

**SCHEDULE – B**  
*(See Clause 2.1)***DEVELOPMENT OF THE PROJECT HIGHWAY****1 Development of the Project Highway**

Development of the Project Highway shall include design and construction of the 2 Lane with Paved Shoulder Project Highway as described in this Schedule-B and in Schedule-C.

**2 Rehabilitation and augmentation**

Rehabilitation and augmentation shall include [Two-Laning and strengthening] of the Project Highway as described in Annex-I of this Schedule-B and in Schedule-C.

**3 Specifications and Standards**

The Project Highway shall be designed and constructed in conformity with the Specifications and Standards specified in Annex-I of Schedule-D.

**Annex I**  
*(Schedule-B)*

**Description of Two Laning**

Project is construction/ improvement of the existing single lane road to two lane with paved shoulder in accordance with IRC-SP: 73:2015, IRC-SP:48:1998 and other relevant codes including standard good practice of the road construction.

**1. SCOPE OF THE PROJECT**

**1.1 GENERAL**

The following sections of this schedule briefly highlight the scope of the work of the 'Project'. The descriptions of the requirements for the various elements of the Project Highway given herein under are the bare minimum requirements for the 'Project'.

In the planning, design and execution of the works and other works in connection with the repair, maintenance or improvement of the Project Highway and functions associated with the construction of the Project Highway and roadside facilities, the Construction Contractor shall take all such actions and do all such things (including, but not limiting to, organizing itself, adopting measures and standards, executing procedures, including inspection procedures and highway patrols, and engaging and managing agents and employees) as will;

- a. enable the NHIDCL to provide an acceptably safe highway in respect of its condition (structural safety) and use (road safety);
- b. enable the NHIDCL to fulfill its statutory and common law obligations;
- c. enable the NHIDCL to provide a congestion free uninterrupted flow of traffic on the Project Highway;
- d. enable the NHIDCL to provide a level of highway service to the public not inferior to that provided on the trunk road during construction or improvement works;
- e. enable the police, local authorities, and others with statutory duties or functions in relation to the Project Highway or adjoining roads to fulfill those duties and functions;
- f. minimise the occurrence and adverse effects of accidents and ensure that all accidents and emergencies are responded to as quickly as possible;
- g. minimize the risk of damage, destruction or disturbance to third party property;
- h. ensure that members of the public are treated with all due courtesy and consideration;
- i. provide a safe, clear and informative system of road signs;
- j. comply with any specified programme requirements, including for the completion of the new road;
- k. enable standards of reliability, durability, accessibility, maintainability, quality control and assurance, and fitness for purpose appropriate to a highway of the character of the Project Highway to be achieved throughout the Contract Period;

- l. ensure adequate off-street parking facilities for both passenger and goods vehicles;
- m. provide adequate bus bays for stopping of buses and bus shelters for commuters to wait under protection;
- n. achieve a high standard in the appearance and aesthetic quality of the Project Highway and achieve integration of the Project Highway with the character of the surrounding landscape through both sensitive design and sensitive management of all visible elements including those on the existing road;
- o. Undertake proper safety audit through an appropriate consultant (i.e. apart from the Independent Consultant) before C.O.D.;
- p. Carry out accident recording and reporting (to NHIDCL) by type on regular basis; and
- q. Ensure adequate safety of the Project Workers on the work site.

## **2. WIDENING OF THE EXISTING HIGHWAY**

**2.1** Notwithstanding the basic alignment plans enclosed with this document the Construction Contractor shall himself carryout and be responsible for engineering surveys, investigation and detailed engineering designs and prepare the working drawings for all the components relevant for the improvement and up-gradation of the Project Highway to fulfill the scope of the project as envisaged herein under. These shall comply with design specifications and standards given in **Schedule–D**. The designs for different project facilities shall follow the locations and indicative designs given in **Schedule–C** and shall comply with design specifications and standards outlined in **Schedule–D**. All the designs and drawings shall be reviewed by the Authority Engineer prior to execution.

The Project Highway shall follow the existing alignment unless otherwise specified by the Authority and shown in the alignment plans specified in Annex-III of Schedule-A. Geometric deficiencies, if any, in the existing horizontal and vertical profiles shall be corrected as per the prescribed standards for [plain/rolling] terrain to the extent land is available.

### **2.2 Width of Carriageway**

**2.2.1** Two-Laning with paved shoulders shall be undertaken. The paved carriageway shall be [7(seven) m] wide with paved shoulder in accordance with the typical cross sections drawings in the Manual.

**2.2.2** Except as otherwise provided in this Agreement, the width of the paved carriageway and cross-sectional features shall conform to paragraph 2.1 above.

## **3. GEOMETRIC DESIGN AND GENERAL FEATURES**

### **3.1 General**

Geometric design and general features of the Project Highway shall be in accordance with Section 2 of the Manual.

### 3.2 Design speed

The design speed shall be the minimum design speed of [30 km per hr for hilly and mountainous terrain].

### 3.3 Improvement of the existing road geometries

[Refer to paragraph 2.1 (v) of the Manual and provide details]

The hilly gradients shall be corrected in such a way so as to attain a limiting gradient of 6% in order to achieve longitudinal drainage. Also vertical curves shall be improved/introduced so that the vertical curves meet IRC: SP-73 - 2015 standards.

The horizontal alignment of the Project Highway shall be improved as per the standards set out in **Schedule-D**.

The improvement shall be done in consultation with the Independent consultant / Project Company ensuring that the proposed improvements are accommodated within the land width available as far as practical otherwise action to acquire more land shall be resorted to through NHIDCL.

In the following sections, where improvement of the existing road geometrics to the prescribed standards is not possible, the existing road geometrics shall be improved to the extent possible within the given right of way and proper road signs and safety measures shall be provided:

#### Improvement due to Realignments: (PKG-IV)

| Sl. No. | DESIGN CHAINAGE |        | EXISTING CHAINAGE |        | LENGTH<br>(m) |
|---------|-----------------|--------|-------------------|--------|---------------|
|         | FROM            | TO     | FROM              | TO     |               |
| 1       | 138150          | 138160 | 138165            | 138175 | 10            |
| 2       | 138160          | 138200 | 138175            | 138220 | 40            |
| 3       | 138200          | 138300 | 138220            | 138320 | 100           |
| 4       | 138300          | 138350 | 138320            | 138370 | 50            |
| 5       | 138400          | 138410 | 138420            | 138430 | 10            |
| 6       | 138410          | 138500 | 138430            | 138530 | 90            |
| 7       | 138550          | 138700 | 138580            | 138750 | 150           |
| 8       | 138700          | 138710 | 138750            | 138760 | 10            |
| 9       | 138710          | 138910 | 138760            | 139020 | 200           |
| 10      | 138910          | 138940 | 139020            | 139060 | 30            |
| 11      | 138940          | 138990 | 139060            | 139115 | 50            |
| 12      | 138990          | 139000 | 139115            | 139125 | 10            |
| 13      | 139000          | 139040 | 139125            | 139180 | 40            |

|    |        |        |        |        |     |
|----|--------|--------|--------|--------|-----|
| 14 | 139040 | 139160 | 139180 | 139305 | 120 |
| 15 | 139160 | 139210 | 139305 | 139360 | 50  |
| 16 | 139210 | 139500 | 139360 | 139690 | 290 |
| 17 | 139500 | 139620 | 139690 | 139800 | 120 |
| 18 | 139620 | 140450 | 139800 | 140685 | 830 |
| 19 | 140450 | 140510 | 140685 | 140750 | 60  |
| 20 | 140510 | 140550 | 140750 | 140800 | 40  |
| 21 | 140800 | 140960 | 140060 | 141215 | 160 |
| 22 | 140960 | 141010 | 141215 | 141270 | 50  |
| 23 | 141010 | 141090 | 141270 | 141350 | 80  |
| 24 | 141090 | 141100 | 141350 | 141360 | 10  |
| 25 | 141200 | 141240 | 141470 | 141520 | 40  |
| 26 | 141240 | 141500 | 141520 | 141830 | 260 |
| 27 | 141650 | 142350 | 142005 | 142730 | 700 |
| 28 | 142400 | 142500 | 142780 | 142885 | 100 |
| 29 | 142500 | 142550 | 142885 | 142935 | 50  |
| 30 | 142550 | 143210 | 142935 | 143803 | 660 |
| 31 | 143210 | 143220 | 143803 | 143813 | 10  |
| 32 | 143220 | 143400 | 143813 | 144000 | 180 |
| 33 | 143650 | 143700 | 144253 | 144305 | 50  |
| 34 | 143700 | 143770 | 144305 | 144380 | 70  |
| 35 | 143770 | 143870 | 144380 | 144475 | 100 |
| 36 | 143870 | 144100 | 144475 | 144710 | 230 |
| 37 | 144500 | 144550 | 145120 | 145170 | 50  |
| 38 | 144550 | 144660 | 145170 | 145280 | 110 |
| 39 | 144660 | 144720 | 145280 | 145340 | 60  |
| 40 | 144720 | 144840 | 145340 | 145450 | 120 |
| 41 | 144840 | 144900 | 145450 | 145660 | 60  |
| 42 | 145000 | 145020 | 145790 | 145810 | 20  |
| 43 | 145020 | 145120 | 145810 | 145910 | 100 |
| 44 | 145120 | 145220 | 145910 | 146030 | 100 |
| 45 | 145220 | 145250 | 146030 | 146060 | 30  |
| 46 | 145250 | 145340 | 146060 | 146150 | 90  |
| 47 | 145340 | 145360 | 146150 | 146170 | 20  |
| 48 | 145360 | 145550 | 146170 | 146370 | 190 |
| 49 | 145550 | 145610 | 146370 | 146440 | 60  |
| 50 | 145610 | 145670 | 146440 | 146660 | 60  |
| 51 | 145670 | 145710 | 146660 | 146560 | 40  |
| 52 | 145710 | 146200 | 146560 | 147290 | 490 |
| 53 | 146250 | 146450 | 147350 | 147600 | 200 |
| 54 | 146450 | 146460 | 147600 | 147610 | 10  |
| 55 | 146460 | 146900 | 147610 | 148100 | 440 |
| 56 | 147000 | 147090 | 148190 | 148410 | 90  |
| 57 | 147090 | 147170 | 148410 | 148480 | 80  |

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|     |        |        |        |        |     |
|-----|--------|--------|--------|--------|-----|
| 58  | 147170 | 147230 | 148480 | 148550 | 60  |
| 59  | 147230 | 147250 | 148550 | 148570 | 20  |
| 60  | 147250 | 147370 | 148570 | 148690 | 120 |
| 61  | 147370 | 147410 | 148690 | 148730 | 40  |
| 62  | 147410 | 148400 | 148730 | 149940 | 990 |
| 63  | 148400 | 148440 | 149940 | 149970 | 40  |
| 64  | 148440 | 148550 | 149970 | 150100 | 110 |
| 65  | 148550 | 148570 | 150100 | 150115 | 20  |
| 66  | 148570 | 148830 | 150115 | 150405 | 260 |
| 67  | 148830 | 148860 | 150405 | 150435 | 30  |
| 68  | 148860 | 148940 | 150435 | 150550 | 80  |
| 69  | 148940 | 149000 | 150550 | 150615 | 60  |
| 70  | 149000 | 149100 | 150615 | 150720 | 100 |
| 71  | 149100 | 149180 | 150720 | 150805 | 80  |
| 72  | 149180 | 149250 | 150805 | 150880 | 70  |
| 73  | 149250 | 149270 | 150880 | 150900 | 20  |
| 74  | 149270 | 149310 | 150900 | 150940 | 40  |
| 75  | 149310 | 149350 | 150940 | 150980 | 40  |
| 76  | 149350 | 149430 | 150980 | 151050 | 80  |
| 77  | 149430 | 149450 | 151050 | 151070 | 20  |
| 78  | 149450 | 149720 | 151070 | 151405 | 270 |
| 79  | 149720 | 149770 | 151405 | 151455 | 50  |
| 80  | 149770 | 149800 | 151455 | 151500 | 30  |
| 81  | 149800 | 149810 | 151500 | 151510 | 10  |
| 82  | 149810 | 149990 | 151510 | 151700 | 180 |
| 83  | 149990 | 150010 | 151700 | 151720 | 20  |
| 84  | 150010 | 150080 | 151720 | 151795 | 70  |
| 85  | 150080 | 150100 | 151795 | 151820 | 20  |
| 86  | 150100 | 150300 | 151820 | 151060 | 200 |
| 87  | 150400 | 150410 | 152170 | 152180 | 10  |
| 88  | 150410 | 150470 | 152180 | 152245 | 60  |
| 89  | 150470 | 150490 | 152245 | 152265 | 20  |
| 90  | 150490 | 150750 | 152265 | 152550 | 260 |
| 91  | 150850 | 151300 | 152660 | 153100 | 450 |
| 92  | 151400 | 151620 | 153200 | 153420 | 220 |
| 93  | 151620 | 151640 | 153420 | 153450 | 20  |
| 94  | 151640 | 151800 | 153450 | 153750 | 160 |
| 95  | 151800 | 151810 | 153750 | 153760 | 10  |
| 96  | 151810 | 152100 | 153760 | 154195 | 290 |
| 97  | 152100 | 152110 | 154195 | 154200 | 10  |
| 98  | 152110 | 152220 | 154200 | 154370 | 110 |
| 99  | 152220 | 152260 | 154370 | 154410 | 40  |
| 100 | 152260 | 152300 | 154410 | 154455 | 40  |
| 101 | 152300 | 152340 | 154455 | 154495 | 40  |

