# Schedules

# Contents

**SCHEDULE - A**
(See Clauses 2.1 and 8.1)

# The Site

## 1. The Site

1.1 Site of the Single-lane Project Highway shall include the land, buildings, structure and road works as described in Annex-I of this Schedule –A.

1.2 The dates of handing over Right of Way to the Contractor are specified in the Annex-II of this Schedule-A.

1.3 An inventory of the Site including the land, buildings, structures, road works, trees and any other immovable property on, or attached to, the Site shall be prepared jointly by the Authority Representative and the Contractor, and such inventory shall form part of the memorandum referred to in Clause 8.2.1 of this Agreement.

1.4 The alignment plans of the Project Highway are specified in Annex-III. In the case of sections where no modification in the existing alignment of the Project Highway is contemplated, the alignment plan has not been provided. Alignment plans have only been given for sections where the existing alignment is proposed to be upgraded. The proposed profile of the Project Highways shall be followed by the contractor with minimum FRL as indicated in the alignment plan. The contractor, however, has to improve/upgrade the Road Profile as indicated in Annexure-III based on site/design requirement.

1.5 The status of the environment clearances obtained or awaited is given in Annex - IV.

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## Annexure – I

(Schedule-A)

## Site

**Note:** Through suitable drawings and description in words, the land, buildings, structures and road works comprising the Site are specified briefly but precisely in this Annex-I. All the chainages/location referred to in Annex-I to Schedule A existing chainages.

### 1. Site

The Site of the Single Lane (3.50 m Carriageway) Project Highway comprises the section of National Highway – 51 commencing from km 85.000 to 95.000 & km 101.000 to km 145.000 i.e. from Tura to Dalu in the state of Meghalaya. The land, carriageway and structures comprising the Site are described below.

### 2. Land

The Site of the Project Highway comprises the land. Already in possession as described below:

| S. No. | Chainage (km) | | ROW (m) |
|---|---|---|---|
| | From | To | |
| 1 | 85+000 | 95+000 | Varying from 15 m to 21 m |
| 2 | 101+000 | 145+000 | |

### 3. Carriageway

The present carriageway of the Project Highway is single lane. The average pavement width in the entire stretch of project road is 3 to 4 m. The type of the existing pavement is flexible.

### 4. Major Bridges

The Site includes the following Major Bridges:

| S. No. | Existing Chainage (km) | Type of Structure | | | No. of Spans with span length (m) | Width (m) |
|---|---|---|---|---|---|---|
| | | Foundation | Sub-Structure | Super-Structure | | |
| 1 | 86+305 | Open | Wall Type | RCC Girder | 3x22 | 10.0 |

### 5. Road over-bridges (ROB)/ Road under-bridges (RUB):

The Site includes the following ROB (road over railway line)/RUB (road under railway line):

| S.No. | Existing Chainage (km) | Type of Structure | | No. of Spans with span length (m) | Width (m) | ROB/ RUB |
|---|---|---|---|---|---|---|
| | | Foundation | Super Structure | | | |
| NIL | | | | | | |

## 6. Grade separators

The Site includes the following grade separators:

| S. No | Existing Chainage (km) | Type of Structure | | No. of Spans with span length (m) | Width (m) |
|---|---|---|---|---|---|
| | | Foundation | Superstructure | | |
| NIL | | | | | |

## 7. Minor Bridges

The Site includes the following minor bridges

| S. No. | Existing Chainage (km) | Type of Structure | | | No. of Spans with span length (c/c of exp gap) | Total Width (m) |
|---|---|---|---|---|---|---|
| | | Foundation | Sub-Structure | Super-Structure | | |
| 1 | 90+380 | Open | Wall Type | RCC Girder | 1x12.75 | 8.5 |
| 2 | 91+740 | Open | Wall Type | RCC Slab | 1x8.75 | 11 |
| 3 | 93+070 | Open | Wall Type | RCC Girder | 1x32.5 | 11 |
| 4 | 93+150 | Open | Wall Type | RCC Girder | 1x17 | 11 |
| 5 | 103+540 | Open | Wall Type | RCC Slab | 1x10.37 | 8.5 |
| 6 | 107+870 | Open | Wall Type | RCC Girder | 1x24.75 | 8.5 |
| 7 | 138+668 | Open | Wall Type | RCC Girder | 1x25.30 | 8.5 |
| 8 | 139+505 | Open | Wall Type | RCC Girder | 2x9+1x17.5 | 8.5 |
| 9 | 142+363 | Open | Wall Type | RCC Slab | 1x6 | 4.9 |
| 10 | 142+710 | Open | Wall Type | RCC Slab | 3x9.75 | 8.5 |
| 11 | 143+620 | Open | Wall Type | RCC Slab | 1x7.7 | 8.5 |

## 8. Railway level crossings

The Site includes the following level crossings:

| S. No. | Location (km) | Remarks |
|---|---|---|
| NIL | | |

## 9. Culverts

The Site has the following culverts:

| S. No. | Existing Chainage | Type of Culvert | Span /Opening with span length (m) /diameter (mm) | Existing Width of Culvert | Remarks |
|---|---|---|---|---|---|
| 1 | 85+955 | NP - 2 HPC | 1 x 1.00 Φ | 7.50 | |
| 2 | 86+764 | NP - 2 Pipe | 1 x 1.00 Φ | 10.00 | |
| 3 | 87+077 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 4 | 87+469 | RCC Slab | 3.00 x 1.50 | 5.70 | |
| 5 | 87+839 | NP - 2 Pipe | 1 x 1.00 Φ | 7.50 | |
| 6 | 88+028 | RCC Slab(3.6 m) + NP-2 Pipe(2.5 m) | 1.00 x 1.30 | 6.10 | |
| 7 | 88+099 | RCC Slab | 1.00 x 1.00 | 5.00 | |
| 8 | 88+137 | RCC Slab | 1.00 x 1.00 | 5.00 | |
| 9 | 88+231 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 10 | 88+311 | NP - 2 Pipe | 1 x 1.00 Φ | 10.00 | |
| 11 | 88+737 | RCC Slab | 2 m x 1 m | 10.90 | |
| 12 | 88+793 | RCC Slab | 2.10 x 2.00 | 6.30 | |
| 13 | 88+860 | RCC Slab | 2.50 x 2.50 | 8 | |
| 14 | 89+510 | Dry Stone Slab (RCC Slab) | 0.7 x 1.00 | 9.30 | |
| 15 | 90+012 | NP - 3 HPC | 1 x 1.00 Φ | 10.00 | |
| 16 | 90+044 | RCC Slab | 0.70 x 0.70 | 5.40 | |
| 17 | 90+255 | NP - 2 Pipe | 1 x 0.90 Φ | 10.00 | |
| 18 | 90+506 | NP - 3 Pipe | 1 x 1.00 Φ | 8.75 | |
| 19 | 90+715 | Dry Stone Slab | 0.60 x 0.70 | 7.00 | |
| 20 | 90+886 | Dry Stone Slab (RCC Slab) | 0.95 x 1.20 | 8.50 | |
| 21 | 91+082 | NP - 3 Pipe (2 Rows) | 2 x 1.00 Φ | 10.00 | |
| 22 | 91+284 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 23 | 91+652 | RCC Slab & S.M. Face Wall | 1.00 x 2.50 | 7.00 | |
| 24 | 92+465 | NP - 3 Pipe (2 Rows) | 2 x 1.00 Φ | 10.00 | |
| 25 | 92+925 | RCC Slab & S.M. Face Wall | 0.60 x 0.60 | 7.80 | |
| 26 | 93+258 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 27 | 93+629 | NP - 2 Pipe | 1 x 0.90 Φ | 8.75 | |
| 28 | 93+748 | NP - 2 Pipe | 1 x 0.90 Φ | 10.00 | |
| 29 | 93+748 | NP - 2 Pipe | 1 x 0.90 Φ | 10.00 | |
| 30 | 94+070 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 31 | 94+145 | Dry Stone Slab | 0.60 x 1.00 | 7.40 | |
| 32 | 94+386 | NP - 3 Pipe | 1 x 1.00 Φ | 6.25 | |
| 33 | 94+520 | RCC slab over dry wall | 0.90 x 1.00 | 14.70 | |
| 34 | 101+127 | NP - 2 Pipe (2 ROWS) | 2 x 0.90 Φ | 10.00 | |
| 35 | 101+250 | Dry Stone Slab | 0.70 x 0.70 | 5.85 | |
| 36 | 101+376 | RCC Slab Over Stone | 0.90 x 1.00 | 8.70 | |
| 37 | 101+529 | NP - 2 Pipe | 1 x 0.90 Φ | 8.35 | |
| 38 | 101+666 | NP - 2 Pipe | 1 x 0.90 Φ | 8.30 | |
| 39 | 102+150 | Dry Stone Slab | 0.60 x 0.60 | 6.50 | |
| 40 | 102+250 | NP - 2 Pipe | 1 x 1.00 Φ | 11.25 | |

