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	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-VII)</b>	<b>INDICATIVE DESIGN STANDARDS</b>
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## 6. INDICATIVE DESIGN STANDARDS

### 6.1 GENERAL

Geometric Design of the Highway shall be in accordance with four lane manual IRC-SP 84-2019. Uniformity of design standards will be maintained throughout the length of the project highway. All deficiencies in the existing Highway Geometry will be rectified to meet the minimum standards.

#### 6.1.1 General Cross-Sectional Requirements

The design of cross section of the upgradation of existing two-lane highway to four-lane highway will consider the following general requirements.

The developed cross sections for the carriageway as well as the service road will have operational safety in focus such as segregation, separation, turning radii, gradients etc. and provisions for various types of movements and maneuvers like merge, diverge, weave etc. will be comprehensively considered and provided for.

Provisions will be made in the cross-section for accommodating utilities both over as well as underground. A 2.0 m wide strip of land at the extreme edge of ROW may be kept for accommodating utility services. Provisions contained in IRC: 98-1997 will be followed to accommodate utility services for Project Highway in built up areas.

As far as possible, uniformity of design standards will be maintained throughout the length of the Project Highway. In case of any change, it shall be affected in a gradual manner.


#### 6.1.2 Design Speed

The Design speed given in Table below will be adopted for this project stretch. (The general slope of the ground classifies Terrain across the project Highway)

*Table 6-1: Design Speed*

Nature of Terrain	Cross Slope of the Ground	Design Speed (Kmph)	
		Ruling	Minimum
Plain & Rolling	Up to 25%	100	80
Mountainous and Steep	More than 25%	60	40

Short stretches (say less than 1 km) of varying terrain in the project stretch will not be taken into consideration while deciding the terrain classification for a given section of Project Highway. In general, the ruling design speed will be adopted for geometric design of the highway. Only in exceptional circumstances, minimum design speed may be adopted where site conditions are extremely restrictive and adequate land width is not available. Abrupt changes in design speed will be avoided.

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### 6.1.3 Right of Way

A minimum Right of Way (ROW) of 45m is required throughout the project length, except at underpass with slip roads in rural sections where ROW will be 55m/60m.

### 6.1.4 Lane Width of Carriageway

The standard lane width of the project highway shall be 3.50m.

### 6.1.5 Median

The median shall be either raised or depressed. The width of median is the distance between inner edges of carriageway. The type of median shall depend upon availability of ROW. The minimum width of median, subject to availability of ROW for various locations, shall be as mentioned below.

*Table 6-2: Width of Median*


Minimum width of Median (m)			
Type of Section	Plain and Rolling Terrain		Mountainous and Steep Terrain
	Raised*	Depressed median (m)	Raised*
Open Country with isolated built-up area	5.0	7.0	2.5
Built-up area	2.5	Not Applicable	2.5
Approach to grade separated structures	5.0	Not Applicable	2.5

\*Including Kerb shyness of 0.5m on either side. In existing Four to Six lane reaches also minimum kerb shyness of 0.5m shall be maintained.

- The median will have a suitably designed drainage system so that water does not stagnate in the median.
- All median drains will be of RCC type. In case of depressed median, a minimum 0.6 m width adjacent to carriageway in either direction is paved.
- As far as possible, the median will be of uniform width in a particular section of the Project Highway. However, where changes are unavoidable, a transition of 1 in 50 will be provided.
- In the case of depressed median, metal beam type, (three beam-one side) crash barriers will be provided on either side of the median.
- Suitable anti-glare measures such as plastic screens shall be provided to reduce headlight glare from opposite traffic.

### 6.1.6 Width of Shoulder

The shoulder width on either side of the carriageway is given below:

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-VII)</b>	<b>INDICATIVE DESIGN STANDARDS</b>
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*Table 6-3: Width of Shoulder (IRC SP 84-2019)*


Type of Section	Width of Shoulder (m)								
	Plain and Rolling Terrain (Either Side)			Mountainous and Steep Terrain					
	Paved	Earthen	Total	Hill Side			Valley Side		
				Paved	Earthen	Total	Paved	Earthen	Total
<b>Open Country with isolated built-up area</b>	1.5	2.0	3.5	1.5	-	1.5	1.5	1.0	2.5
<b>Built up area</b>	2.0	-	2.0	0.25 + 1.5 (Raised)	-	1.75	0.25 + 1.5 (Raised)	-	1.75
<b>Approaches to Grade separated structures</b>	2.0	-	2.0						
<b>Approaches to bridges</b>	1.5	2.0	3.5						

Note: As per circular (NHAI/Bharatmala/EC/DPR/2016/143430) Manual for 4 laning and 6 laning 2019 version has been published recently wherein there are substantial changes in the design of highways. The same shall be adopted for the design of Highways except the width of paved & earthen shoulders. The width of the width of paved & earthen shoulders shall be adopted as per earlier 4 lane manual (IRC: SP-84, 2014).