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|              |        |        |        |        |              |
|--------------|--------|--------|--------|--------|--------------|
| 102          | 152340 | 152540 | 154495 | 154715 | 200          |
| 103          | 152540 | 152570 | 154715 | 154745 | 30           |
| 104          | 152570 | 152670 | 154745 | 154870 | 100          |
| 105          | 152670 | 152690 | 154870 | 154900 | 20           |
| 106          | 152690 | 153323 | 154900 | 155810 | 633          |
| 107          | 153323 | 154036 | 155810 | 156535 | 713          |
| <b>Total</b> |        |        |        |        | <b>14036</b> |

**Improvement due to Sharp Curves: Package-IV**

| SL. No | Design Chainage(Km) |             | Remarks     |
|--------|---------------------|-------------|-------------|
|        | From                | To          |             |
| 1      | 138+020.195         | 138+034.986 | Radius <300 |
| 2      | 138+126.065         | 138+163.706 | Radius <300 |
| 3      | 138+254.693         | 138+279.680 | Radius <300 |
| 4      | 138+451.636         | 138+481.587 | Radius <300 |
| 5      | 138+596.789         | 138+609.150 | Radius <300 |
| 6      | 138+708.464         | 138+748.462 | Radius <300 |
| 7      | 138+829.641         | 138+894.983 | Radius <300 |
| 8      | 138+957.407         | 138+992.053 | Radius <300 |
| 9      | 139+327.934         | 139+370.009 | Radius <300 |
| 10     | 139+484.383         | 139+533.162 | Radius <300 |
| 11     | 139+670.444         | 139+704.684 | Radius <300 |
| 12     | 139+786.679         | 139+985.459 | Radius <300 |
| 13     | 140+173.149         | 140+214.869 | Radius <300 |
| 14     | 140+261.423         | 140+307.268 | Radius <300 |
| 15     | 140+413.319         | 140+441.529 | Radius <300 |
| 16     | 140+595.236         | 140+635.569 | Radius <300 |
| 17     | 140+722.901         | 140+772.594 | Radius <300 |
| 18     | 141+088.568         | 141+110.391 | Radius <300 |
| 19     | 141+191.370         | 141+203.908 | Radius <300 |
| 20     | 141+315.369         | 141+325.911 | Radius <300 |
| 21     | 141+426.616         | 141+474.358 | Radius <300 |
| 22     | 141+559.187         | 141+600.209 | Radius <300 |
| 23     | 141+859.291         | 141+886.593 | Radius <300 |
| 24     | 141+947.610         | 141+974.302 | Radius <300 |
| 25     | 142+242.379         | 142+303.207 | Radius <300 |
| 26     | 142+395.936         | 142+426.069 | Radius <300 |
| 27     | 142+590.329         | 142+658.484 | Radius <300 |
| 28     | 142+758.084         | 142+833.868 | Radius <300 |
| 29     | 142+884.645         | 143+014.732 | Radius <300 |
| 30     | 143+069.445         | 143+151.260 | Radius <300 |
| 31     | 143+181.074         | 143+252.236 | Radius <300 |
| 32     | 143+411.396         | 143+431.981 | Radius <300 |
| 33     | 144+014.591         | 144+020.081 | Radius <300 |
| 34     | 144+088.906         | 144+111.693 | Radius <300 |
| 35     | 144+625.625         | 144+666.122 | Radius <300 |

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|    |             |             |             |
|----|-------------|-------------|-------------|
| 36 | 144+797.694 | 144+830.305 | Radius <300 |
| 37 | 145+142.516 | 145+221.451 | Radius <300 |
| 38 | 145+321.097 | 145+343.394 | Radius <300 |
| 39 | 145+435.262 | 145+474.965 | Radius <300 |
| 40 | 145+553.523 | 145+690.892 | Radius <300 |
| 41 | 145+742.003 | 145+801.049 | Radius <300 |
| 42 | 145+885.257 | 145+919.384 | Radius <300 |
| 43 | 145+985.100 | 145+992.397 | Radius <300 |
| 44 | 146+976.404 | 147+025.035 | Radius <300 |
| 45 | 147+256.277 | 147+273.458 | Radius <300 |
| 46 | 147+447.373 | 147+550.916 | Radius <300 |
| 47 | 147+735.230 | 147+874.971 | Radius <300 |
| 48 | 147+927.003 | 148+016.211 | Radius <300 |
| 49 | 148+094.418 | 148+151.331 | Radius <300 |
| 50 | 148+227.528 | 148+235.850 | Radius <300 |
| 51 | 148+313.117 | 148+342.510 | Radius <300 |
| 52 | 148+419.247 | 148+435.219 | Radius <300 |
| 53 | 148+493.000 | 148+503.951 | Radius <300 |
| 54 | 148+676.049 | 148+682.236 | Radius <300 |
| 55 | 148+829.905 | 148+839.660 | Radius <300 |
| 56 | 148+954.652 | 148+976.008 | Radius <300 |
| 57 | 149+151.153 | 149+156.855 | Radius <300 |
| 58 | 149+275.324 | 149+319.755 | Radius <300 |
| 59 | 149+396.588 | 149+499.157 | Radius <300 |
| 60 | 149+586.973 | 149+642.542 | Radius <300 |
| 61 | 149+728.699 | 149+766.374 | Radius <300 |
| 62 | 149+919.674 | 149+947.751 | Radius <300 |
| 63 | 150+484.168 | 150+509.338 | Radius <300 |
| 64 | 150+584.800 | 150+642.481 | Radius <300 |
| 65 | 150+712.641 | 150+719.659 | Radius <300 |
| 66 | 150+770.911 | 150+798.647 | Radius <300 |
| 67 | 150+851.801 | 150+914.307 | Radius <300 |
| 68 | 150+985.925 | 151+002.111 | Radius <300 |
| 69 | 151+055.239 | 151+064.998 | Radius <300 |
| 70 | 151+112.264 | 151+135.452 | Radius <300 |
| 71 | 151+192.670 | 151+312.532 | Radius <300 |
| 72 | 151+313.720 | 151+347.758 | Radius <300 |
| 73 | 151+428.362 | 151+443.429 | Radius <300 |
| 74 | 151+619.110 | 151+647.371 | Radius <300 |
| 75 | 151+741.983 | 151+814.774 | Radius <300 |
| 76 | 151+918.612 | 151+995.362 | Radius <300 |
| 77 | 152+050.113 | 152+077.837 | Radius <300 |
| 78 | 152+192.881 | 152+263.315 | Radius <300 |
| 79 | 152+370.868 | 152+447.264 | Radius <300 |
| 80 | 152+502.851 | 152+536.359 | Radius <300 |
| 81 | 152+619.506 | 152+692.901 | Radius <300 |
| 82 | 152+775.878 | 152+791.006 | Radius <300 |
| 83 | 152+868.571 | 152+973.636 | Radius <300 |
| 84 | 153+050.610 | 153+117.595 | Radius <300 |

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|    |             |             |             |
|----|-------------|-------------|-------------|
| 85 | 153+173.566 | 153+254.317 | Radius <300 |
| 86 | 153+287.591 | 153+364.355 | Radius <300 |
| 87 | 153+434.059 | 153+464.849 | Radius <300 |
| 88 | 153+521.542 | 153+544.978 | Radius <300 |
| 89 | 153+707.973 | 153+733.787 | Radius <300 |
| 90 | 153+859.684 | 153+868.340 | Radius <300 |
| 91 | 153+908.445 | 153+915.141 | Radius <300 |
| 92 | 153+940.487 | 153+970.199 | Radius <300 |
| 93 | 154+011.338 | 154+016.807 | Radius <300 |

### 3.4 Proposed Right of Way

[Refer to paragraph 2.3 of the Manual]. Details of the proposed Right of Way are tabulated below.

| Sl. No | Design Chainage |         | Length | Width (m) |
|--------|-----------------|---------|--------|-----------|
|        | From            | To      |        |           |
| 1      | 138             | 154.036 | 16.036 | 18m – 35m |

3.4.1 The Scheduled date on which the Authority Shall provide ROW to the contractor is given in Annexure-II of Schedule A

### 3.5 Type of Shoulders

[Refer to paragraph 2.6.1 of the Manual and specify]

- (a) In built-up sections, 1.5m paved shoulders with footpath have been considered as TCS-4.
- (b) In open country, paved shoulders of 1.5m in width shall be provided and 1.0m earthen shoulder shall be covered with 150mm thick compacted layer of granular material.
- (c) Design and specifications of paved shoulders and granular material shall conform to the requirements specified in paragraphs 5.9.9 and 5.9.10 of the Manual.

### 3.6 Lateral and vertical clearances at underpasses

3.6.1 Lateral and vertical clearances at underpasses and provision of guardrails/crash barriers shall be as per paragraph 2.11 of the Manual.

3.6.2 *Lateral clearance:* The width of the opening at the underpasses shall be as follows:

| Sl No. | Location [Chainage (km)] |    | Span/Opening (m) | Remarks |
|--------|--------------------------|----|------------------|---------|
|        | From                     | To |                  |         |
| Nil    |                          |    |                  |         |

**3.7 Lateral and vertical clearances at overpasses**

**3.7.1** Lateral and vertical clearances at overpasses shall be as per paragraph 2.12 of the Manual.

**3.7.2** *Lateral clearance:* The width of the opening at the overpasses shall be as follows:

| Sl No. | Location [Chainage (km)] |    | Span/Opening (m) | Remarks |
|--------|--------------------------|----|------------------|---------|
|        | From                     | To |                  |         |
| Nil    |                          |    |                  |         |

**3.8 Service roads**

Service roads shall be constructed at the locations and for the lengths indicated below:[Refer to paragraph 2.13 of the Manual and provide details]

| SI No. | Location of Service Road (km) |    | Right Hand Side (RHS) / Left Hand Side (LHS) / Both Sides | Length (km) of Service Road |
|--------|-------------------------------|----|---|-----------------------------|
|        | From                          | To |   |                             |
| Nil    |                               |    |   |                             |

**3.9 Grade Separated Structures**

**3.9.1** Grade separated structures shall be provided as per paragraph 2.14 of the Manual. The requisite particulars are given below:

[Refer to paragraphs 2.14.1 of the Manual and provide details]

| SI No. | Location of Structure | Length (m) | Number and Length of Spans (m) | Approach Gradient | Remarks, if any |
|--------|-----------------------|------------|--------------------------------|-------------------|-----------------|
| Nil    |                       |            |                                |                   |                 |

**3.9.2** In the case of grade separated structures, the type of structure and the level of the Project Highway and the cross roads shall be as follows: [Refer to paragraphs 2.14.2 of the Manual and specify the type of vehicular under pass/ overpass structure and whether the cross road is to be carried at the existing level, raised or lowered].

| SI No. | Location | Type of Structure/Length (m) | Cross Road at  |              |               | Remarks, if any |
|--------|----------|------------------------------|----------------|--------------|---------------|-----------------|
|        |          |                              | Existing Level | Raised Level | Lowered Level |                 |
| Nil    |          |                              |                |              |               |                 |

**3.10 Cattle and pedestrian underpass / overpass**

Cattle and pedestrian underpass/overpass shall be constructed as follows: [Refer to paragraph 2.14.3 of the Manual and specify the requirements of cattle and pedestrian

underpass/overpass.

| SI No. | Location | Type of Crossing |
|--------|----------|------------------|
| Nil    |          |                  |

### 3.11 Typical cross-sections of the Project Highway

Typical cross-sections to be followed as per IRC: SP-73-2015 and in addition the proposed cross section for various situations are given in Fig.B-1 to B-4. These illustrate the widening proposals for the project highway. The Project Highway (length 16.036 km) shall be 2-lane carriageway with 1.5m wide paved and 1.0m wide earthen shoulders facility.

Following typical cross sections shall be provided for the Project Highway:

- TCS –1 : Typical cross section of 2-lane carriageway with retaining wall  
TCS –2 : Typical cross section of 2-lane carriageway without retaining wall  
TCS –3 : Typical cross section of 2-lane carriageway at realignment stretches in hill cutting  
TCS – 4 : Typical cross section of 2-lane carriageway at built up areas.