| S. No. | Existing Chainage | Type of Culvert | Span /Opening with span length (m) /diameter (mm) | Existing Width of Culvert | Remarks |
|---|---|---|---|---|---|
| 41 | 102+415 | RCC Slab (1 ROW) + | 2 x 1.00 Φ, | 10.00 | |
| 42 | 102+521 | RCC Slab | 0.60 x 2.50 | 7.25 | |
| 43 | 102+678 | RCC Slab | 0.60 x 2.00 | 6.45 | |
| 44 | 102+773 | Dry Stone Slab | 0.60 x 0.65 | 6.20 | |
| 45 | 103+090 | Dry Stone Slab | 0.70 x 0.80 | 10.50 | |
| 46 | 103+150 | RCC Slab | 1.40 x 2.50 | 9.80 | |
| 47 | 103+310 | NP - 2 Pipe | 1 x 0.60 Φ | 7.50 | |
| 48 | 103+395 | Dry Stone Slab | 0.75 x 0.70 | 9.20 | |
| 49 | 103+503 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 50 | 103+590 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 51 | 103+620 | Dry Stone Slab | 0.60 x 1.20 | 8.50 | |
| 52 | 103+660 | Dry Stone Slab | 0.75 x 1.00 | 7.40 | |
| 53 | 103+836 | Dry Stone Slab | 0.75 x 0.75 | 6.90 | |
| 54 | 103+900 | Dry Stone Slab | 0.75 x 0.75 | 8.50 | |
| 55 | 104+050 | NP - 3 Pipe (2 ROWS) | 2 x 1.00 Φ | 11.25 | |
| 56 | 104+184 | Box Type | 0.80 x 1.80 | 7.50 | |
| 57 | 104+276 | Box Type | 0.70 x 1.60 | 6.70 | |
| 58 | 104+314 | NP - 3 Pipe | 1 x 1.00 Φ | 5.00 | |
| 59 | 104+347 | RCC Slab over stone masonry | 0.60 x 0.60 | 6.25 | |
| 60 | 104+425 | Box Type | 0.65 x 1.80 | 6.00 | |
| 61 | 105+700 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 62 | 104+838 | Dry Stone Slab | 0.60 x 1.70 | 7.70 | |
| 63 | 105+153 | RCC Slab | 0.80 x 0.90 | 6.50 | |
| 64 | 105+576 | RCC Slab | 0.70 x 0.60 | 6.30 | |
| 65 | 105+806 | RCC Slab | 0.40 x 1.70 | 6.80 | |
| 66 | 105+972 | RCC Slab | 0.65 x 1.70 | 6.50 | |
| 67 | 106+016 | Dry Stone Slab | 0.80 x 0.75 | 8.50 | |
| 68 | 106+167 | Dry Stone Slab | 0.60 x 0.80 | 5.00 | |
| 69 | 107+300 | Dry Stone Slab | 0.60 x 0.80 | 7.00 | |
| 70 | 106+383 | NP - 2 Pipe | 1 x 0.60 Φ | 7.00 | |
| 71 | 106+498 | RCC Slab | 1.50 x 1.60 | 6.40 | |
| 72 | 106+650 | Dry Stone Slab | 1.80 x 0.70 | 6.30 | |
| 73 | 106+750 | RCC Slab | 1.20 x 0.60 | 6.20 | |
| 74 | 107+014 | RCC Slab | 1.30 x 0.70 | 5.70 | |
| 75 | 107+250 | NP - 3 Pipe | 2 x 1.00 Φ | 10.00 | |
| 76 | 107+362 | NP - 3 Pipe (Ext. RCC Slab | 1 x 1.00 Φ | 7.50 | |
| 77 | 108+002 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 78 | 108+165 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 79 | 108+241 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 80 | 108+381 | Dry Stone Slab | 0.50 x 0.60 | 6.40 | |
| 81 | 108+481 | Dry Stone Slab | 0.60 x 0.70 | 6.80 | |

| S. No. | Existing Chainage | Type of Culvert | Span /Opening with span length (m) /diameter (mm) | Existing Width of Culvert | Remarks |
|---|---|---|---|---|---|
| 82 | 108+529 | Half NP - 2 Pipe, Half Dry | 1 x 0.60 Φ, | 6.00 | |
| 83 | 108+700 | NP - 3 Pipe(2 Rows) | 2 x 1.00 Φ | 10.00 | |
| 84 | 108+855 | NP - 3 Pipe(2 Rows) | 2 x 1.00 Φ | 10.00 | |
| 85 | 109+010 | RCC Slab | 0.90 x 1.40 | 4.80 | |
| 86 | 109+272 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 87 | 109+553 | Dry Stone Slab | 1.20 x 0.50 | 4.80 | |
| 88 | 110+310 | RCC Slab over SM Wall | 0.40 x 0.80 | 6.10 | |
| 89 | 111+660 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 90 | 113+059 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 91 | 113+505 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 92 | 113+515 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 93 | 114+050 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 94 | 114+121 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 95 | 114+270 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 96 | 114+405 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 97 | 114+660 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 98 | 114+725 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 99 | 114+781 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 100 | 114+859 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 101 | 115+094 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 102 | 115+154 | NP - 3 Pipe | 2 x 1.00 Φ | 11.25 | |
| 103 | 115+367 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 104 | 115+493 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 105 | 116+225 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 106 | 116+302 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 107 | 116+408 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 108 | 116+443 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 109 | 116+584 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 110 | 116+701 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 111 | 116+741 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 112 | 117+238 | NP - 3 Pipe | 2 x 1.00 Φ | 10.00 | |
| 113 | 117+435 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 114 | 117+582 | NP - 3 Pipe | 2 x 1.00 Φ | 11.25 | |
| 115 | 117+645 | NP - 3 Pipe | 2 x 1.00 Φ | 10.00 | |
| 116 | 117+771 | NP - 3 Pipe | 2 x 1.00 Φ | 10.00 | |
| 117 | 117+868 | NP - 3 Pipe | 2 x 1.00 Φ | 10.00 | |
| 118 | 117+970 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 119 | 118+068 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 120 | 118+130 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 121 | 118+232 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 122 | 118+264 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |

