10m
8	145900	145930	NB (RHS & LHS)	(30+30=60)	Varying 5-10m



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S. No.	From	To	Side (RHS)	Length	Height of Fill (m)
	146500	146600	NB (LHS)	100	Varying 5-10m
9	147877	147967	SB	90	Varying 3-5m
	148575	148715.18	SB	140.1865	Varying 5-10m

(c) Special Slope protection for Hill Side slope

Following protection measures shall be provided

S. No.	Ht. of Cutting (m)	Proposed Slope Protection Measures						
		Revetment Wall/ Concrete Cladding	32 mm dia Self Driven Anchors with Grouting	76 mm dia Drainage holes with perforated pipes	Two Layers of DT Mesh (120x100mm) for Face 2.7/3.7mm dia wire, ZN+PVC	Coir Mat with Vegetation	Catch Drain	2.0m dia, 15m long well, @100m spacing, 76mm dia and 1m long two no's lateral drainage holes
1.	3m-5m	Revetment Wall	-	-	-	-	-	-
2.	>5m-30m	Revetment Wall	length of Self Drilling Anchors Varies between 9m to 12m and with 2m c/c	length of Drainage holes with Drainage pipes varies between 9m to 12m and with 4m c/c	Yes	Yes	Yes	Provided only between Ch. 132+670 to Ch. 133+250
3.	>30m-40m	Concrete Cladding			Yes	Yes	Yes	

The applicable Chainage are given below

North Bound Carriageway

S. No.	Design Chainage		Length (m)	Height of Protection (m)
	From (Ch.)	To (Ch.)		
1.	130+590 (NB)	130+750 (NB)	160	10m to 30m
2.	131+170 (NB)	131+350 (NB)	180	30m to 40m


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S. No.	Design Chainage		Length (m)	Height of Protection (m)
	From (Ch.)	To (Ch.)		
	131+350 (NB)	131+763(NB)	413	30m to 40m
3.	132+580 (NB)	132+955 (NB)	375	20m to 30m
	133+105 (NB)	133+185 (NB)	80	10m to 20m
4.	145+900 (NB)	146+600(NB)	700	10m to 20m

South Bound Carriageway

S. No.	Design Chainage		Length (m)	Height of Protection (m)
	From (Ch.)	To (Ch.)		
1.	147+917 (SB)	147+967 (SB)	50	10m to 20m

0.13 PAVEMENT DESIGN

Pavement design forms an integral part of highway design. Pavement performance under prevailing and projected traffic and environmental conditions is considered to be crucial as it has an implication on the economic returns from the project.

The Flexible Pavement shall be provided for Road Works. Design of pavement shall be for minimum design traffic loading of 115 MSA with Minimum Effective CBR of 10%. The Flexible pavement shall be designed for a minimum design period of 20 Years

The Rigid Pavement shall be provided for Box Structure for North Bound Carriageway & Tunnel for South Bound Carriageway. Rigid pavement shall be designed for a minimum design period of 30 years.

Stage construction shall not be permitted.

0.14 ENVIRONMENTAL SCREENING OF THE PROJECT

Environmental screening and preliminary environmental assessment of the proposed project roads have been carried out as per the requirement of the ToR. Environmental Acts, Rules and Notifications laid down by the Government of India have been reviewed and there applicability in the project has been established.

Initial environmental screening envisages the following major areas of concern:

- Landslides
- Felling of trees along the project road
- Acquisition of Reserved Forest land

Based on the screening of the area, following clearances are required:

• Environmental Clearance

Proposed project is the expansion of National Highway having a accumulative length of about 4-5 km (less than 100 km) and it does not pass through Wild Life Sanctuary, National Park or any other sensitive locations. Therefore, environmental clearance will not be required. However, environmental impact assessment is to be carried out and EIA & EMP Report is to be prepared as per

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“Environmental Impact Assessment Guidance Manual for Highways published by Ministry of Environment & Forests, February 2010”.

- **Forest Clearance**

Forest clearance will be required from State Forest Department for diversion of Reserved Forest land for widening of the project road.

- **Muck Disposal Locations**

The Construction of Tunnel is proposed in improvement proposal, hence quantity of muck will be generated and required to be disposed off as per Guidelines. The Muck disposal locations as identified and approved in the on-going prevailing EPC contract for this section shall be used for Muck

Consent to Establish / NOC

Under the Water (Prevention and Control of Pollution) Act 1974, Rules & Amendments and Air (Prevention and Control of Pollution) Act 1981, Rules & Amendments; Consent to Establish is to be obtained from State Pollution Control Board for the proposed expansion of the project road.

0.15 PRELIMINARY COST ESTIMATES

The total project cost is calculated based on the quantity of individual item multiplied by the rate for this it demand summing up the cost of all the items. The Project road has been separated bill wise total project cost is tabulated in Table below:

0.15.1 Unit Rates

The unit rates are based on Schedule of Rates 2020 of Public Works Department, Jammu & Kashmir. Leads have been calculated from borrow areas, stone quarries and other material sources. The unit rates have been worked out by taking the cost of materials as provided in the State Schedule of Rates (except for cement steel and bitumen for which market rates have been provided).

Preliminary Estimate

Quantities of earthwork and pavements have been worked out using Mx Road.

The cost of bridges has been worked out from their GAD's. Quantities of culverts have been worked out from their standard drawings. The cost of land acquisition, resettlement and rehabilitation costs and environmental mitigation measures have been provided as per assessment of their costs. Estimates for allowances for contingencies and supervision charges and utility relocation costs have been provided as percentage of total cost.

0.15.2 Project Cost

The Civil Cost and Total project cost are presented in table below.

Project Cost

S No.	Details	Amount
1	Civil Construction Cost (Without GST and without utility)	Rs 325.44 Cr
	GST 12%+Labour Cess 1%	Rs 43.3 Cr
	Shifting of Utility	Nil
2	Civil Construction Cost (With GST, Labour Cess & Utility)	Rs 367.74Cr
3	Total Project Cost	Rs 442.14 Cr

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The total cost includes Contingencies, Supervision charges, Administrative charges, and cost of Resettlement and Rehabilitation, Land acquisition cost and Environmental cost.

0.16 PROPOSED LAND ACQUISITION

Due to the improvement proposal, the additional land acquisition is required. Consultants have prepared the land acquisition plan and estimated the total requirement of land.

The details land area to be acquired for improvement has been tabulated in table below.

Land Details

S. No.	Description	Area
1	Total Land required (in Ha):	17.596 Ha.
2	Land already in Possession (in Ha):	12.774Ha.
3	Additional Land Required (in Ha):	4.822 Ha. Govt. Land & Forest Land =1.29 Ha. Pvt. Land=3.322Ha.
4	3A Published	3A is finalized and likely to be published by 15.09.2021
5	3D Published	-

0.17 UTILITY RELOCATION

During the study, after preparation of Plan & Profile, it has been observed that there is no utility required to be shifted.

0.18 CONCLUSIONS AND RECOMMENDATION

As Nashri to Ramban section of the National Highway-1A (new NH-44) holds national importance, considering the importance of the road and to maintain the uninterrupted traffic movement, the project is recommended for implementation on high priority. Moreover, implementation of the project would result in the development of basic infrastructure in the region which would ultimately contribute to the overall economic development of the State.

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