The cross section schedule shall be as follows:

| SI.NO. | DESIGN CHAINAGE |        | LENGTH<br>(m) | TYPE<br>TCS | Remarks / Location                              |
|--------|-----------------|--------|---------------|-------------|---|
|        | FROM            | TO     |               |             |   |
| 1      | 138000          | 138150 | 150           | 2           | Reconstruction and widening                     |
| 2      | 138150          | 138160 | 10            | 3           | Realignment                                     |
| 3      | 138160          | 138200 | 40            | 1           | Realignment with Retaining wall                 |
| 4      | 138200          | 138300 | 100           | 1           | Realignment with Retaining wall                 |
| 5      | 138300          | 138350 | 50            | 3           | Realignment                                     |
| 6      | 138350          | 138390 | 40            | 2           | Reconstruction and widening                     |
| 7      | 138390          | 138400 | 10            | 1           | Reconstruction and widening with retaining wall |
| 8      | 138400          | 138410 | 10            | 1           | Realignment with Retaining wall                 |
| 9      | 138410          | 138500 | 90            | 3           | Realignment                                     |
| 10     | 138500          | 138530 | 30            | 1           | Reconstruction and widening with retaining wall |
| 11     | 138530          | 138550 | 20            | 2           | Reconstruction and widening                     |
| 12     | 138550          | 138700 | 150           | 3           | Realignment                                     |
| 13     | 138700          | 138710 | 10            | 3           | Realignment                                     |
| 14     | 138710          | 138910 | 200           | 3           | Realignment                                     |
| 15     | 138910          | 138940 | 30            | 1           | Realignment with Retaining wall                 |
| 16     | 138940          | 138990 | 50            | 3           | Realignment                                     |
| 17     | 138990          | 139000 | 10            | 1           | Realignment with Retaining wall                 |
| 18     | 139000          | 139040 | 40            | 1           | Realignment with Retaining wall                 |
| 19     | 139040          | 139160 | 120           | 3           | Realignment                                     |

Two Laning of Joram – koloriang Road (NH-713) on EPC basis from design km 138+000 to km 154+036 [Existing km 138.000 to km 158.000] in the State of Arunachal Pradesh under SARDP-NE

| Sl.NO. | DESIGN CHAINAGE |        | LENGTH<br>(m) | TYPE<br>TCS | Remarks / Location                              |
|--------|-----------------|--------|---------------|-------------|---|
|        | FROM            | TO     |               |             |   |
| 20     | 139160          | 139210 | 50            | 1           | Realignment with Retaining wall                 |
| 21     | 139210          | 139500 | 290           | 3           | Realignment                                     |
| 22     | 139500          | 139620 | 120           | 1           | Realignment with Retaining wall                 |
| 23     | 139620          | 140450 | 830           | 3           | Realignment                                     |
| 24     | 140450          | 140510 | 60            | 3           | Realignment                                     |
| 25     | 140510          | 140550 | 40            | 3           | Realignment                                     |
| 26     | 140550          | 140640 | 90            | 2           | Reconstruction and widening                     |
| 27     | 140640          | 140660 | 20            | 1           | Reconstruction and widening with retaining wall |
| 28     | 140660          | 140790 | 130           | 2           | Reconstruction and widening                     |
| 29     | 140790          | 140800 | 10            | 1           | Reconstruction and widening with retaining wall |
| 30     | 140800          | 140960 | 160           | 1           | Realignment with Retaining wall                 |
| 31     | 140960          | 141010 | 50            | 3           | Realignment                                     |
| 32     | 141010          | 141090 | 80            | 1           | Realignment with Retaining wall                 |
| 33     | 141090          | 141100 | 10            | 3           | Realignment                                     |
| 34     | 141100          | 141160 | 60            | 2           | Reconstruction and widening                     |
| 35     | 141160          | 141200 | 40            | 1           | Reconstruction and widening with retaining wall |
| 36     | 141200          | 141240 | 40            | 1           | Realignment with Retaining wall                 |
| 37     | 141240          | 141500 | 260           | 3           | Realignment                                     |
| 38     | 141500          | 141650 | 150           | 2           | Reconstruction and widening                     |
| 39     | 141650          | 142350 | 700           | 3           | Realignment                                     |
| 40     | 142350          | 142400 | 50            | 2           | Reconstruction and widening                     |
| 41     | 142400          | 142500 | 100           | 3           | Realignment                                     |
| 42     | 142500          | 142550 | 50            | 1           | Realignment with Retaining wall                 |
| 43     | 142550          | 143210 | 660           | 3           | Realignment                                     |
| 44     | 143210          | 143220 | 10            | 1           | Realignment with Retaining wall                 |
| 45     | 143220          | 143400 | 180           | 3           | Realignment                                     |
| 46     | 143400          | 143650 | 250           | 2           | Reconstruction and widening                     |
| 47     | 143650          | 143700 | 50            | 3           | Realignment                                     |
| 48     | 143700          | 143770 | 70            | 3           | Realignment                                     |
| 49     | 143770          | 143870 | 100           | 1           | Realignment with Retaining wall                 |
| 50     | 143870          | 144100 | 230           | 3           | Realignment                                     |
| 51     | 144100          | 144320 | 220           | 2           | Reconstruction and widening                     |
| 52     | 144320          | 144430 | 110           | 1           | Reconstruction and widening with retaining wall |
| 53     | 144430          | 144500 | 70            | 2           | Reconstruction and widening                     |
| 54     | 144500          | 144550 | 50            | 3           | Realignment                                     |
| 55     | 144550          | 144660 | 110           | 3           | Realignment                                     |
| 56     | 144660          | 144720 | 60            | 3           | Realignment                                     |
| 57     | 144720          | 144840 | 120           | 3           | Realignment                                     |
| 58     | 144840          | 144900 | 60            | 3           | Realignment                                     |
| 59     | 144900          | 145000 | 100           | 2           | Reconstruction and widening                     |
| 60     | 145000          | 145020 | 20            | 3           | Realignment                                     |

Two Laning of Joram – koloriang Road (NH-713) on EPC basis from design km 138+000 to km 154+036 [Existing km 138.000 to km 158.000] in the State of Arunachal Pradesh under SARDP-NE

| Sl.NO. | DESIGN CHAINAGE |        | LENGTH<br>(m) | TYPE<br>TCS | Remarks / Location                              |
|--------|-----------------|--------|---------------|-------------|---|
|        | FROM            | TO     |               |             |   |
| 61     | 145020          | 145120 | 100           | 1           | Realignment with Retaining wall                 |
| 62     | 145120          | 145220 | 100           | 3           | Realignment                                     |
| 63     | 145220          | 145250 | 30            | 1           | Realignment with Retaining wall                 |
| 64     | 145250          | 145340 | 90            | 3           | Realignment                                     |
| 65     | 145340          | 145360 | 20            | 1           | Realignment with Retaining wall                 |
| 66     | 145360          | 145550 | 190           | 3           | Realignment                                     |
| 67     | 145550          | 145610 | 60            | 1           | Realignment with Retaining wall                 |
| 68     | 145610          | 145670 | 60            | 3           | Realignment                                     |
| 69     | 145670          | 145710 | 40            | 3           | Realignment                                     |
| 70     | 145710          | 146200 | 490           | 3           | Realignment                                     |
| 71     | 146200          | 146250 | 50            | 2           | Reconstruction and widening                     |
| 72     | 146250          | 146450 | 200           | 3           | Realignment                                     |
| 73     | 146450          | 146460 | 10            | 1           | Realignment with Retaining wall                 |
| 74     | 146460          | 146900 | 440           | 3           | Realignment                                     |
| 75     | 146900          | 146930 | 30            | 2           | Reconstruction and widening                     |
| 76     | 146930          | 147000 | 70            | 1           | Reconstruction and widening with retaining wall |
| 77     | 147000          | 147090 | 90            | 3           | Realignment                                     |
| 78     | 147090          | 147170 | 80            | 3           | Realignment                                     |
| 79     | 147170          | 147230 | 60            | 3           | Realignment                                     |
| 80     | 147230          | 147250 | 20            | 3           | Realignment                                     |
| 81     | 147250          | 147370 | 120           | 3           | Realignment                                     |
| 82     | 147370          | 147410 | 40            | 1           | Realignment with Retaining wall                 |
| 83     | 147410          | 148400 | 990           | 3           | Realignment                                     |
| 84     | 148400          | 148440 | 40            | 1           | Realignment with Retaining wall                 |
| 85     | 148440          | 148550 | 110           | 3           | Realignment                                     |
| 86     | 148550          | 148570 | 20            | 1           | Realignment with Retaining wall                 |
| 87     | 148570          | 148830 | 260           | 3           | Realignment                                     |
| 88     | 148830          | 148860 | 30            | 1           | Realignment with Retaining wall                 |
| 89     | 148860          | 148940 | 80            | 3           | Realignment                                     |
| 90     | 148940          | 149000 | 60            | 1           | Realignment with Retaining wall                 |
| 91     | 149000          | 149100 | 100           | 3           | Realignment                                     |
| 92     | 149100          | 149180 | 80            | 1           | Realignment with Retaining wall                 |
| 93     | 149180          | 149250 | 70            | 3           | Realignment                                     |
| 94     | 149250          | 149270 | 20            | 1           | Realignment with Retaining wall                 |
| 95     | 149270          | 149310 | 40            | 3           | Realignment                                     |
| 96     | 149310          | 149350 | 40            | 1           | Realignment with Retaining wall                 |
| 97     | 149350          | 149430 | 80            | 3           | Realignment                                     |
| 98     | 149430          | 149450 | 20            | 3           | Realignment                                     |
| 99     | 149450          | 149720 | 270           | 3           | Realignment                                     |
| 100    | 149720          | 149770 | 50            | 3           | Realignment                                     |
| 101    | 149770          | 149800 | 30            | 3           | Realignment                                     |

Two Laning of Joram – koloriang Road (NH-713) on EPC basis from design km 138+000 to km 154+036 [Existing km 138.000 to km 158.000] in the State of Arunachal Pradesh under SARDP-NE

| SI.NO.       | DESIGN CHAINAGE |        | LENGTH<br>(m) | TYPE<br>TCS | Remarks / Location                              |
|--------------|-----------------|--------|---------------|-------------|---|
|              | FROM            | TO     |               |             |   |
| 102          | 149800          | 149810 | 10            | 1           | Realignment with Retaining wall                 |
| 103          | 149810          | 149990 | 180           | 3           | Realignment                                     |
| 104          | 149990          | 150010 | 20            | 1           | Realignment with Retaining wall                 |
| 105          | 150010          | 150080 | 70            | 3           | Realignment                                     |
| 106          | 150080          | 150100 | 20            | 1           | Realignment with Retaining wall                 |
| 107          | 150100          | 150300 | 200           | 3           | Realignment                                     |
| 108          | 150300          | 150380 | 80            | 2           | Reconstruction and widening                     |
| 109          | 150380          | 150400 | 20            | 1           | Reconstruction and widening with retaining wall |
| 110          | 150400          | 150410 | 10            | 1           | Realignment with Retaining wall                 |
| 111          | 150410          | 150470 | 60            | 3           | Realignment                                     |
| 112          | 150470          | 150490 | 20            | 1           | Realignment with Retaining wall                 |
| 113          | 150490          | 150750 | 260           | 3           | Realignment                                     |
| 114          | 150750          | 150850 | 100           | 2           | Reconstruction and widening                     |
| 115          | 150850          | 151300 | 450           | 3           | Realignment                                     |
| 116          | 151300          | 151400 | 100           | 2           | Reconstruction and widening                     |
| 117          | 151400          | 151620 | 220           | 3           | Realignment                                     |
| 118          | 151620          | 151640 | 20            | 1           | Realignment with Retaining wall                 |
| 119          | 151640          | 151800 | 160           | 3           | Realignment                                     |
| 120          | 151800          | 151810 | 10            | 1           | Realignment with Retaining wall                 |
| 121          | 151810          | 152100 | 290           | 3           | Realignment                                     |
| 122          | 152100          | 152110 | 10            | 1           | Realignment with Retaining wall                 |
| 123          | 152110          | 152220 | 110           | 3           | Realignment                                     |
| 124          | 152220          | 152260 | 40            | 1           | Realignment with Retaining wall                 |
| 125          | 152260          | 152300 | 40            | 3           | Realignment                                     |
| 126          | 152300          | 152340 | 40            | 1           | Realignment with Retaining wall                 |
| 127          | 152340          | 152540 | 200           | 3           | Realignment                                     |
| 128          | 152540          | 152570 | 30            | 1           | Realignment with Retaining wall                 |
| 129          | 152570          | 152670 | 100           | 3           | Realignment                                     |
| 130          | 152670          | 152690 | 20            | 1           | Realignment with Retaining wall                 |
| 131          | 152690          | 153323 | 633           | 3           | Realignment                                     |
| 132          | 153323          | 154036 | 713           | 4           | Built up  |
| <b>Total</b> |                 |        | <b>16036</b>  |             |   |

Note: The extent of cross section type is indicative and shall be reviewed in consultation with the Independent Consultant at the time of construction as per the site condition.

The alternative cross section of the Project Highway at the cross drainage structures shall follow the typical cross section in consultation with the Independent Consultant at the time of construction. The utility services, including optical fiber cables, shall be provided in the utility corridor earmarked for this purpose on the side where it is convenient to the NHIDCL or the fiber cable shall be relocated by the respective owner at a safe place as indicated by NHIDCL in such a way that it causes least hindrances to the execution of project. In urban sections the utility connection, the utility services shall be carried through the nearest cross drainage structure/cattle crossing below its deck slab and above HFL. In absence of such a

structure in the vicinity of the purposed location, it shall pass through separate underground ducts. Location and design of the cross utility ducts shall be finalized at the detailed design stage in consonance with the Independent Consultant and NHIDCL.