| S. No. | Existing Chainage | Type of Culvert | Span /Opening with span length (m) /diameter (mm) | Existing Width of Culvert | Remarks |
|---|---|---|---|---|---|
| 123 | 118+309 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 124 | 118+329 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 125 | 118+392 | NP - 3 Pipe | 2 x 1.00 Φ | 10.00 | |
| 126 | 118+492 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 127 | 118+515 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 128 | 118+572 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 129 | 118+629 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 130 | 118+739 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 131 | 118+836 | NP - 3 Pipe | 2 x 1.00 Φ | 10.00 | |
| 132 | 119+289 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 133 | 119+358 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 134 | 119+473 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 135 | 119+710 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 136 | 119+852 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 137 | 120+511 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 138 | 120+663 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 139 | 120+810 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 140 | 121+831 | RCC Slab over SM wall | 0.90 x 1.80 | 5.30 | |
| 141 | 121+930 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 142 | 122+080 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 143 | 122+270 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 144 | 122+419 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 145 | 123+343 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 146 | 123+425 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 147 | 123+471 | RCC Slab over SM wall | 1.00 x 1.00 | 7.30 | |
| 148 | 123+705 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 149 | 123+769 | Stone Slabe over dry wall | 0.80 x 1.00 | 7.70 | |
| 150 | 124+058 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 151 | 124+159 | NP - 2 Pipe | 1 x 1.00 Φ | 10.00 | |
| 152 | 124+517 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 153 | 124+322 | RCC Slab over SM wall | 1.00 x 1.00 | 10.00 | |
| 154 | 124+557 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 155 | 124+652 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 156 | 124+678 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 157 | 124+761 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 158 | 124+901 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 159 | 125+024 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 160 | 125+121 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 161 | 125+182 | NP - 3 Pipe | 2 x 1.00 Φ | 10.00 | |
| 162 | 125+215 | NP - 3 Pipe | 2 x 1.00 Φ | 10.00 | |
| 163 | 125+307 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |

| S. No. | Existing Chainage | Type of Culvert | Span /Opening with span length (m) /diameter (mm) | Existing Width of Culvert | Remarks |
|---|---|---|---|---|---|
| 164 | 125+390 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 165 | 125+458 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 166 | 125+563 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 167 | 125+860 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 168 | 126+099 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 169 | 126+161 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 170 | 126+222 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 171 | 126+305 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 172 | 126+371 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 173 | 126+462 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 174 | 126+506 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 175 | 126+582 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 176 | 126+669 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 177 | 126+733 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 178 | 126+837 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 179 | 127+129 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 180 | 127+315 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 181 | 127+514 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 182 | 127+802 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 183 | 127+921 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 184 | 128+068 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 185 | 128+109 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 186 | 128+310 | NP - 3 Pipe | 2 x 1.00 Φ | 11.25 | |
| 187 | 128+463 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 188 | 128+595 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 189 | 128+711 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 190 | 128+802 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 191 | 128+950 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 192 | 129+112 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 193 | 129+217 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 194 | 129+506 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 195 | 129+718 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 196 | 129+884 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 197 | 129+944 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 198 | 130+303 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 199 | 130+427 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 200 | 130+617 | RCC Slab | 1.20 x 1.00 | 6.20 | |
| 201 | 131+610 | RCC Slab over SM wall | 0.6 x 1.00 | 7.00 | |
| 202 | 131+899 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 203 | 132+273 | RCC Slab over SM wall | 0.60 x 1.00 | 7.80 | |
| 204 | 132+922 | RCC Slab over SM wall | 0.90 x 0.90 | 5.70 | |

| S. No. | Existing Chainage | Type of Culvert | Span /Opening with span length (m) /diameter (mm) | Existing Width of Culvert | Remarks |
|---|---|---|---|---|---|
| 205 | 133+254 | NP - 3 Pipe | 1 x 1.00 Φ | 10.00 | |
| 206 | 133+450 | RCC Slab over dry stone | 1.00 x 1.00 | 7.20 | |
| 207 | 133+690 | RCC Slab over dry stone | 1.00 x 1.00 | 7.60 | |
| 208 | 135+235 | RCC Slab | 1.00 x 1.00 | 6.00 | |
| 209 | 137+064 | Stone Slab over dry wall | 0.45 x 1.00 | 5.00 | |
| 210 | 137+493 | NP - 2 Pipe | 1 x 0.90 Φ | 10.00 | |
| 211 | 137+696 | RCC Slab | 1.9 x 1.00 | 8.00 | |
| 212 | 137+742 | NP - 2 Pipe | 0.60 m Φ | 7.50 | |
| 213 | 138+174 | RCC Slab | 1.00 x 1.00 | 6.60 | |
| 214 | 138+498 | NP - 2 Pipe | 1 x 1.00 Φ | 11.25 | |
| 215 | 138+782 | RCC Slab | 0.60 x 0.60 | 6.15 | |
| 216 | 139+010 | RCC Slab | 0.40 x 0.80 | 5.40 | |
| 217 | 140+200 | NP - 2 Pipe | 1 x 1.00 Φ | 10.00 | |
| 218 | 139+643 | RCC Slab | 0.90 x 0.90 | 6.20 | |
| 219 | 139+820 | NP - 2 Pipe | 1 x 0.60 Φ | 6.25 | |
| 220 | 139+898 | Stone Slab over dry wall | 0.60 x 0.80 | 9.30 | |
| 221 | 140+414 | NP - 2 Pipe | 1 x 0.60 Φ | 7.50 | |
| 222 | 140+781 | RCC Slab | 1.20 x 1.60 | 8.50 | |
| 223 | 141+044 | NP - 3 Pipe | 2 x 1.00 Φ | 10.00 | |
| 224 | 141+119 | NP - 3 Pipe | 1 x 1.00 Φ | 11.25 | |
| 225 | 141+587 | RCC Slab | 2.50 x 2.50 | 12.20 | |
| 226 | 141+886 | RCC Slab | 2.50 x 1.50 | 12.20 | |
| 227 | 144+200 | NP - 3 Pipe | 2 x 1.00 Φ | 12.00 | |

## 10. Bus bays/Bus Shelters

The details of bus shelters on the Site are as follows:

| S. No. | Chainage (km) | Length (m) | Left Hand Side | Right Hand Side |
|---|---|---|---|---|
| NIL | | | | |

## 11. Truck Lay byes

The details of truck lay byes are as follows:

| S. No. | Chainage (km) | Length (m) | Left Hand Side | Right Hand Side |
|---|---|---|---|---|
| NIL | | | | |

## 12. Road side drains

The details of the roadside drains are as follows:

| S. No. | Location | | Type | |
|---|---|---|---|---|
| | From km | To km | Masonry/cc (Pucca) | Earthen (Kutcha) |
| 1 | 85+000 | 95+000 | - | Yes |
| 2 | 101+000 | 145+000 | - | Yes |

## 13. Major junctions

The details of major junctions are as follows:

| S. No | Chainage (km) | At Grade | Side | Type | Remarks |
|---|---|---|---|---|---|
| | Existing Chainage | | | | |
| 1 | 92+925 | At Grade | RHS | Y | EDAN BARI |
| 2 | 109+306 | At Grade | RHS | Y | TO TURA BY-PASS |

**(NH: National Highway, SH: State Highway, MDR: Major District Road.)**

## 14. Minor junctions

The details of the minor junctions (all at grade) are as follows:

| S. No. | Location of Intersection | Type of Intersection | Other features | |
|---|---|---|---|---|
| | | | LHS | RHS |
| 1 | 85+357 | T | Police HQ Ggoeragre | |
| 2 | 85+838 | T | | To Babadam |
| 3 | 86+033 | T | To Champarea | |
| 4 | 86+863 | Y | | To Ganol |
| 5 | 88+136 | Y | | To Nehu Campus |
| 6 | 88+360 | Y | B.T. Road | |
| 7 | 89+680 | Y | | Rongan Hiran |
| 8 | 92+184 | T | | Bosco Mount |
| 9 | 92+710 | T | | Don Bosco Sec.School |
| 10 | 92+790 | Y | DAP.of Agriculture Rongkhon | |
| 11 | 94+620 | Y | | Edan Bari |
| 12 | 94+862 | T | | Tura Public School |
| 13 | 101+360 | T | To ganrak | |
| 14 | 104+286 | Y | | To Sangsanggri,Tura |
| 15 | 104+611 | Y | To Rongpinggre E.G.S.I.P. | |
| 16 | 104+631 | Y | BT Road | |
| 17 | 107+948 | T | | To Rongongri |
| 18 | 109+912 | T | | To The Rubber Board |
| 19 | 110+392 | T | | To Tura By-pass |
| 20 | 111+905 | T | ToJjenggitc | |
| 21 | 112+677 | Y | To Bolchugri | |
| 22 | 113+367 | Y | | To Purakashya |
| 23 | 114+010 | Y | | To Chikwatgri |
| 24 | 114+548 | Y | To Rongrang Gri | |
| 25 | 116+127 | Y | | BT road |