Complying with above circular, width of paved and earthen shoulder proposed as per IRC SP 84-2014 for the project road.

### 6.1.7 Roadway Width

The width of roadway will depend upon the width of carriageway, shoulders and the median. On horizontal curves with radius up to 300m, width of pavement and roadway will be increased as given below:

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*Table 6-4: Extra width of Pavement and Roadway in Each Carriageway*

Radius of Curve (m)	Extra Width (m)
75 – 100	0.9
101 – 300	0.6

### 6.1.8 Cross-Fall

- The camber or cross fall on straight sections of road carriageway and paved shoulders will be 2.5% for bituminous surface and 2% for CC pavement.
- Cross fall will be unidirectional for each carriageway sloping towards the outer edge in straight stretches and towards lower edge on horizontal curves.
- The cross fall for earthen shoulder is 0.5% steeper than that of the carriageway subject to a minimum of 3.0%. On super elevated sections, earthen portion of the shoulder on outer edge of the curve will be provided with reverse cross fall of 0.5% so that earth does not drain on the carriageway.

## 6.2 GEOMETRIC DESIGN

Geometric design of the highway will be in accordance with IRC: 73-1980, IRC: 38-1988 and IRC SP: 23-1983. Uniformity of design standards will be maintained throughout the length of Project Highway. All deficiencies in the existing highway geometry will be rectified to meet the minimum standards.

### 6.2.1 Super Elevation


Super Elevation will be limited to 7 percent, if radius of curve is less than desirable minimum radius. It will be limited to 5 percent, if radius is more than desirable minimum.

### 6.2.2 Radii of Horizontal Curves

The minimum and absolute minimum radii of horizontal curves for various classes of terrain are given below:

*Table 6-5: Minimum Radii of Horizontal Curves*

Nature of Terrain	Desirable Minimum (m)	Absolute Minimum (m)
Plain and Rolling	400	250
Mountainous and Steep	150	75

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### 6.2.3 Sight Distance

The safe stopping sight distance and desirable minimum sight distance for divided carriageway for various design speeds are tabulated below. A minimum of safe stopping sight distance will be adopted for the improvement of the existing carriageway.

*Table 6-6: Safe Sight Distance*

Design Speed (km/hr.)	Safe Stopping sight distance (m)	Desirable minimum sight distance (m)
100	180	360
80	130	260
60	90	180
40	45	90

## 6.3 VERTICAL ALIGNMENT

The vertical alignment will provide for a smooth longitudinal profile. Grade changes shall not be too frequent as to cause kinks and visual discontinuities in the profile. In this regard, directions given in IRC: 73 shall be kept in view.

### 6.3.1 Gradients

The ruling and limiting gradients are tabulated below. Ruling Gradient shall be adopted as far as possible. Limiting Gradient shall be adopted in difficult situations, and for short lengths.

*Table 6-7: Gradients*


Nature of Terrain	Ruling Gradient	Limiting Gradient
Plain and Rolling	2.5%	3.3%
Mountainous	5.0%	6.0%
Steep	6.0%	7.0%

- Long sweeping vertical curves will be provided at all grade changes. These will be designed as square parabolas.
- Design of vertical curves and their coordination with horizontal curves, will be in accordance with the IRC: SP:23-1983

### 6.3.2 Lateral and Vertical Clearances at Underpasses

#### 6.3.2.1 General

- In case of VUP/LVUP/SVUP, the proposed structure base shall be kept 150 mm above the ground level to ensure that these VUPs don't become water accumulation points.

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- Guard rails/crash barriers shall be provided for protection of vehicles from colliding with the abutments and piers and the deck of the structures.

#### 6.3.2.2 Vertical Clearance and Horizontal Clearance

S. No.	Type of underpass	Vertical clearance	Horizontal clearance
1	Vehicular Underpass (VUP)	5.5m	20m
2	Light Vehicular Underpass (LVUP)	4.0m	12m
3	Smaller Vehicular Underpass (SVUP)	4.0m	7m

### 6.3.3 Lateral and Vertical Clearances at Overpasses

Wherever any structure is provided over the Project Highway; the minimum clearances at over passes shall be as follows:

#### 6.3.3.1 Lateral Clearance

Full roadway width shall be carried through the overpass structure unless otherwise specified in Schedule 'B'. Provision shall also be made for future widening of the Project Highway to 6-lane with service roads. The abutments and piers shall be provided with suitable protection against collision of vehicles. Crash barriers shall be provided on abutment side and on sides of piers for this purpose. The ends of crash barriers shall be turned away from the line of approaching traffic. The span arrangement for the overpass structure shall be as specified in Schedule 'B'

The acceleration and deceleration lanes and transition length will be considered as incidental to the project and shall not be counted towards service road length.

#### 6.3.3.2 Vertical Clearance

Minimum of 5.5m will be provided at all points of carriageway and the service roads of the Project Highway