### 3.12 Longitudinal Section

As a minimum, the Construction Contractor shall achieve the proposed finished road level as indicated in the plan and profile drawings for this purpose in FFSR. However, the final finished road levels (FRL) will be finalized as per site conditions in consultation with NHIDCL.

### 3.13 Built-Up Areas

The alignment passes through Built up areas as tabulated below.

| Sl.no | Location/Design Chainage(km) | Name of Village/town etc |
|-------|------------------------------|--------------------------|
| 1     | 154+000                      | Koloriang                |

## 4. INTERSECTIONS AND GRADE SEPARATORS

All intersections shall be as per Section 3 of the Manual. Existing intersections which are deficient shall be improved to the prescribed standards.

[Refer to paragraphs 3.1.1, 3.1.2 and 3.3 of the Manual and specify the requirements. Explain where necessary with drawings/sketches/general arrangement].

There are no intersections with cross roads having bituminous surfacing. The cross roads fall into the category VRs. The Construction Contractor has to construct the following:

- i) Typical junction treatments as specified in Final Project Report shall be applied. Design types of intersections are as given below:

Properly designed intersections shall be provided at the locations and of the types and features given in the tables below:

- (a) At-grade Intersections

#### Major Intersections

| Sl No. | Location of Intersection | Intersection Towards | Existing Configurations |       |           |          | Type of Intersection |
|--------|--------------------------|----------------------|-------------------------|-------|-----------|----------|----------------------|
|        |                          |                      | Location                | Type  | Width (m) | Surfac e |                      |
| 1      | 154+036                  | Three sides          | Koloriang               | SH-17 | 3.5/4     | BT       | 4-Legged             |

Details of junction improvements shall be as per IRC SP:73-2015.

**Minor Intersections**

| SI No. | Location of Intersection | Type of Intersection | Side       |
|--------|--------------------------|----------------------|------------|
| 1      | 142+040                  | 3-Legged             | Right side |
| 2      | 142+580                  | 3-Legged             | Left side  |
| 3      | 144+100                  | 3-Legged             | Right side |
| 4      | 148+410                  | 3-Legged             | Left side  |
| 5      | 150+280                  | 3-Legged             | Right side |
| 6      | 150+710                  | 3-Legged             | Right side |
| 7      | 153+630                  | 3-Legged             | Right side |
| 8      | 153+760                  | 3-Legged             | Right side |
| 9      | 153+850                  | 3-Legged             | Right side |
| 10     | 153+960                  | 3-Legged             | Right side |

Details of junction improvements shall be as per IRC SP:73-2015.

**(b) Grade Separated Intersections with/without Ramps**

| SI No. | Location (km) | Salient Features | Minimum Length of Viaduct to be Provided (m) | Road to be Carried Over/Under the Structures |
|--------|---------------|------------------|--|--|
| Nil    |               |                  |  |  |

**5. ROAD EMBANKMENT AND CUT SECTION**

- 5.1** Widening and improvement of the existing road embankment/cuttings and construction of new road embankment/ cuttings shall conform to the Specifications and Standards given in section 4 of the Manual and the specified cross sectional details. Deficiencies in the plan and profile of the existing road shall be corrected.
- 5.2** Raising of the existing road [Refer to paragraph 4.2.2 of the Manual and specify sections to be raised].

The existing road shall be raised in the following sections:

| SI No. | Section (km) |    | Length (km) | Extent of Raising* | Remarks |
|--------|--------------|----|-------------|--------------------|---------|
|        | From         | To |             |                    |         |
| Nil    |              |    |             |                    |         |

\* Difference between levels at proposed c/l and existing road/ground below proposed c/l

**6. PAVEMENT DESIGN**

- 6.1** Pavement design shall be carried out in accordance with section 5 of the Manual. The detailed pavement design including overlay and pavement characteristics requirements of the Project Highway shall be done in accordance with Schedule D. Flexible pavement shall be



considered for the project road. Flexible Pavement design shall be carried out in accordance with Section 5 of the Two Lane Manual (IRC: SP 73 -2015).

## 6.2 Type of pavement

Flexible pavement shall be adopted for Project Highway in accordance with IRC: 37-2012. Clause 2.2 of IRC:37-2012 identifies five type of flexible pavements. The estimated cost of civil works is based on flexible pavements consisting of Granular base, Sub base, DBM and Be. Since, the successful bidders under EPC mode can use any type of five flexible pavements mentioned Clause 2.2 of IRC: 37-2012, they may carry out their own diligence to arrive at project cost before submitting bids.

## 6.3 Design requirements

[Refer to paragraph 5.4, 5.9 and 5.1'0 of the Manual and specify design requirements and strategy]

### 6.3.1 Design Period and strategy

Flexible pavement for new pavement or for widening and strengthening of the existing pavement shall be designed for a minimum design period of 15 years. Stage construction shall not be permitted.

### 6.3.2 Design Traffic

Notwithstanding anything to the contrary contained in this Agreement or the Manual, the Contractor shall design the pavement for design traffic of 20 million standard axles as follows.

| PACKAGE | Design Chainage (km) |         | Length (km) | 15 Year MSA* |
|---------|----------------------|---------|-------------|--------------|
|         | From                 | To      |             |              |
| III     | 138+000              | 154+036 | 16.036      | 20           |

\*As per 5.4.1 of IRC:SP:73-2015

### 6.3.3 Design Parameters

The flexible pavement for the main carriageway is a 2-lane carriageway having 1.5 m wide paved shoulder and 1.0 m wide earthen shoulder in some stretches .This shall be designed using the IRC 37: 2012 Method for the projected traffic levels and the following indicative design input parameters:

#### Indicative Design Parameters

|       |                            |   |
|-------|----------------------------|---|
| (i)   | Performance Period         | 15 years + Construction Period of 24 months   |
| (ii)  | Traffic on Design Lane     | Minimum 20msa. Design should take care of the maximum wheel load derived from the axle load survey on the design lane |
| (iii) | Design serviceability Loss | 2.0   |

|        |  |  |
|--------|--|--|
| (iv)   | Reliability                                | 90%  |
| (v)    | Overall Standard Deviation                 | 0.49   |
| (vi)   | Effective Roadblock Soil Resilient Modulus | Corresponding to 4-day soaked CBR value of 8.0% to 10.0% |
| (vii)  | Layer Coefficients                         | As per the IRC 37 : 2012 procedures                      |
| (viii) | Drainage quality of Pavement               | Good   |

**6.3.4** The Project highway will be a light-trafficked section connecting the major arterial network of the country. The design exercise should therefore duly take into account the importance of the road, the performance level and the maintenance requirements during the performance period. The provision of Wet Mix Macadam (granular base)/cement-treated base/ sub-base (crushed stone only)/ subgrade layer(s) and the use of 60/70 Bitumen in bituminous base layers and polymer modified bitumen (PMB 40) in wearing course shall be considered while deciding about the composition of the pavement structure. The design should also accompany the Quality Assurance Plan (QAP) along with its implementation scheme for the construction of the pavement structure.

**6.3.5** However, in case of a change in the pavement design at the detailed engineering stage, the same shall not be considered as a change in scope of work nor shall qualify for a variation order.

**6.3.6** Paved shoulders of 1.5 m width shall have same thickness of the pavement as that of the main carriageway with same composition as that of main carriageway for monolithic construction.

**6.3.7** Contractor shall design the pavement for design traffic of 20 million standard axles (msa) with corresponding subgrade CBR.

#### **6.3.8 Rigid Pavement**

No rigid pavement has been considered for the Project Highway.

### **6.4 Reconstruction / Realignment / Bypass of sections**

[Refer to paragraph 5.9.7 of the Manual and specify the sections, if any, to be reconstructed.]

The following sections of the existing road shall be reconstructed. These shall be designed as new pavement.

| Sl No. | Section (km) |         | Remarks                             |
|--------|--------------|---------|-------------------------------------|
|        | From         | To      |                                     |
| 1      | 138+000      | 154+036 | Poor condition of existing pavement |

## **7. ROADSIDE DRAINAGE**

*Two Laning of Joram – koloriang Road (NH-713) on EPC basis from design km 138+000 to km 154+036 [Existing km 138.000 to km 158.000] in the State of Arunachal Pradesh under SARDP-NE*

Drainage system including surface and subsurface drains for the Project Highway shall be provided as per section 6 of the Manual.

The improvements in the drainage and the slope erosion shall be made as per the following norms:

### 7.1 Drainage Measures

Following measures shall be adopted:

- i) Open side Trapezoidal drains at the hill side for widening at hill sides.
- ii) Open side Trapezoidal drains at both sides in realignment stretches by hill cut.

Open side trapezoidal cross section drain shall be provided on hill sides of the project highway in order to intercept surface water from the carriageway, shoulders and hill slopes. RCC Lined drains have slopes also been proposed in urban/semi urban/intersection stretches. The concrete drains shall be covered in reaches along commercial establishments and intersections. The drains outfall into the natural water courses i.e. either in culverts or bridges. Table below gives the location of lined drains.

These are guidelines for minimum provisions. However, contractor has to design as per requirement of road in accordance with manual.

**Details of Lined Drains**

| S.NO. | DESIGN CHAINAGE |        | LENGTH<br>(m) | SIDE | Remarks /<br>Location                           |
|-------|-----------------|--------|---------------|------|---|
|       | FROM            | TO     |               |      |   |
| 1     | 138000          | 138150 | 150           | One  | Reconstruction and widening                     |
| 2     | 138150          | 138160 | 20            | Both | Realignment                                     |
| 3     | 138160          | 138200 | 40            | One  | Realignment with Retaining wall                 |
| 4     | 138200          | 138300 | 100           | One  | Realignment with Retaining wall                 |
| 5     | 138300          | 138350 | 100           | Both | Realignment                                     |
| 6     | 138350          | 138390 | 40            | One  | Reconstruction and widening                     |
| 7     | 138390          | 138400 | 10            | One  | Reconstruction and widening with retaining wall |
| 8     | 138400          | 138410 | 10            | One  | Realignment with Retaining wall                 |
| 9     | 138410          | 138500 | 180           | Both | Realignment                                     |

|    |        |        |      |      |   |
|----|--------|--------|------|------|---|
| 10 | 138500 | 138530 | 30   | One  | Reconstruction and widening with retaining wall |
| 11 | 138530 | 138550 | 20   | One  | Reconstruction and widening                     |
| 12 | 138550 | 138700 | 300  | Both | Realignment                                     |
| 13 | 138700 | 138710 | 20   | Both | Realignment                                     |
| 14 | 138710 | 138910 | 400  | Both | Realignment                                     |
| 15 | 138910 | 138940 | 30   | One  | Realignment with Retaining wall                 |
| 16 | 138940 | 138990 | 100  | Both | Realignment                                     |
| 17 | 138990 | 139000 | 10   | One  | Realignment with Retaining wall                 |
| 18 | 139000 | 139040 | 40   | One  | Realignment with Retaining wall                 |
| 19 | 139040 | 139160 | 240  | Both | Realignment                                     |
| 20 | 139160 | 139210 | 50   | One  | Realignment with Retaining wall                 |
| 21 | 139210 | 139500 | 580  | Both | Realignment                                     |
| 22 | 139500 | 139620 | 120  | One  | Realignment with Retaining wall                 |
| 23 | 139620 | 140450 | 1660 | Both | Realignment                                     |
| 24 | 140450 | 140510 | 120  | Both | Realignment                                     |
| 25 | 140510 | 140550 | 80   | Both | Realignment                                     |
| 26 | 140550 | 140640 | 90   | One  | Reconstruction and widening                     |
| 27 | 140640 | 140660 | 20   | One  | Reconstruction and widening with retaining wall |
| 28 | 140660 | 140790 | 130  | One  | Reconstruction and widening                     |
| 29 | 140790 | 140800 | 10   | One  | Reconstruction and widening with retaining wall |
| 30 | 140800 | 140960 | 160  | One  | Realignment with Retaining wall                 |
| 31 | 140960 | 141010 | 100  | Both | Realignment                                     |
| 32 | 141010 | 141090 | 80   | One  | Realignment with Retaining wall                 |
| 33 | 141090 | 141100 | 20   | Both | Realignment                                     |
| 34 | 141100 | 141160 | 60   | One  | Reconstruction and widening                     |