| S. No. | Location of Intersection | Type of Intersection | Other features | |
|---|---|---|---|---|
| | | | LHS | RHS |
| 26 | 120+624 | Y | | To Rongdilbanggre |
| 27 | 120+687 | Y | To Chokpot | |
| 28 | 124+201 | T | | To Wakkalnangri |
| 29 | 126+059 | T | | To Wakkalnangri |
| 30 | 128+255 | Y | To Among Para | |
| 31 | 129+767 | Y | To Deku bazar | |
| 32 | 134+379 | Y | | To Moropgre |
| 33 | 135+082 | T | | To Morigre |
| 34 | 135+247 | Y | | To Rengsipara |
| 35 | 140+023 | T | To Rendapara | |
| 36 | 140+643 | Y | | To Rendapara |
| 37 | 141+844 | T | To Bagamara | |
| 38 | 142+861 | T | To Baghmara | |
| 39 | 143+491 | Y | | To Magupara |
| 40 | 144+124 | Y | | To Purakhasia |
| 41 | 144+344 | Y | BT road | |
| 42 | 144+582 | Y | | To Purakhasia |
| 43 | 144+582 | T | To Koinabhui Road | |

## 15. Bypasses

The details of the existing road sections proposed to be bypassed are as follows:

| S. No | Name of bypass (Town) | Chainage (Km) | | Length (Km) |
|---|---|---|---|---|
| | | From | To | |
| NIL | | | | |

**16. Other Structures :** NIL

## 17. Design Chainages corresponding to Existing references

| S.No. | Existing Chainage (Km) | Proposed Chainage (Km) |
|---|---|---|
| 1 | 85+000 | 85+000 |
| 2 | 86+000 | 85+977 |
| 3 | 87+000 | 86+747 |
| 4 | 88+000 | 87+749 |
| 5 | 89+000 | 88+687 |
| 6 | 90+000 | 89+683 |
| 7 | 91+000 | 90+646 |
| 8 | 92+000 | 91+646 |
| 9 | 93+000 | 92+375 |
| 10 | 94+000 | 93+350 |
| 11 | 95+000 | 94+268 |
| 12 | 101+000 | 101+000 |
| 13 | 102+000 | 101+921 |
| 14 | 103+000 | 102+719 |
| 15 | 104+000 | 103+634 |
| 16 | 105+000 | 104+634 |
| 17 | 106+000 | 105+616 |
| 18 | 107+000 | 106+565 |
| 19 | 108+000 | 107+489 |
| 20 | 109+000 | 108+449 |
| 21 | 110+000 | 109+428 |
| 22 | 111+000 | 110+431 |
| 23 | 112+000 | 111+395 |
| 24 | 113+000 | 112+378 |
| 25 | 114+000 | 113+300 |
| 26 | 115+000 | 114+165 |
| 27 | 116+000 | 115+123 |
| 28 | 117+000 | 116+124 |
| 29 | 118+000 | 117+083 |
| 30 | 119+000 | 118+069 |
| 31 | 120+000 | 119+077 |
| 32 | 121+000 | 119+968 |
| 33 | 122+000 | 120+866 |
| 34 | 123+000 | 121+857 |
| 35 | 124+000 | 122+842 |
| 36 | 125+000 | 123+877 |
| 37 | 126+000 | 124+821 |
| 38 | 127+000 | 125+680 |

| S.No. | Existing Chainage (Km) | Proposed Chainage (Km) |
|---|---|---|
| 39 | 128+000 | 126+602 |
| 40 | 129+000 | 127+568 |
| 41 | 130+000 | 128+550 |
| 42 | 131+000 | 129+506 |
| 43 | 132+000 | 130+506 |
| 44 | 133+000 | 131+506 |
| 45 | 134+000 | 132+461 |
| 46 | 135+000 | 133+453 |
| 47 | 136+000 | 134+512 |
| 48 | 137+000 | 135+509 |
| 49 | 138+000 | 136+459 |
| 50 | 139+000 | 137+350 |
| 51 | 140+000 | 138+329 |
| 52 | 141+000 | 139+346 |
| 53 | 142+000 | 140+343 |
| 54 | 143+000 | 141+299 |
| 55 | 144+000 | 142+326 |
| 56 | 145+000 | 143+268 |

**Annex - II**

(Schedule-A)

## Dates for providing Right of Way

The dates on which the Authority shall provide Right of Way to the Contractor on different stretches of the Site are stated below:

| S.No. | Design Chainage (km) | | Length (km) | Width (m) | Date of Providing ROW |
|---|---|---|---|---|---|
| | From | To | | | |
| 1 | 85+000 | 94+268 | 51.536 | 20.00 to 30.00 | Minimum 90% on Appointed date and Remaining within 150 days of Appointed date |
| | 101+000 | 143+268 | | | |

**Annex-III**

(Schedule-A)

**Alignment Plans**

The existing alignment of the Project Highway shall be modified in the following sections as per the alignment plan indicated below:

The alignment plan of the Project Highway is available on CPP Portal i.e. https://eprocure.gov.in/cppp/ and NHIDCL website i.e. https://nhidcl.com/ .

**Annex - IV**

(Schedule-A)

**Environment Clearances**

The project highway does not require environment clearance as per MoEF circular dated 22.08.2013.

The muck dumping sites in forest area stand identified and freezed by forest department to be abided by agency during dumping of muck as stated in Schedule F.

# Annex-V

## Index Map of Project Highways

**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 Project Highway as described in this Schedule-B and in Schedule-C.

**2. Rehabilitation and Upgradation**

Widening and upgradation shall include Two-Laning with Paved shoulder 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 with Paved Shoulder

## 1. WIDENING OF THE EXISTING HIGHWAY

**1.1** 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/mountainous/steep terrain to the extent land is available.

## 1.2 WIDTH OF CARRIAGEWAY

**1.2.1** Two-Lanning with paved shoulders shall be undertaken. The paved carriageway shall be a minimum of 7 m wide in accordance with the typical cross sections of the Project Highway in paragraphs 2.11 of Schedule –B and Schedule –I: Drawings. Additional widths for widening at horizontal curve shall be as per the requirement of the design criteria.

**1.2.2** Except as otherwise provided in this Agreement, the width of carriageway paved shoulders and cross-sectional features shall conform to paragraph 1.2.1 above