Two Laning of Joram – koloriang Road (NH-713) on EPC basis from design km 138+000 to km 154+036 [Existing km 138.000 to km 158.000] in the State of Arunachal Pradesh under SARDP-NE

|    |        |        |      |      |   |
|----|--------|--------|------|------|---|
| 35 | 141160 | 141200 | 40   | One  | Reconstruction and widening with retaining wall |
| 36 | 141200 | 141240 | 40   | One  | Realignment with Retaining wall                 |
| 37 | 141240 | 141500 | 520  | Both | Realignment                                     |
| 38 | 141500 | 141650 | 150  | One  | Reconstruction and widening                     |
| 39 | 141650 | 142350 | 1400 | Both | Realignment                                     |
| 40 | 142350 | 142400 | 50   | One  | Reconstruction and widening                     |
| 41 | 142400 | 142500 | 200  | Both | Realignment                                     |
| 42 | 142500 | 142550 | 50   | One  | Realignment with Retaining wall                 |
| 43 | 142550 | 143210 | 1320 | Both | Realignment                                     |
| 44 | 143210 | 143220 | 10   | One  | Realignment with Retaining wall                 |
| 45 | 143220 | 143400 | 360  | Both | Realignment                                     |
| 46 | 143400 | 143650 | 250  | One  | Reconstruction and widening                     |
| 47 | 143650 | 143700 | 100  | Both | Realignment                                     |
| 48 | 143700 | 143770 | 140  | Both | Realignment                                     |
| 49 | 143770 | 143870 | 100  | One  | Realignment with Retaining wall                 |
| 50 | 143870 | 144100 | 460  | Both | Realignment                                     |
| 51 | 144100 | 144320 | 220  | One  | Reconstruction and widening                     |
| 52 | 144320 | 144430 | 110  | One  | Reconstruction and widening with retaining wall |
| 53 | 144430 | 144500 | 70   | One  | Reconstruction and widening                     |
| 54 | 144500 | 144550 | 100  | Both | Realignment                                     |
| 55 | 144550 | 144660 | 220  | Both | Realignment                                     |
| 56 | 144660 | 144720 | 120  | Both | Realignment                                     |
| 57 | 144720 | 144840 | 240  | Both | Realignment                                     |
| 58 | 144840 | 144900 | 120  | Both | Realignment                                     |
| 59 | 144900 | 145000 | 100  | One  | Reconstruction and widening                     |
| 60 | 145000 | 145020 | 40   | Both | Realignment                                     |
| 61 | 145020 | 145120 | 100  | One  | Realignment with Retaining wall                 |

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|    |        |        |      |      |   |
|----|--------|--------|------|------|---|
| 62 | 145120 | 145220 | 200  | Both | Realignment                                     |
| 63 | 145220 | 145250 | 30   | One  | Realignment with Retaining wall                 |
| 64 | 145250 | 145340 | 180  | Both | Realignment                                     |
| 65 | 145340 | 145360 | 20   | One  | Realignment with Retaining wall                 |
| 66 | 145360 | 145550 | 380  | Both | Realignment                                     |
| 67 | 145550 | 145610 | 60   | One  | Realignment with Retaining wall                 |
| 68 | 145610 | 145670 | 120  | Both | Realignment                                     |
| 69 | 145670 | 145710 | 80   | Both | Realignment                                     |
| 70 | 145710 | 146200 | 980  | Both | Realignment                                     |
| 71 | 146200 | 146250 | 50   | One  | Reconstruction and widening                     |
| 72 | 146250 | 146450 | 400  | Both | Realignment                                     |
| 73 | 146450 | 146460 | 10   | One  | Realignment with Retaining wall                 |
| 74 | 146460 | 146900 | 880  | Both | Realignment                                     |
| 75 | 146900 | 146930 | 30   | One  | Reconstruction and widening                     |
| 76 | 146930 | 147000 | 70   | One  | Reconstruction and widening with retaining wall |
| 77 | 147000 | 147090 | 180  | Both | Realignment                                     |
| 78 | 147090 | 147170 | 160  | Both | Realignment                                     |
| 79 | 147170 | 147230 | 120  | Both | Realignment                                     |
| 80 | 147230 | 147250 | 40   | Both | Realignment                                     |
| 81 | 147250 | 147370 | 240  | Both | Realignment                                     |
| 82 | 147370 | 147410 | 40   | One  | Realignment with Retaining wall                 |
| 83 | 147410 | 148400 | 1980 | Both | Realignment                                     |
| 84 | 148400 | 148440 | 40   | One  | Realignment with Retaining wall                 |
| 85 | 148440 | 148550 | 220  | Both | Realignment                                     |
| 86 | 148550 | 148570 | 20   | One  | Realignment with Retaining wall                 |
| 87 | 148570 | 148830 | 520  | Both | Realignment                                     |
| 88 | 148830 | 148860 | 30   | One  | Realignment with Retaining wall                 |
| 89 | 148860 | 148940 | 160  | Both | Realignment                                     |
| 90 | 148940 | 149000 | 60   | One  | Realignment with Retaining wall                 |

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|     |        |        |     |      |   |
|-----|--------|--------|-----|------|---|
| 91  | 149000 | 149100 | 200 | Both | Realignment                                     |
| 92  | 149100 | 149180 | 80  | One  | Realignment with Retaining wall                 |
| 93  | 149180 | 149250 | 140 | Both | Realignment                                     |
| 94  | 149250 | 149270 | 20  | One  | Realignment with Retaining wall                 |
| 95  | 149270 | 149310 | 80  | Both | Realignment                                     |
| 96  | 149310 | 149350 | 40  | One  | Realignment with Retaining wall                 |
| 97  | 149350 | 149430 | 160 | Both | Realignment                                     |
| 98  | 149430 | 149450 | 40  | Both | Realignment                                     |
| 99  | 149450 | 149720 | 540 | Both | Realignment                                     |
| 100 | 149720 | 149770 | 100 | Both | Realignment                                     |
| 101 | 149770 | 149800 | 60  | Both | Realignment                                     |
| 102 | 149800 | 149810 | 10  | One  | Realignment with Retaining wall                 |
| 103 | 149810 | 149990 | 360 | Both | Realignment                                     |
| 104 | 149990 | 150010 | 20  | One  | Realignment with Retaining wall                 |
| 105 | 150010 | 150080 | 140 | Both | Realignment                                     |
| 106 | 150080 | 150100 | 20  | One  | Realignment with Retaining wall                 |
| 107 | 150100 | 150300 | 400 | Both | Realignment                                     |
| 108 | 150300 | 150380 | 80  | One  | Reconstruction and widening                     |
| 109 | 150380 | 150400 | 20  | One  | Reconstruction and widening with retaining wall |
| 110 | 150400 | 150410 | 10  | One  | Realignment with Retaining wall                 |
| 111 | 150410 | 150470 | 120 | Both | Realignment                                     |
| 112 | 150470 | 150490 | 20  | One  | Realignment with Retaining wall                 |
| 113 | 150490 | 150750 | 520 | Both | Realignment                                     |
| 114 | 150750 | 150850 | 100 | One  | Reconstruction and widening                     |
| 115 | 150850 | 151300 | 900 | Both | Realignment                                     |
| 116 | 151300 | 151400 | 100 | One  | Reconstruction and widening                     |
| 117 | 151400 | 151620 | 440 | Both | Realignment                                     |
| 118 | 151620 | 151640 | 20  | One  | Realignment with Retaining wall                 |

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|              |        |        |              |      |                                 |
|--------------|--------|--------|--------------|------|---------------------------------|
| 119          | 151640 | 151800 | 320          | Both | Realignment                     |
| 120          | 151800 | 151810 | 10           | One  | Realignment with Retaining wall |
| 121          | 151810 | 152100 | 580          | Both | Realignment                     |
| 122          | 152100 | 152110 | 10           | One  | Realignment with Retaining wall |
| 123          | 152110 | 152220 | 220          | Both | Realignment                     |
| 124          | 152220 | 152260 | 40           | One  | Realignment with Retaining wall |
| 125          | 152260 | 152300 | 80           | Both | Realignment                     |
| 126          | 152300 | 152340 | 40           | One  | Realignment with Retaining wall |
| 127          | 152340 | 152540 | 400          | Both | Realignment                     |
| 128          | 152540 | 152570 | 30           | One  | Realignment with Retaining wall |
| 129          | 152570 | 152670 | 200          | Both | Realignment                     |
| 130          | 152670 | 152690 | 20           | One  | Realignment with Retaining wall |
| 131          | 152690 | 153323 | 1266         | Both | Realignment                     |
| 132          | 153323 | 154036 | 1426         | Both | Built up                        |
| <b>Total</b> |        |        | <b>28432</b> |      |                                 |

**Note:** (The above locations shall be reviewed in consultation with the Independent Consultant at the time of construction as per the site condition).

Trapezoidal section for the drain/ditch has been proposed as it is more economical and efficient as compared to rectangular cross section V-Shaped. These road side drains have been designed of adequate capacity to carry 100% surface runoff of the drainage area of highway ROW and the adjoining land. The side slopes have been kept as 1H:1V in case of unlined drain/ditches. However, successful bidder may adopt any type of PCC drain as per IRC and accordingly they may carry out their own diligence to arrive at project cost before submitting the bid.

## 7.2 Slope Protection Measures

### 7.2.1 Breast Wall and Retaining Wall

Following measures shall be adopted:

Slope protection along hill slope side shall be with breast walls with PCC minimum M15 grade concrete. However, at the zones prone to sliding breast walls will be of sausage type (by stone-mesh gabions) or specialized treatment as per good engineering practices. Retaining wall has been considered at valley sides. The height of breast walls is varying from 1.5 m to 3m as per site requirement and to be



finalized by consultation with Authority Engineers. The breast wall of height 3m has been considered if the height of hill cut is more than 9m and in this circumstances 3m berm with catch water drain is required to be provided. The maximum cut slope at hill side is 55° (0.7H to 1V). Slide prone zones is from Km 143+100 to Km 143+800, Km 147+200 to Km 147+700, Km 150+500 to 150+800 and Km 150+850 to Km 151+350.

**7.2.2** Embankment less than 3m in height shall be turfed as per MoRTH Specifications.

**7.2.3** Vetiver Plantation, Hydro Seeding and Hydro Mulching etc or similar works is to be done for slope protection and site mitigation measure upto a height of 12-15 m all along the slopes in each cutting locations except hard rock location which needs to be protected with appropriate applicable technologies, if required.

### 7.3 Rip rap Protection:

The riprap protection or similar work to be provided at valley side shoulder over the granular sub base layer in the following locations as special safety feature on valley side on curves.

| Sl. No | Chainage |        | Length(m) |
|--------|----------|--------|-----------|
|        | From(km) | To(km) |           |
| 1      | 138000   | 138150 | 150       |
| 2      | 138160   | 138200 | 40        |
| 3      | 138200   | 138300 | 100       |
| 4      | 138350   | 138390 | 40        |
| 5      | 138390   | 138400 | 10        |
| 6      | 138400   | 138410 | 10        |
| 7      | 138500   | 138530 | 30        |
| 8      | 138530   | 138550 | 20        |
| 9      | 138910   | 138940 | 30        |
| 10     | 138990   | 139000 | 10        |
| 11     | 139000   | 139040 | 40        |
| 12     | 139160   | 139210 | 50        |
| 13     | 139500   | 139620 | 120       |
| 14     | 140550   | 140640 | 90        |
| 15     | 140640   | 140660 | 20        |
| 16     | 140660   | 140790 | 130       |
| 17     | 140790   | 140800 | 10        |
| 18     | 140800   | 140960 | 160       |
| 19     | 141010   | 141090 | 80        |
| 20     | 141100   | 141160 | 60        |
| 21     | 141160   | 141200 | 40        |
| 22     | 141200   | 141240 | 40        |

| Sl. No | Chainage |        | Length(m) |
|--------|----------|--------|-----------|
|        | From(km) | To(km) |           |
| 23     | 141500   | 141650 | 150       |
| 24     | 142350   | 142400 | 50        |
| 25     | 142500   | 142550 | 50        |
| 26     | 143210   | 143220 | 10        |
| 27     | 143400   | 143650 | 250       |
| 28     | 143770   | 143870 | 100       |
| 29     | 144100   | 144320 | 220       |
| 30     | 144320   | 144430 | 110       |
| 31     | 144430   | 144500 | 70        |
| 32     | 144900   | 145000 | 100       |
| 33     | 145020   | 145120 | 100       |
| 34     | 145220   | 145250 | 30        |
| 35     | 145340   | 145360 | 20        |
| 36     | 145550   | 145610 | 60        |
| 37     | 146200   | 146250 | 50        |
| 38     | 146450   | 146460 | 10        |
| 39     | 146900   | 146930 | 30        |
| 40     | 146930   | 147000 | 70        |
| 41     | 147370   | 147410 | 40        |
| 42     | 148400   | 148440 | 40        |
| 43     | 148550   | 148570 | 20        |
| 44     | 148830   | 148860 | 30        |
| 45     | 148940   | 149000 | 60        |
| 46     | 149100   | 149180 | 80        |
| 47     | 149250   | 149270 | 20        |
| 48     | 149310   | 149350 | 40        |
| 49     | 149800   | 149810 | 10        |
| 50     | 149990   | 150010 | 20        |
| 51     | 150080   | 150100 | 20        |
| 52     | 150300   | 150380 | 80        |
| 53     | 150380   | 150400 | 20        |
| 54     | 150400   | 150410 | 10        |
| 55     | 150470   | 150490 | 20        |
| 56     | 150750   | 150850 | 100       |
| 57     | 151300   | 151400 | 100       |
| 58     | 151620   | 151640 | 20        |
| 59     | 151800   | 151810 | 10        |
| 60     | 152100   | 152110 | 10        |
| 61     | 152220   | 152260 | 40        |

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| Sl. No | Chainage |        | Length(m) |
|--------|----------|--------|-----------|
|        | From(km) | To(km) |           |
| 62     | 152300   | 152340 | 40        |
| 63     | 152540   | 152570 | 30        |
| 64     | 152670   | 152690 | 20        |

## 8. DESIGN OF STRUCTURES

### 8.1 General

The Project road includes provision of no major bridges (span $\geq$ 60m), 6 nos minor bridge (span $<$ 60m) and 98 RCC Box/ Slab culverts. All culverts and other structures shall be designed and constructed in accordance with section 7 of the Manual and shall conform to the cross-sectional features and other details specified therein. New bridges and culverts shall be constructed wide enough to accommodate the adjacent road cross section as given in this Schedule-B. The details of existing culverts are given in Schedule–A.