# 2. GEOMETRIC DESIGN AND GENERAL FEATURES

## 2.1 General

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

**Table. Summary of Geometric Design Criteria for Highway**

| | Design Elements | | Type/Value | Remarks |
|---|---|---|---|---|
| 1 | Highway Classification | | National Highway | |
| 2 | Terrain Classification | | Steep | |
| 3 | Design Speed (km/h) | | | |
| | | Ruling (km/h) | 40 | |
| | | Minimum (km/h) | 30 | |
| 4 | Cross-Sectional Elements | Basic Lane Width (m) | 3.5 | |
| | | Number of Lanes | 2 | |
| | | Formation Width (m) | 12.0 | |
| | | Carriageway Width (m) | 2 x 3.5 | |
| | | Outer Shoulder Paved Width (m) | 2 x 1.5 | **Paved shoulders varying as per TCS** |
| | | Outer Shoulder Earthen Width (m) | 2 x 1.0 | |
| | | Crossfall of Roadway (%) | 2.5 | |
| | | Slope of Earthworks | | |
| | | Fill | V : H = 1:1.75 | |
| | | Cut(soil) | V : H = 1:1.2 | Varies |
| | | Cut (rock) | V : H = 1:0.2-0.5 | Varies |
| 5 | Sight Dist. | Stopping Sight Distance, SSD (m) | 30 (45) | () 40km/h |
| | | Intermediate Sight Distance, ISD (m) | 60 (90) | () 40km/h |
| | | Overtaking Sight Distance, OSD (m) | (165) | () 40km/h |
| 6 | Horizontal Alignment | Horizontal Curve | | |
| | | Absolute Minimum Radius of Horizontal Curve (m) | 25 | |
| | | Ruling Minimum Radius of Horizontal Curve (m) | 50 | |
| | | Widening of Carriageway on Horizontal Curves | | |
| | | Widening for Absolute Minimum Radius (20m-40m) | 1.5 | |
| | | Widening for Ruling Minimum Radius (41m-60m) | 1.2 | |
| | | Widening for Radius (61m-100m) | 0.9 | |
| | | Widening for Radius (101m-300m) | 0.6 | |
| | | Superelevation (Se) | | |
| | | Maximum Se for Absolute Minimum Radius (%) | 7.0 | |
| | | Superelevation Runoff Rate | 1/60 | |
| | | Transition Curve | | |
| | | Minimum Length for Absolute Minimum Radius (m) | 30 | |
| | | Minimum Length for Ruling Minimum Radius (m) | 20 | |
| 7 | Vertical Alignment | Vertical Gradient | | |
| | | Ruling Gradient (%) | 6.0 | |
| | | Critical length of continuous Ruling Gradient (m) | 2000 | 120m rise in 2km for steep terrain |
| | | Limiting Gradient (%) | 7.0 | |
| | | Exceptional Gradient (%) | 8.0 | |
| | | Critical Length for Exceptional Gradient (m) | 100 | |
| | | Minimum Gradient for Drainage (%) | 0.5 | Cut sections with lined side drains |
| | | Vertical Curve | | |
| | | Minimum Length of Vertical Curve (m) | 15 | |
| | | Minimum Radius of Summit (Crest) Curve (m) | | |
| | | Absolute Minimum Radius (m) | 205 | From SSD |
| | | Minimum Radius (m) | 375 | From ISD |
| | | Desirable Minimum Radius (m) | 1500 | From OSD |
| | | Minimum Radius of Valley (Sag) Curve (m) | | |
| | | Absolute Minimum Radius (m) | 355 | |

**2.2 Design Speed**

The design speed shall be ruling speed of 40 km per hour and minimum speed of 30 km per hour as shown in Table of paragraph 2.1.

**2.3 Improvement of the existing road Geometries –**

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

**2.4 Right of Way**

The site of the project highway comprises the land as described in Annexure-II of Schedule-A

**2.5 Type of Shoulders**

(a) Paved shoulders shall be provided in accordance with the typical cross sections as per para 2.11

(c) Design and specifications of paved/earthen shoulders and granular material shall conform to the requirements specified in paragraphs 5.10 and 5.11 of the Manual.

**2.6 Lateral and vertical clearances at underpasses**

No underpass is proposed in the Project Highway.

**2.7 Lateral and vertical clearances at overpasses**

No overpass is proposed in the Project Highway.

**2.8 Service roads**

No service road is proposed in the Project Highway.

**2.9 Grade separated structures**

No grade separated structure is proposed in the Project Highway.

**2.10 Cattle and pedestrian under pass / over pass**

No cattle and pedestrian underpass is proposed in the Project Highway.

## 2.11 Typical cross-sections of the Project Highway

Indicative typical cross sections along with different types of cross-sections required to be developed in different segments of the project highway are indicative in figure 2.11 shown below. The project highway is to be developed with the typical cross-section best suited to the site requirement.

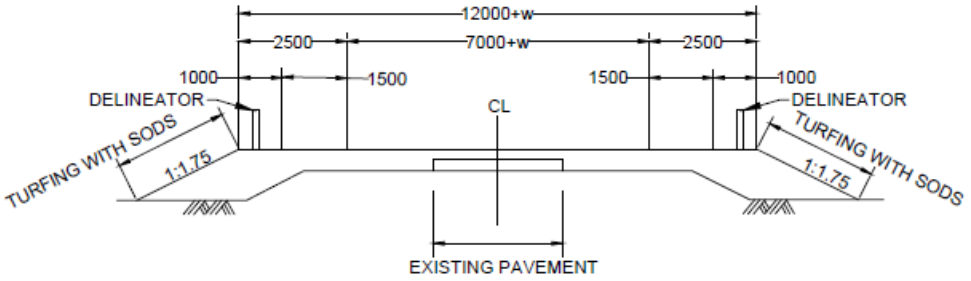



**Figure 2.11(1): Typical Cross Section – Type 1 (Plain and Rolling Terrain – Formation in Embankment)**

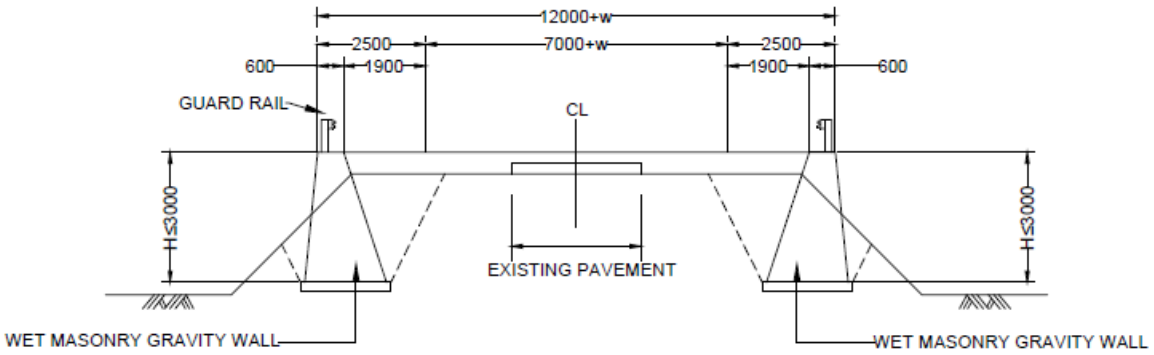



**Figure 2.11(2): Typical Cross Section – Type 2 (Plain and Rolling Terrain – Formation in Embankment)**

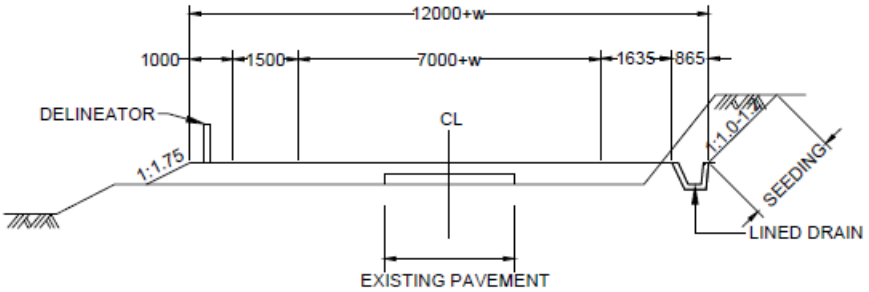



**Figure 2.11(3): Typical Cross Section – Type 3 (Formation in Cutting and Embankment)**

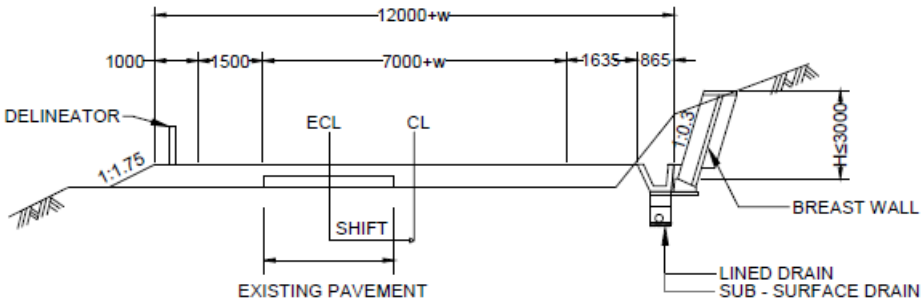



**Figure 2.11(4): Typical Cross Section – Type 4 (Mountainous and Steep Terrain)**

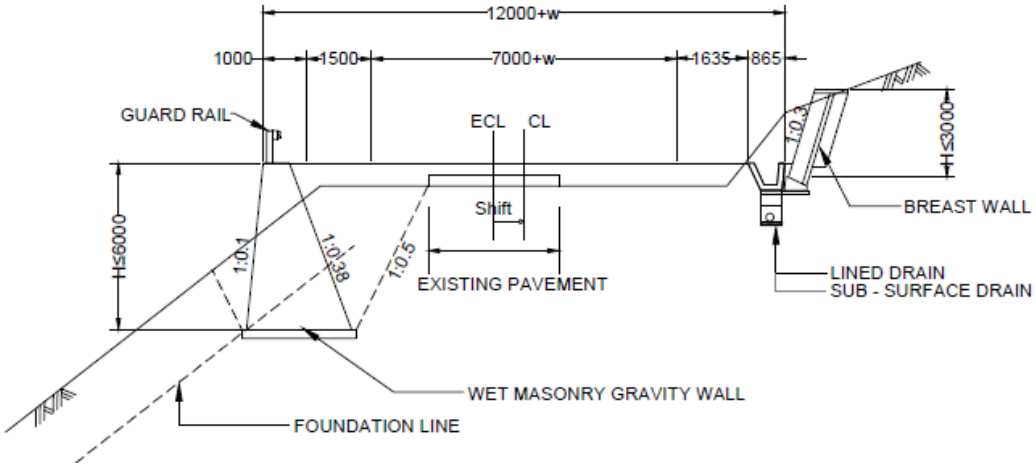



**Figure 2.11(5): Typical Cross Section – Type 5 (Mountainous and Steep Terrain)**

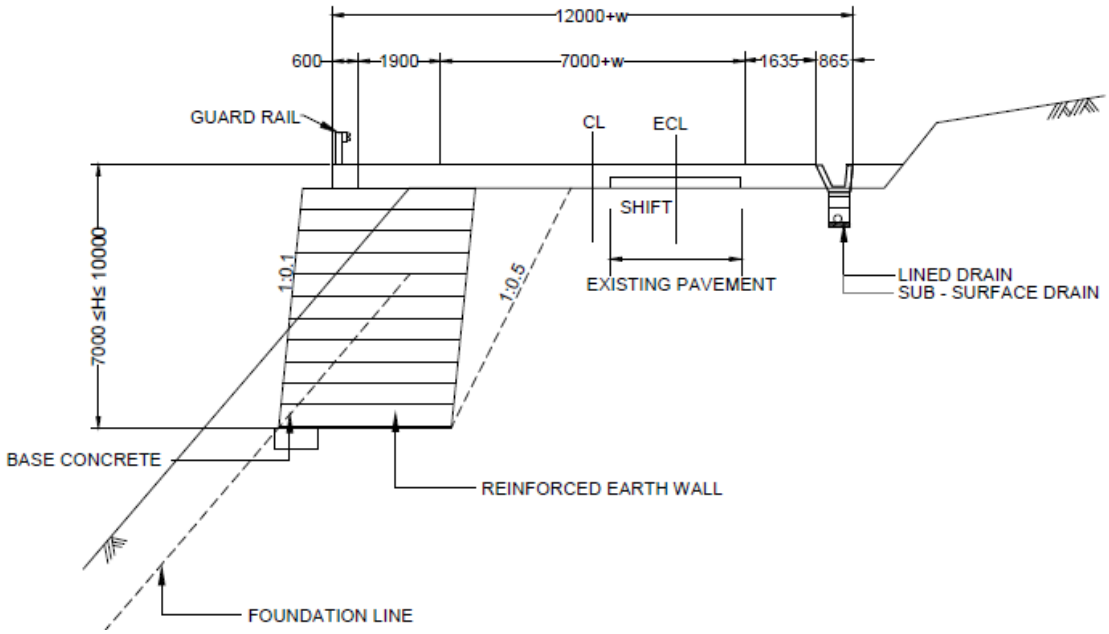



**Figure 2.11(6): Typical Cross Section – Type 6 (Mountainous and Steep Terrain)**

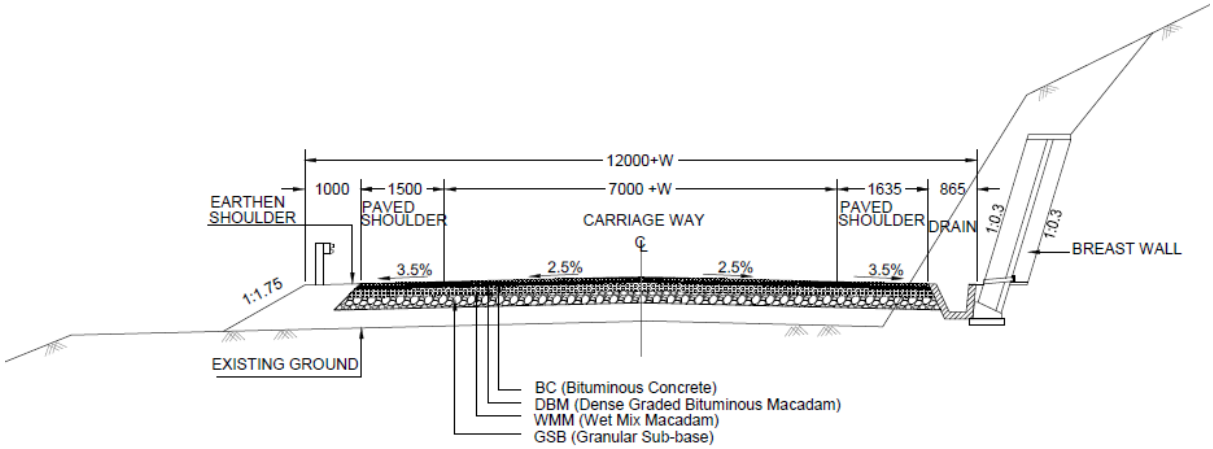



**Figure 2.11(7): Typical Cross Section – Pavement Structure in Widening Primarily to Hill Side**

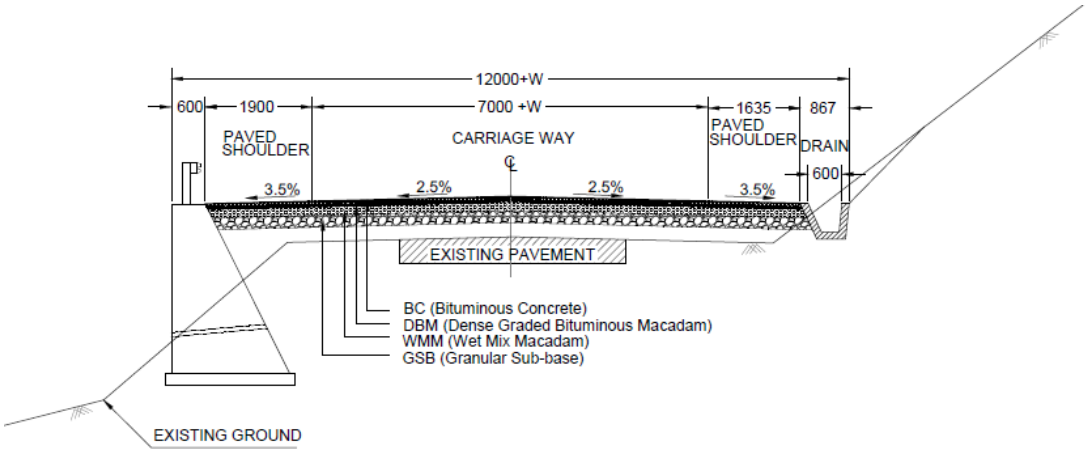



**Figure 2.11(8): Typical Cross Section – Pavement Structure in Widening Primarily to Valley Side**

## 3. INTERSECTIONS AND GRADE SEPARATORS

All intersections and grade separators shall be as per section 3 of the Manual. Existing intersections which are deficient shall be improved to the prescribed standards.