The details of culverts shall be provided by the EPC Contractor and locations are given in Clause 8.2 of Schedule-B.

All the cross-drainage structures and other structures shall be designed in accordance with the design standards set out in **Schedule–D**.

The following guidelines shall be followed:

- All the cross drainage structures for the new carriageway shall be designed in such way so that the outer most face of railing/parapet shall be in line with the out most edge of shoulder.
- The existing culverts shall be extended to match the new road cross sections.
- The adequacy of the vent size for all culverts/bridges shall be ascertained through detailed hydrological surveys and finalized in consultation with the IC/Project Company. The highest flood level/maximum supply level shall be properly assessed after collecting flood histories form local authorities/interviews with locals/irrigation authorities.
- For drainage purpose the new/to be reconstructed box culverts of minimum span 2.0 m shall be provided.
- Suitable river training works, bank protection and embankment protection works ensuring safety of bridge structure and its approaches against damage by flood water / rain water shall be provided.

The cross drainage plan of the highway shall be finalized in consultation with IC/Project Company and if required additional culverts shall be provided.

Cross-section of the new culverts and bridges at deck level for the Project Highway shall conform to the typical cross-sections given in section 7 of the Manual.

**8.2 Culverts**

**8.2.1** Overall width of all culverts shall be equal to the roadway width of the approaches.

**8.2.2** Reconstruction of existing culverts

The existing culverts at the following locations shall be re-constructed as new culverts:  
[Refer to paragraph 7.3 (i) of the Manual and provide details]

| Sl. No. | Existing Chainage (km) | Design Chainage (km) | Proposal      | Proposed Span |
|---------|------------------------|----------------------|---------------|---------------|
| 1       | 138+020                | 138+028              | RCC Box/ Slab | 3.0           |
| 2       | 138+760                | 138+700              | RCC Box/ Slab | 2.0           |
| 3       | 138+800                | 138+730              | RCC Box/ Slab | 2.0           |
| 4       | 141+000                | 140+750              | RCC Box/ Slab | 2.0           |
| 5       | 141+135                | 140+880              | RCC Box/ Slab | 2.0           |
| 6       | 141+500                | 141+230              | RCC Box/ Slab | 2.0           |
| 7       | 142+100                | 141+740              | RCC Box/ Slab | 2.0           |
| 8       | 142+320                | 141+960              | RCC Box/ Slab | 2.0           |
| 9       | 143+455                | 143+000              | RCC Box/ Slab | 2.0           |
| 10      | 145+090                | 144+470              | RCC Box/ Slab | 2.0           |
| 11      | 145+445                | 144+810              | RCC Box/ Slab | 3.0           |
| 12      | 146+165                | 145+350              | RCC Box/ Slab | 2.0           |
| 13      | 151+410                | 149+720              | RCC Box/ Slab | 3.0           |
| 14      | 151+490                | 149+840              | RCC Box/ Slab | 2.0           |
| 15      | 151+580                | 149+925              | RCC Box/ Slab | 3.0           |

\* Specify modifications, if any, required in the road level etc.

**8.2.3** Additional new culverts shall be constructed as per particulars given in the table below:

| Sl. No. | Existing Chainage (km) | Design Chainage (km) | Proposal      | Span |
|---------|------------------------|----------------------|---------------|------|
| 1       | 138+900                | 138+810              | RCC Box/ Slab | 2.0  |
| 2       | 139+090                | 138+960              | RCC Box/ Slab | 2.0  |
| 3       | 139+125                | 138+980              | RCC Box/ Slab | 2.0  |
| 4       | 139+310                | 139+170              | RCC Box/ Slab | 2.0  |
| 5       | 139+490                | 139+320              | RCC Box/ Slab | 2.0  |
| 6       | 139+540                | 139+360              | RCC Box/ Slab | 2.0  |
| 7       | 139+910                | 139+720              | RCC Box/ Slab | 2.0  |
| 8       | 141+300                | 141+040              | RCC Box/ Slab | 3.0  |
| 9       | 141+450                | 141+180              | RCC Box/ Slab | 2.0  |

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|    |         |         |               |     |
|----|---------|---------|---------------|-----|
| 10 | 141+770 | 141+455 | RCC Box/ Slab | 3.0 |
| 11 | 142+045 | 141+680 | RCC Box/ Slab | 2.0 |
| 12 | 142+590 | 142+200 | RCC Box/ Slab | 2.5 |
| 13 | 142+640 | 142+270 | RCC Box/ Slab | 2.0 |
| 14 | 142+695 | 142+315 | RCC Box/ Slab | 2.0 |
| 15 | 142+795 | 142+405 | RCC Box/ Slab | 2.0 |
| 16 | 143+020 | 142+640 | RCC Box/ Slab | 2.0 |
| 17 | 143+120 | 142+740 | RCC Box/ Slab | 2.0 |
| 18 | 143+820 | 143+230 | RCC Box/ Slab | 2.0 |
| 19 | 144+010 | 143+410 | RCC Box/ Slab | 2.0 |
| 20 | 144+150 | 143+550 | RCC Box/ Slab | 2.0 |
| 21 | 144+315 | 143+710 | RCC Box/ Slab | 2.0 |
| 22 | 144+840 | 144+210 | RCC Box/ Slab | 3.0 |
| 23 | 145+495 | 145+000 | RCC Box/ Slab | 2.0 |
| 24 | 146+440 | 145+610 | RCC Box/ Slab | 2.0 |
| 25 | 146+520 | 145+680 | RCC Box/ Slab | 3.5 |
| 26 | 146+930 | 145+900 | RCC Box/ Slab | 6.0 |
| 27 | 147+280 | 146+200 | RCC Box/ Slab | 4.5 |
| 28 | 147+400 | 146+450 | RCC Box/ Slab | 5.0 |
| 29 | 147+590 | 146+650 | RCC Box/ Slab | 2.0 |
| 30 | 147+820 | 146+980 | RCC Box/ Slab | 2.0 |
| 31 | 148+155 | 147+410 | RCC Box/ Slab | 3.5 |
| 32 | 148+730 | 147+700 | RCC Box/ Slab | 2.0 |
| 33 | 149+175 | 147+790 | RCC Box/ Slab | 4.0 |
| 34 | 149+240 | 147+800 | RCC Box/ Slab | 6.0 |
| 35 | 149+290 | 147+850 | RCC Box/ Slab | 2.5 |
| 36 | 149+405 | 147+940 | RCC Box/ Slab | 3.0 |
| 37 | 149+500 | 147+985 | RCC Box/ Slab | 3.0 |
| 38 | 149+575 | 148+060 | RCC Box/ Slab | 2.0 |
| 39 | 149+720 | 148+200 | RCC Box/ Slab | 4.5 |
| 40 | 149+960 | 148+430 | RCC Box/ Slab | 3.0 |
| 41 | 150+180 | 148+630 | RCC Box/ Slab | 3.0 |
| 42 | 150+420 | 148+830 | RCC Box/ Slab | 2.5 |
| 43 | 150+455 | 148+870 | RCC Box/ Slab | 4.0 |
| 44 | 150+520 | 148+920 | RCC Box/ Slab | 2.5 |
| 45 | 150+585 | 148+970 | RCC Box/ Slab | 2.5 |
| 46 | 150+650 | 149+030 | RCC Box/ Slab | 2.0 |
| 47 | 150+750 | 149+130 | RCC Box/ Slab | 2.0 |
| 48 | 150+775 | 149+160 | RCC Box/ Slab | 2.0 |
| 49 | 150+850 | 149+220 | RCC Box/ Slab | 2.0 |
| 50 | 151+070 | 149+440 | RCC Box/ Slab | 3.0 |

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|    |         |         |               |     |
|----|---------|---------|---------------|-----|
| 51 | 151+100 | 149+480 | RCC Box/ Slab | 2.0 |
| 52 | 151+350 | 149+650 | RCC Box/ Slab | 3.0 |
| 53 | 151+720 | 150+010 | RCC Box/ Slab | 2.0 |
| 54 | 151+765 | 150+050 | RCC Box/ Slab | 3.0 |
| 55 | 151+810 | 150+090 | RCC Box/ Slab | 2.5 |
| 56 | 151+870 | 150+152 | RCC Box/ Slab | 2.0 |
| 57 | 152+080 | 150+320 | RCC Box/ Slab | 3.0 |
| 58 | 152+205 | 150+430 | RCC Box/ Slab | 3.0 |
| 59 | 152+260 | 150+490 | RCC Box/ Slab | 2.5 |
| 60 | 152+305 | 150+530 | RCC Box/ Slab | 3.5 |
| 61 | 152+890 | 151+060 | RCC Box/ Slab | 3.0 |
| 62 | 153+070 | 151+290 | RCC Box/ Slab | 6.0 |
| 63 | 153+180 | 151+390 | RCC Box/ Slab | 4.0 |
| 64 | 153+310 | 151+510 | RCC Box/ Slab | 4.0 |
| 65 | 153+450 | 151+640 | RCC Box/ Slab | 4.0 |
| 66 | 153+775 | 151+820 | RCC Box/ Slab | 5.0 |
| 67 | 153+960 | 151+920 | RCC Box/ Slab | 6.0 |
| 68 | 154+020 | 151+980 | RCC Box/ Slab | 2.5 |
| 69 | 154+085 | 152+040 | RCC Box/ Slab | 4.0 |
| 70 | 154+205 | 152+110 | RCC Box/ Slab | 4.0 |
| 71 | 154+340 | 152+190 | RCC Box/ Slab | 2.5 |
| 72 | 154+400 | 152+260 | RCC Box/ Slab | 2.5 |
| 73 | 154+575 | 152+420 | RCC Box/ Slab | 2.5 |
| 74 | 154+760 | 152+590 | RCC Box/ Slab | 4.0 |
| 75 | 154+900 | 152+690 | RCC Box/ Slab | 2.5 |
| 76 | 155+100 | 152+850 | RCC Box/ Slab | 6.0 |
| 77 | 155+420 | 152+920 | RCC Box/ Slab | 2.0 |
| 78 | 155+370 | 152+990 | RCC Box/ Slab | 2.5 |
| 79 | 155+600 | 153+260 | RCC Box/ Slab | 2.5 |
| 80 | 156+400 | 153+910 | RCC Box/ Slab | 2.0 |

**8.2.4** Repairs/replacements of railing/parapets, flooring and protection. works of the existing culverts shall be undertaken as follows:

[Refer to paragraph 7.23 of the Manual and provide details]

| Sl. No. | Existing Chainage (km) | Design Chainage (km) | Proposal      | Proposed Span |
|---------|------------------------|----------------------|---------------|---------------|
| 1       | 140+970                | 140+720              | RCC Box/ Slab | 3.0           |
| 2       | 155+850                | 153+285              | RCC Box/ Slab | 2.1           |
| 3       | 156+180                | 153+530              | RCC Box/ Slab | 5.9           |

**8.2.5** Floor protection works shall be as specified in the relevant IRC Codes and Specifications.

### 8.3 Bridges

**8.3.1** The existing bridges to be reconstructed/widened

- (i) The existing bridges at the following locations shall be reconstructed as new structures (Minor Bridge)

| SI No. | Existing Chainage | Design Chainage | Proposed Span(m) | Proposed Width(m) | Remarks        |
|--------|-------------------|-----------------|------------------|-------------------|----------------|
| 1      | 140+450           | 140+230         | 1 x 34           | 16.0              | Reconstruction |
| 2      | 143+400           | 142+930         | 1 x 10           | 16.0              | Reconstruction |
| 3      | 144+640           | 144+070         | 1 x 39           | 16.0              | Reconstruction |
| 4      | 147+100           | 146+030         | 1 x 7            | 16.0              | Reconstruction |
| 5      | 152+640           | 150+830         | 1 x 25           | 16.0              | Reconstruction |

| SI No | Bridge Location (km) | Salient Details of Existing Bridge |                   |             |                        |                    | Adequacy or Otherwise of the Existing Waterway, Vertical Clearance etc. | Remarks       |
|-------|----------------------|------------------------------------|-------------------|-------------|------------------------|--------------------|---|---------------|
|       |                      | Span Arrangement                   | Carriageway Width | Total Width | Type of Superstructure | Type of Foundation |   |               |
|       |                      | ( m )                              | ( m )             | ( m )       |                        |                    |   |               |
| 1     | 140+450              | 1 X 34.0                           | 3.5               | 5.5         | DS type Bailey bridge  | Open               | Vertical Clearance~8.5m   | Narrow Bridge |
| 2     | 143+400              | 1 X 10.0                           | 5.5               | 6           | RCC Slab               | Open               | Vertical Clearance~4.0m   | Narrow Bridge |
| 3     | 144+640              | 1 X 39.0                           | 3.5               | 5.5         | TS type bailey bridge  | Open               | Vertical Clearance~17.0m  | Narrow Bridge |
| 4     | 147+100              | 1 X 6.5                            | 5.3               | 5.8         | RCC Slab               | Open               | Vertical Clearance~6.0m   | Narrow Bridge |
| 5     | 152+640              | 1 X 25.0                           | 3.5               | 5.5         | DS type Bailey bridge  | Open               | Vertical Clearance~8.5m   | Narrow Bridge |