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

**a) At-grade intersections (Major Junctions)**

The location is as mentioned in paragraph 13 of Annexure-I of Schedule-A

**b) At-grade intersections (Minor Junctions)**

The location is as mentioned in paragraph 14 of Annexure-I of Schedule-A

Note : It is clarified that if any other junction is identified during development of the project in addition to those mentioned above shall also be improved with proper drainage facilities as per standards. It shall be covered within the scope of work.

### c) Grade separated intersection without ramps

| S. No. | Location | Salient features | Minimum length of viaduct to be provided | Road to be carried over/under the structures |
|---|---|---|---|---|
| NIL | | | | |

## 4. ROAD EMBANKMENT AND CUT SECTION

**4.1** 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.

**4.2** Raising of the existing road
The existing road shall be raised at the required locations as per proposed plan and profile.

**4.3** All of surplus cutting soils shall be transported and be disposed to the Spoil Banks in accordance with the Clause 3.1 of Schedule D (Specification and Standard for the Construction).

## 5. PAVEMENT DESIGN

**5.1** Pavement design shall be carried out in accordance with the IRC:37-2012.

### 5.2 Type of pavement

Flexible Pavement will be designed in accordance with the IRC:37-2012.

### 5.3 Design Requirements

Design requirement for the flexible pavement shall be in accordance with section 5 of the IRC: SP-73-2015,and the IRC: 37-2012 or the latest version of both.

### 5.3.1 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.

### 5.3.2 Design Traffic

The design traffic specified in the IRC: SP-73-2015 Section 5.4.1 (i) shall be applied,

### 5.3.3 Subgrade Soil

The requirements for the Subgrade's CBR specified in IRC: SP-73-2015,IRC: 37-2012 and MoRTH (Specification of Roads and Bridges) shall be satisfied.

### 5.4 Reconstruction of stretches

Reconstruction of stretches for matching the proposed plan & profile shall be taken up as per actual requirements.

## 6. ROADSIDE DRAINAGE

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

Subsurface drainage system shown in drawings shall be provided at below section:

| Design Chainage (Km) | | Length (m) |
|---|---|---|
| Start | End | |
| 115+340 | 124+840 | 9,500 |

Lined Drain of Trapezoidal Shape with 0.3 m bottom width and 0.6 m top width and 0.5 m height is to be provided shown in drawings along the project highway in section as shown in TCS. However the drain be provided as per site requirement.

## 7. DESIGN OF STRUCTURES

### 7.1 General

**7.1.1** All bridges, culverts and 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.

**7.1.2** Width of the carriageway of new structures of more than 60m length shall be as follows, if the carriageway width is different from 7.5m in the table below.

| S.No | Design Chainage (Km) | Width of Carriageway (m) and cross sectional features |
|---|---|---|
| NIL | | |

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

| S. No. | Design Chainage (Km) | Remarks |
|---|---|---|
| NIL | | |

**7.1.4** All bridges shall be high-level bridges.

**7.1.5** The structures shall be designed to carry utility services as per the requirement of site.

**7.1.6** Cross-section of the new culverts and bridges at deck level for the Project Highway shall conform to the typical cross-sections for the Project Highway.

## 7.2 Culverts

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

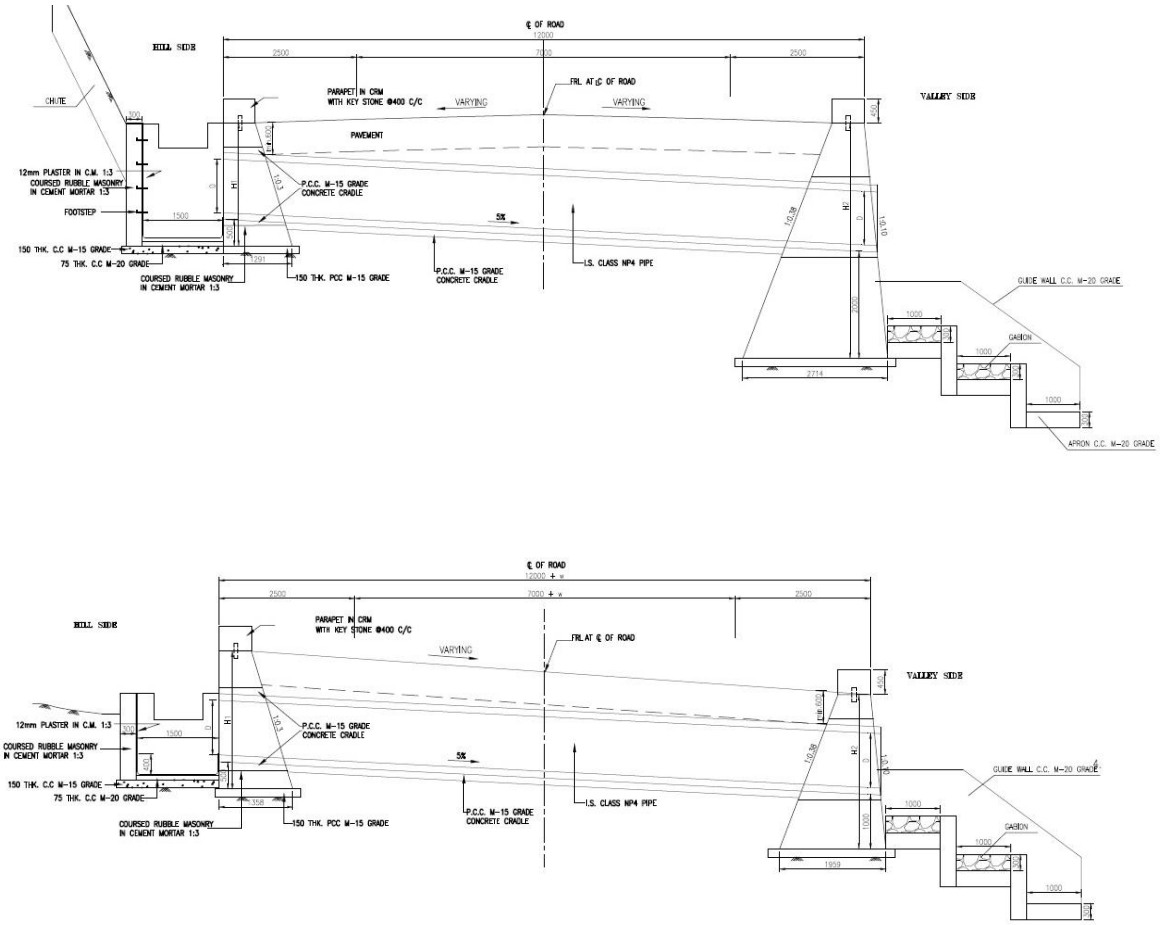
**7.2.2 Reconstruction of existing culverts**:

The existing culverts as shown in Table here after shall be removed and replaced by culvert newly constructed.