**8.3.2** The following structures shall be provided with footpaths:

| SI No. | Location (km) | Remarks                |
|--------|---------------|------------------------|
| 1      | 140+230       | Footpath on both sides |
| 2      | 142+930       | Footpath on both sides |
| 3      | 144+070       | Footpath on both sides |
| 4      | 146+030       | Footpath on both sides |

|   |         |                        |
|---|---------|------------------------|
| 5 | 150+830 | Footpath on both sides |
| 6 | 153+215 | Footpath on both sides |

**8.3.3 Additional New Minor Bridges**

New minor bridges at the following locations on the project highways shall be constructed

| Sl. No. | Bridge Location (Km) | Span Arrangement (m) | Carriageway Width (m) | Total Width (m) | Type of Superstructure | Type of Foundation |
|---------|----------------------|----------------------|-----------------------|-----------------|------------------------|--------------------|
| 1       | 153+215              | 1 x 30.0m            | 11.0m                 | 16.0m           | PSC Girder             | Open               |

**8.3.4 Additional new bridges**

[Specify additional new bridges if required, and attach GAD]

No new bridges at the following locations on the Project Highway shall be constructed.

| Sl No. | Location (km) | Total Length (m) | Remarks |
|--------|---------------|------------------|---------|
| Nil    |               |                  |         |

**8.3.5 The railings of existing bridges shall be replaced by crash barriers at the following locations:**

[Refer to paragraph 7.18 (iv) of the Manual and provide details]

| Sl No. | Location (km) | Remarks |
|--------|---------------|---------|
| Nil    |               |         |

**8.3.6 Repairs/replacements of railings/parapets of the existing bridges shall be undertaken as follows:**

[Refer to paragraph 7.18 (v) of the Manual and provide details]

| Sl No. | Location (km) | Remarks |
|--------|---------------|---------|
| Nil    |               |         |

**8.3.7 Drainage system for bridge decks**

An effective drainage system for bridge decks shall be provided as specified in paragraph 7.21 of the Manual

**8.3.8 Structures in marine environment**

[Refer to paragraph 7.22 of the Manual and specify the necessary measures / treatments for protecting structures in marine environment, where applicable]



**8.4 Rail-road Bridges**

**8.4.1** Design, construction and detailing of ROB/RUB shall be as specified in section 7 of the Manual. [Refer to paragraph 7.19 of the Manual and specify modification, if any]

**8.4.2 Road over-bridges**

Road over-bridges (road over rail) shall be provided at the following level crossings, as per GAD drawings attached:

| SI No. | Location of Level Crossing (km) | Length of Bridge (m) |
|--------|---------------------------------|----------------------|
| Nil    |                                 |                      |

**8.1.1 Road under-bridges**

Road under-bridges (road under railway line) shall be provided at the following level crossings, as per GAD drawings attached:

| SI No. | Location of Level Crossing (km) | Number and Length of Span (m) |
|--------|---------------------------------|-------------------------------|
| Nil    |                                 |                               |

**8.5 Grade Separated Structures**

[Refer to paragraph 7.20 of the Manual]

The grade separated structures shall be provided at the locations and of the type and length specified in paragraphs 2.9 and 3 of this Annex-I.

**8.6 Underpasses/Overpasses**

There is no Underpass/Overpass proposed on the Project Highway.

**8.7 Repairs and strengthening of bridges and structures**

[Refer to paragraph 7.23 of the Manual and provide details]

The existing bridges and structures to be repaired/strengthened, and the nature and extent of repairs/strengthening required are given below:

**A. Bridges**

| SI No. | Location of Bridge (km) | Nature and Extent of Repairs/Strengthening to be Carried out |
|--------|-------------------------|--|
| Nil    |                         |  |

**B. ROB / RUB**

| SI No. | Location of Bridge (km) | Nature and Extent of Repairs/Strengthening to be Carried out |
|--------|-------------------------|--|
|--------|-------------------------|--|

Nil

**C. Overpasses / Underpasses and Other Structures**

| Sl No. | Location of Bridge (km) | Nature and Extent of Repairs/Strengthening to be Carried out |
|--------|-------------------------|--|
| Nil    |                         |  |

**8.8 List of Major Bridges and Structures**

The following is the list of Major Bridges

| Sl No. | Location (km) |
|--------|---------------|
| Nil    |               |

**9. TRAFFIC CONTROL DEVICES AND ROAD SAFETY WORKS****9.1 General**

Traffic control devices and road safety works shall be provided in accordance with Section 9 of the Manual.

Specifications of the reflective sheeting [Refer to paragraph 9.3 of the Manual and specify]

Traffic signs and pavements markings shall include roadside signs, overhead signs, curve amount signs and road marking along the Project Highway. The design and marking for the project Highway shall be as per design standards indicated in **Schedule-D** and the location for various treatments shall be finalized in consultation with the Independent Consultant and Project Company.

The road markings shall be applied to lane lines, road center lines, edge lines, continuity line, stop lines, give way lines, directional arrows, diagonal/chevron markings, and Zebra crossings at parking areas.

PCC kerbs (duly painted) approximately 170 RM (minimum) shall be provided by EPC Contractor in bus bays and Islands.

**9.2 Traffic Signs**

- (i) A complete range of permanent retro-reflective traffic signs as per the requirements defined in but not limited to the FPR, for the safe and efficient movement of traffic. These sign are to be of regulatory, warning and informatory types and placed on the roadside except at the start and end of the project road and start and end of two bypasses where overhead directional and lane designation signs shall be mounted on the steels portals.

- (ii) Temporary traffic and construction signs are to be provided during construction and maintenance operations for traffic diversion and pedestrian safety.

### 9.3 Pavement Marking

- (i) Retro-reflective thermoplastic paint is proposed for use. The road markings shall be applied to lane lines, road center lines, edge lines, continuity line, stop lines, give way lines, diagonal/chevron markings, Zebra crossings and at parking areas.
- (ii) Delineators bollards and other safety devices shall be provided on entire project Highway and other locations as directed by NHIDCL.
- (iii) All signs shall be the reflectorized type with high intensity retro-reflective sheeting conforming to ASTM D 4956-01, type VIII and /or type IX of micro prismatic type. All sign boards of size more than 1.2 m and less than 0.9 m shall be provided at the locations finalized in consultation with NHIDCL.
- (iv) Cautionary sign boards (900mm Equilateral Triangle), stop sign (900mm Octagonal) mandatory sign boards(600mm dia), Village name boards (600X900mm), Hazard Plate (300X900mm), chevron signboard (600X750mm), Facility information sign (600X800mm), Advance direction sign (1800X1200mm), Place identification sign (1200X900mm) shall be provided by the Construction Contractor with suitable interval in consultation with NHIDCL.

The minimum quantity of Traffic signages and pavement marking are tabulated here

| <b>Traffic Signages, Road Marking and other appurtenances</b> | <b>unit</b> | <b>Quantity</b> |
|---|-------------|-----------------|
| Centre line on straight portion                               | sqm         | 1270            |
| Centre line on curve portion                                  | sqm         | 481             |
| Edge Line at Paved Shoulder                                   | sqm         | 6415            |
| Add 15% for Misc. including Pedestrian X-ings etc             | sqm         | 1225            |
| Directional Arrows, letter marking etc.                       | Nos.        | 146             |
| Advance Direction signs size 1800X1200 mm                     | Nos.        | 17              |
| Village name boards size 600X900 mm                           | Nos.        | 152             |
| Place Identification signs size 1200X900 mm                   | Nos.        | 11              |
| 90 cm Triangle  | Nos.        | 23              |
| 90 cm Octagon   | Nos.        | 21              |
| Hazard plate 300X900 mm                                       | Nos.        | 113             |
| 800 x 600 mm Size   | Nos.        | 45              |
| 60 Cm circular  | Nos.        | 75              |

| <b>Traffic Signages, Road Marking and other appurtenances</b> | <b>unit</b> | <b>Quantity</b> |
|---|-------------|-----------------|
| Boundary Stone (taken 10% of Qty)                             | Nos.        | 163             |
| 5th Km Stone -New   | Nos.        | 3               |
| Ordinary Km Stone   | Nos.        | 15              |
| Hectometer Stone  | Nos.        | 62              |
| Delinator   | Nos.        | 1214            |
| Rip Rap   | Rm          | 3640            |
| Convex Mirror   | Nos         | 60              |
| W Type metal Crash Barrier                                    | Rm          | 4311            |

## 10. ROADSIDE FURNITURE

**10.1.1** Roadside furniture shall be provided in accordance with the provisions of Section 11 of the Manual.

**10.1.2** Overhead traffic signs: location and size

[Refer to paragraph 11.5 of the Manual and provide details]

The overhead signs shall be the reflectorized type with high intensity retro-reflective sheeting conforming to ASTM D 4956-01, type VIII and /or type IX of micro prismatic type. The retro reflected sheets of Engineering Grade and high intensity grade (ordinary) shall not be used. The height, lateral clearance, location and installation shall be as per relevant clauses of MoRTH specifications. Overhead sign shall be installed ahead of major intersections and urban areas as per detailed design requirements. The minimum number of overhead signs shall be 02 (overhead gantry) as per this manual.

| <b>Sl No.</b> | <b>Location (km)</b> | <b>Size</b>  | <b>Remarks</b>  |
|---------------|----------------------|--------------|-----------------|
| 1             | 138+000              | 12.0m x 2.1m | Overhead Gantry |
| 2             | 154+036              | 12.0m x 2.1m | Overhead Gantry |

## 11. COMPULSORY AFFORESTATION

[Refer to paragraph 12.1 of the Manual and specify the number of trees which are required to be planted by the Contractor as compensatory afforestation.]

Minimum 1160 nos. trees are required to be planted.

## 12. HAZARDOUS LOCATIONS

- i) Metal Beam crash barrier length of minimum 4310m (single runner, heavy duty and W-shape) shall be provided at the locations of bridge approaches and high embankments (3.0m and more), at sharp curves on both sides. Heavy duty metal

beam crash barriers shall be provided on this project by the Construction Contractor at the locations finalized in consultation with NHIDC L. Typical details of metal crash barrier as per manual.

The safety barriers shall also be provided at the following hazardous locations:

| Sl No. | Location    |             | Length (m) | Remarks     |
|--------|-------------|-------------|------------|-------------|
|        | From        | To          |            |             |
| 1      | 138+020.195 | 138+034.986 | 14.79      | Radius<300m |
| 2      | 138+126.065 | 138+163.706 | 37.64      | Radius<300m |
| 3      | 138+254.693 | 138+279.680 | 24.99      | Radius<300m |
| 4      | 138+451.636 | 138+481.587 | 29.95      | Radius<300m |
| 5      | 138+596.789 | 138+609.150 | 12.36      | Radius<300m |
| 6      | 138+708.464 | 138+748.462 | 40.00      | Radius<300m |
| 7      | 138+829.641 | 138+894.983 | 65.34      | Radius<300m |
| 8      | 138+957.407 | 138+992.053 | 34.65      | Radius<300m |
| 9      | 139+209.046 | 139+219.875 | 10.83      | Radius<300m |
| 10     | 139+327.934 | 139+370.009 | 42.07      | Radius<300m |
| 11     | 139+484.383 | 139+533.162 | 48.78      | Radius<300m |
| 12     | 139+659.123 | 139+685.426 | 26.30      | Radius<300m |
| 13     | 139+817.276 | 139+867.796 | 50.52      | Radius<300m |
| 14     | 139+953.995 | 139+967.054 | 13.06      | Radius<300m |
| 15     | 140+175.767 | 140+221.612 | 45.85      | Radius<300m |
| 16     | 140+327.663 | 140+355.873 | 28.21      | Radius<300m |
| 17     | 140+509.579 | 140+549.913 | 40.33      | Radius<300m |
| 18     | 140+637.245 | 140+686.938 | 49.69      | Radius<300m |
| 19     | 141+002.912 | 141+024.734 | 21.82      | Radius<300m |
| 20     | 141+105.713 | 141+118.252 | 12.54      | Radius<300m |
| 21     | 141+229.713 | 141+240.254 | 10.54      | Radius<300m |
| 22     | 141+340.959 | 141+388.702 | 47.74      | Radius<300m |
| 23     | 141+473.531 | 141+514.553 | 41.02      | Radius<300m |
| 24     | 141+773.635 | 141+800.936 | 27.30      | Radius<300m |
| 25     | 141+861.954 | 141+888.646 | 26.69      | Radius<300m |
| 26     | 142+156.723 | 142+217.551 | 60.83      | Radius<300m |
| 27     | 142+310.279 | 142+340.412 | 30.13      | Radius<300m |
| 28     | 142+504.672 | 142+572.828 | 68.16      | Radius<300m |
| 29     | 142+672.427 | 142+748.212 | 75.79      | Radius<300m |
| 30     | 142+798.988 | 142+929.075 | 130.09     | Radius<300m |
| 31     | 142+983.788 | 143+065.603 | 81.82      | Radius<300m |
| 32     | 143+095.417 | 143+166.579 | 71.16      | Radius<300m |
| 33     | 143+325.739 | 143+346.325 | 20.59      | Radius<300m |
| 34     | 143+438.312 | 143+527.970 | 89.66      | Radius<300m |
| 35     | 144+197.338 | 144+418.557 | 221.22     | Radius<300m |
| 36     | 144+539.968 | 144+580.466 | 40.50      | Radius<300m |

| SI No. | Location    |             | Length (m) | Remarks     |
|--------|-------------|-------------|------------|-------------|
|        | From        | To          |            |             |
| 37     | 144+712.038 | 144+744.648 | 32.61      | Radius<300m |
| 38     | 145+056.859 | 145+135.794 | 78.93      | Radius<300m |
| 39     | 145+235.440 | 145+257.738 | 22.30      | Radius<300m |
| 40     | 145+349.606 | 145+389.309 | 39.70      | Radius<300m |
| 41     | 145+467.866 | 145+605.235 | 137.37     | Radius<300m |
| 42     | 145+656.347 | 145+715.392 | 59.04      | Radius<300m |
| 43     | 145+799.600 | 145+833.728 | 34.13      | Radius<300m |
| 44     | 145+899.444 | 145+906.740 | 07.30      | Radius<300m |
| 45     | 146+890.748 | 146+939.379 | 48.63      | Radius<300m |
| 46     | 147+170.621 | 147+187.801 | 17.18      | Radius<300m |
| 47     | 147+361.716 | 147+465.259 | 103.54     | Radius<300m |
| 48     | 147+649.573 | 147+789.314 | 139.74     | Radius<300m |
| 49     | 147+841.346 | 147+930.554 | 89.21      | Radius<300m |
| 50     | 148+008.761 | 148+065.674 | 56.91      | Radius<300m |
| 51     | 148+141.872 | 148+150.194 | 08.32      | Radius<300m |
| 52     | 148+227.461 | 148+256.853 | 29.39      | Radius<300m |
| 53     | 148+333.591 | 148+349.562 | 15.97      | Radius<300m |
| 54     | 148+407.344 | 148+418.295 | 10.95      | Radius<300m |
| 55     | 148+590.392 | 148+596.579 | 06.19      | Radius<300m |
| 56     | 148+744.248 | 148+754.003 | 09.76      | Radius<300m |
| 57     | 148+868.995 | 148+890.351 | 21.36      | Radius<300m |
| 58     | 149+065.496 | 149+071.198 | 05.70      | Radius<300m |
| 59     | 149+189.667 | 149+234.098 | 44.43      | Radius<300m |
| 60     | 149+310.931 | 149+413.500 | 102.57     | Radius<300m |
| 61     | 149+501.317 | 149+556.886 | 55.57      | Radius<300m |
| 62     | 149+643.043 | 149+680.717 | 37.67      | Radius<300m |
| 63     | 149+834.017 | 149+862.094 | 28.08      | Radius<300m |
| 64     | 150+032.296 | 150+081.529 | 49.23      | Radius<300m |
| 65     | 150+398.511 | 150+423.681 | 25.17      | Radius<300m |
| 66     | 150+499.143 | 150+556.825 | 57.68      | Radius<300m |
| 67     | 150+626.984 | 150+634.003 | 07.02      | Radius<300m |
| 68     | 150+685.255 | 150+712.991 | 27.74      | Radius<300m |
| 69     | 150+766.145 | 150+828.650 | 62.51      | Radius<300m |
| 70     | 150+900.268 | 150+916.455 | 16.19      | Radius<300m |
| 71     | 150+969.582 | 150+979.342 | 09.76      | Radius<300m |
| 72     | 151+026.608 | 151+049.796 | 23.19      | Radius<300m |
| 73     | 151+107.013 | 151+226.876 | 119.86     | Radius<300m |
| 74     | 151+228.063 | 151+262.101 | 34.04      | Radius<300m |
| 75     | 151+342.705 | 151+357.772 | 15.07      | Radius<300m |
| 76     | 151+533.453 | 151+561.714 | 28.26      | Radius<300m |
| 77     | 151+656.326 | 151+729.117 | 72.79      | Radius<300m |

Two Laning of Joram – koloriang Road (NH-713) on EPC basis from design km 138+000 to km 154+036 [Existing km 138.000 to km 158.000] in the State of Arunachal Pradesh under SARDP-NE

| SI No. | Location    |             | Length (m) | Remarks     |
|--------|-------------|-------------|------------|-------------|
|        | From        | To          |            |             |
| 78     | 151+832.955 | 151+909.706 | 76.75      | Radius<300m |
| 79     | 151+964.457 | 151+992.180 | 27.72      | Radius<300m |
| 80     | 152+107.225 | 152+177.658 | 70.43      | Radius<300m |
| 81     | 152+285.211 | 152+361.607 | 76.40      | Radius<300m |
| 82     | 152+417.194 | 152+450.703 | 33.51      | Radius<300m |
| 83     | 152+533.850 | 152+607.245 | 73.39      | Radius<300m |
| 84     | 152+690.221 | 152+705.349 | 15.13      | Radius<300m |
| 85     | 152+782.914 | 152+887.980 | 105.07     | Radius<300m |
| 86     | 152+964.953 | 153+031.938 | 66.98      | Radius<300m |
| 87     | 153+087.909 | 153+168.660 | 80.75      | Radius<300m |
| 88     | 153+201.935 | 153+278.699 | 76.76      | Radius<300m |
| 89     | 153+348.403 | 153+379.192 | 30.79      | Radius<300m |
| 90     | 153+435.886 | 153+459.322 | 23.44      | Radius<300m |
| 91     | 153+622.316 | 153+648.131 | 25.82      | Radius<300m |
| 92     | 153+774.027 | 153+782.684 | 08.66      | Radius<300m |
| 93     | 153+854.831 | 153+884.543 | 29.71      | Radius<300m |
| 94     | 153+925.682 | 153+931.151 | 05.47      | Radius<300m |

The safety barriers, protective works shall also be provided at the hazardous location/lengths. The minimum quantity of protection work is presented in the following table:

| Type of Protection Work with Minimum Quantity                                     |      |          |
|---|------|----------|
| Protection Work   | Unit | Quantity |
| 1.Parapet   | Rm   | 1690     |
| 2.Breast wall with PCC  |      |          |
| a)1.5m height   | Rm   | 3750     |
| b) 2m height  | Rm   | 4050     |
| c) 3m height  | Rm   | 2950     |
| 3. Breast wall sausage type by gabion/ specialized treatment for slide protection | Rm   | 2000     |
| 4. Retaining Wall with PCC  |      |          |
| a)2m Height   | Rm   | 1180     |
| b)3m Height   | Rm   | 340      |
| c)4m Height   | Rm   | 430      |

**13. ROAD LAND BOUNDARY**

Road land (ROW) boundary shall be demarcated by putting RCC boundary pillars of size 60cm x 15cm x 15 cm embedded in concrete (as per IRC:25) along the Project Highway at 200 m interval on both sides. All the components used in delineating road land boundary shall be aesthetically pleasing, sturdy and vandal proof. The road land boundary shall be demarcated in consultation with NHIDCL.

**14. SPECIAL REQUIREMENT FOR HILL ROADS**

[Refer to paragraphs 14.5 and 14.8 of the Manual and provide details where relevant and required.]

**15. CHANGE OF SCOPE**

The length of Structures and bridges specified hereinabove shall be treated as an approximate assessment. The actual lengths as required on the basis of detailed investigations shall be determined by the Contractor in accordance with the Specifications and Standards. Any variations in the lengths specified in this Schedule-B shall not constitute a Change of Scope, save and except any variations in the length arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 13.

**16. PRE-CONSTRUCTION ACTIVITIES****16.1 Land Acquisition (L.A.)**

Existing Road is single lane road. Proposed ROW of 18 m to 35m on this project is adequate to accommodate 2-lane configuration.

The land is to be acquired by NHIDCL and all related costs shall be borne by NHIDCL.

**16.2 Utility Shifting and Removal of Trees**

All the utilities are to be got shifted by NHIDCL and the related cost shall be borne by NHIDCL. The permission regarding cutting of trees is to be given by NHIDCL. The cost towards utility shifting, environmental and forest clearances, railway clearances etc. shall be borne by NHIDCL as per the demand note of the concerned government/semi government departments/agencies.

**16.3 Clearance to be obtained**

NHIDCL shall provide all necessary clearances from all the concerned authorities required for implementing the project at his own cost.

**16.4 Encroachment Removal**

Encroachments shall be removed by NHIDCL at his own cost and the State Government will provide administrative support to maintain law and order.



**16.5 Compensatory Afforestation:**

Refer Clause 11 of this Schedule-B.

**17. LANDSCAPING**

The finished road facility shall exhibit adequate landscaping of aesthetically pleasing view. All the borrow areas shall be properly dressed maintaining drain ability outward from the road facility. The side slopes shall be turfed.

Planting along the highway shall follow a variety of schemes depending upon location requirement as per the IRC and MoRTH guidelines. On island, planting of dust and gaseous substance absorbing shrubs such as aneurism oleander album is recommended. To ensure survival from herbivorous animals, shrubs/plants containing latex shall only be planted. Trees shall be provided with tree guards.

The treatment of highway embankment slopes shall be with vegetative turfing, hydro seeding and hydro mulching as per IRC: 56-2011, depending on the soil types involved. Pitching works along with filter material on slopes shall be as per MoRTH specifications.

**18. Fixed Parameters for Design**

- (i) The Construction Contractor shall consider the following fixed parameters for design
  - (a) In general Drawings are provided for reference. The Construction Contractor can follow the same as it is with the review of IC. The Construction Contractor can also follow the alternate Design/Drawings with the prior approval of NHIDCL. However the Construction Contractor shall be responsible for all design and Drawings and not be absolved from their liabilities even if they follow the DPR Drawings without any change.
  - (b) The scope of work shall be as specified in **Schedule-B** together with the provision of Project facilities as given in **Schedule-C** and in conformity with the specifications & standards set forth in **Schedule-D**.
  - (c) The finished top level of the road (Formation level) as shown in the P&P (Plan & Profile) drawing shall not be reduced/lowered unless there are some apparent errors / deficiencies in the FFSR and the Construction Contractor is able to demonstrate sound and durable design by lowering the formation levels with proper geometry as recommended in IRC: SP:73-2015 or other codes as applicable to the National Highways but no portion of Road should be allowed under submergence.
  - (d) The numbers and sizes of the culverts as well as waterway as provided in the FFSR shall not be reduced in any case, however the locations can be suitably modified in consultation & approval of the IC if required. Any additional

- requirement of culverts as per site conditions or increase in size due to hydrologic requirement should be assessed by the Construction Contractor and incorporated accordingly.
- (e) Alternative design for structures i.e. bridges, culverts, and retaining walls etc. can be adopted by the Construction Contractor in accordance with Design Requirements subject to review of the same by Authority Engineer. However, the span length (total clear span/water way) as shown in the drawings shall be considered as minimum requirement and cannot be reduced.
  - (f) The length and/or the nos. of various project facilities like Drain, Bus bays, etc. as mentioned in Schedule B and Schedule C shall be minimum, however the locations can be suitably modified in consultation with the Authority Engineer.
  - (g) The Geometric Design Standards for the Project/Project Facilities shall be as per IRC: 73 or other codes as applicable to the National Highways. These should be adhered to and minimum requirements should be maintained for the Project Highway. The Construction Contractor may adopt better standards for enhancing the requirements of safety and mobility.
  - (h) *Pavement Design*
    - i) The typical cross sections shall be followed as far as possible. Alternate cross sections shall be accepted subjected to approval from the Authority Engineer without altering the pavement widths and subject to the restriction of ROW widths. Pavement of the main carriageway has been designed for a period of 15 years + 24 months of construction period.
    - ii) The composition of Pavement Layers of the paved shoulders shall not be lower than the adjacent flexible pavement of the mainline project highway.
  - (i) All the slopes having embankment height more than 1.0m shall be protected by vegetation mulching. Filter material shall be provided below the pitching where ever embankment is exposed to water bodies.
  - (j) W- Beam crash barrier shall be provided on sections of the road
    - i) sharp curves having radius less than 300m
  - (k) All culverts shall be replaced by box culverts.
  - (l) Reinforced Earth/RCC Retaining Wall type shall be liberally provided through areas for high fill/embankment with aesthetically pleasing appearance. These shall be of varying height constructed of several sections, located mainly between main line and where land constraint exists. Design life of reinforcing elements for earth retaining structures shall be 100 years minimum.
  - (m) Riprap protection to be provided at the valley side on curves as special safety features.
  - (n) All road signs shall be with retro-reflective sheet of high intensity grade conforming to ASTM D-4957-01/ (type VIII and type IX) and as per clause 801 of MoRTH specifications. The retro reflective sheet with engineering grade shall not be used and instead micro-prismatic shall be used.