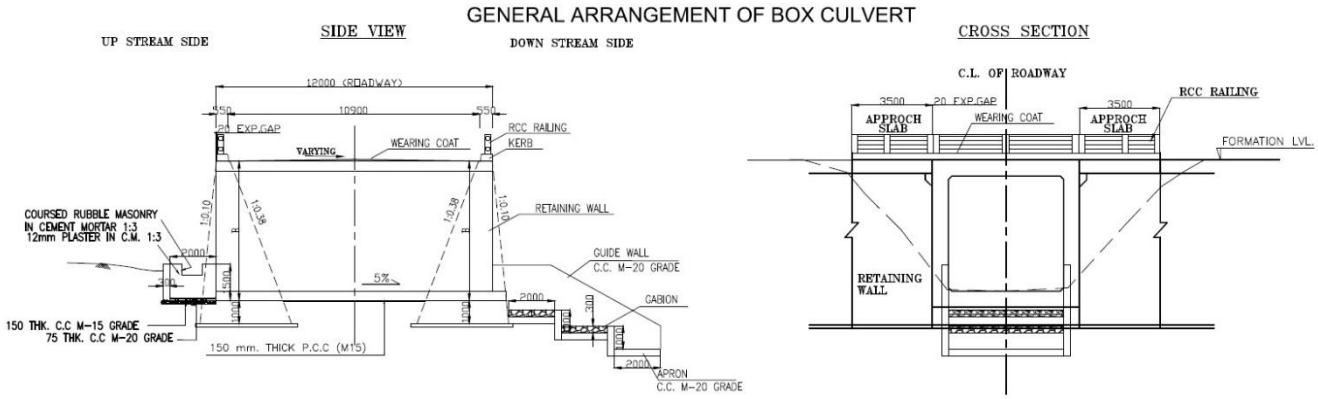
**7.2.3 .** ***Additional New Culverts***

Additional new culverts as shown in Table here shall be constructed

**Typical Cross Section for Pipe Culverts:**



## Typical Cross Section for Box Culverts:




Culverts Length = 12m to be confirmed by Detailed Design

| Sl. No. | Chainage (km) | Type / Opening of Culvert (m) | Remarks |
|---|---|---|---|
| 1 | 85+190 | Pipe culvert dia 1.2m | New |
| 2 | 85+410 | Pipe culvert dia 1.2m | New |
| 3 | 85+650 | Pipe culvert dia 1.2m | New |
| 4 | 85+820 | Pipe culvert dia 1.2m | New |
| 5 | 85+955 | Pipe culvert dia 1.2m | Re-construction |
| 6 | 86+590 | Box Culvert 2mx2m | Re-construction |
| 7 | 86+830 | Pipe culvert dia 1.2m | Re-construction |
| 8 | 87+220 | Pipe culvert dia 1.2m | Re-construction |
| 9 | 87+420 | Pipe culvert dia 1.2m | New |
| 10 | 87+585 | Pipe culvert dia 1.2m | Re-construction |
| 11 | 87+860 | Pipe culvert dia 1.2m | Re-construction |
| 12 | 87+900 | Box Culvert 2mx2m | Re-construction |
| 13 | 88+010 | Pipe culvert dia 1.2m | Re-construction |
| 14 | 88+290 | Pipe culvert dia 1.2m | New |
| 15 | 88+490 | Pipe culvert dia 1.2m | Re-construction |
| 16 | 88+550 | Pipe culvert dia 1.2m | Re-construction |
| 17 | 88+650 | Pipe culvert dia 1.2m | Re-construction |
| 18 | 88+860 | Pipe culvert dia 1.2m | New |
| 19 | 89+050 | Box Culvert 2mx2m | New |
| 20 | 89+220 | Pipe culvert dia 1.2m | New |
| 21 | 89+510 | Pipe culvert dia 1.2m | New |
| 22 | 89+710 | Pipe culvert dia 1.2m | Re-construction |
| 23 | 89+740 | Pipe culvert dia 1.2m | Re-construction |
| 24 | 89+930 | Pipe culvert dia 1.2m | New |
| 25 | 90+190 | Pipe culvert dia 1.2m | Re-construction |
| 26 | 90+405 | Box Culvert 2mx2m | Re-construction |
| 27 | 90+570 | Pipe culvert dia 1.2m | Re-construction |
| 28 | 90+740 | Pipe culvert dia 1.2m | Re-construction |
| 29 | 90+880 | Box Culvert 2mx2m | New |
| 30 | 90+940 | Box Culvert 2mx2m | Re-construction |

| Sl. No. | Chainage (km) | Type / Opening of Culvert (m) | Remarks |
|---|---|---|---|
| 31 | 91+260 | Pipe culvert dia 1.2m | New |
| 32 | 91+630 | Pipe culvert dia 1.2m | New |
| 33 | 91+860 | Pipe culvert dia 1.2m | New |
| 34 | 92+120 | Pipe culvert dia 1.2m | Re-construction |
| 35 | 92+220 | Pipe culvert dia 1.2m | Re-construction |
| 36 | 92+610 | Pipe culvert dia 1.2m | Re-construction |
| 37 | 92+780 | Pipe culvert dia 1.2m | New |
| 38 | 92+940 | Pipe culvert dia 1.2m | Re-construction |
| 39 | 93+095 | Box culvert 2mx2m | Re-construction |
| 40 | 93+160 | Pipe culvert dia 1.2m | Re-construction |
| 41 | 93+340 | Pipe culvert dia 1.2m | New |
| 42 | 93+470 | Box Culvert 2mx2m | Re-construction |
| 43 | 93+510 | Pipe culvert dia 1.2m | New |
| 44 | 93+630 | Box Culvert 2mx2m | Re-construction |
| 45 | 93+850 | Pipe culvert dia 1.2m | Re-construction |
| 46 | 93+880 | Pipe culvert dia 1.2m | Re-construction |
| 47 | 94+160 | Pipe culvert dia 1.2m | New |
| Tura Town Area | | | |
| 48 | 101+090 | Pipe culvert dia 1.2m | New |
| 49 | 101+280 | Pipe culvert dia 1.2m | Re-construction |
| 50 | 101+380 | Pipe culvert dia 1.2m | Re-construction |
| 51 | 101+530 | Pipe culvert dia 1.2m | New |
| 52 | 101+740 | Pipe culvert dia 1.2m | New |
| 53 | 101+780 | Pipe culvert dia 1.2m | Re-construction |
| 54 | 102+080 | Pipe culvert dia 1.2m | Re-construction |
| 55 | 102+270 | Pipe culvert dia 1.2m | Re-construction |
| 56 | 102+350 | Pipe culvert dia 1.2m | Re-construction |
| 57 | 102+530 | Pipe culvert dia 1.2m | New |
| 58 | 102+730 | Pipe culvert dia 1.2m | New |
| 59 | 102+830 | Pipe culvert dia 1.2m | Re-construction |
| 60 | 102+900 | Pipe culvert dia 1.2m | Re-construction |
| 61 | 103+035 | Pipe culvert dia 1.2m | Re-construction |
| 62 | 103+110 | Pipe culvert dia 1.2m | New |
| 63 | 103+400 | Pipe culvert dia 1.2m | Re-construction |
| 64 | 103+600 | Pipe culvert dia 1.2m | Re-construction |
| 65 | 103+680 | Pipe culvert dia 1.2m | Re-construction |
| 66 | 103+810 | Pipe culvert dia 1.2m | Re-construction |
| 67 | 103+900 | Pipe culvert dia 1.2m | Re-construction |
| 68 | 103+940 | Pipe culvert dia 1.2m | Re-construction |
| 69 | 104+200 | Pipe culvert dia 1.2m | New |
| 70 | 104+460 | Pipe culvert dia 1.2m | Re-construction |
| 71 | 104+580 | Pipe culvert dia 1.2m | Re-construction |
| 72 | 104+870 | Pipe culvert dia 1.2m | New |
| 73 | 105+180 | Pipe culvert dia 1.2m | New |
| 74 | 105+420 | Pipe culvert dia 1.2m | Re-construction |
| 75 | 105+590 | Pipe culvert dia 1.2m | Re-construction |
| 76 | 105+755 | Pipe culvert dia 1.2m | New |
| 77 | 105+860 | Pipe culvert dia 1.2m | Re-construction |

| Sl. No. | Chainage (km) | Type / Opening of Culvert (m) | Remarks |
|---|---|---|---|
| 78 | 105+960 | Pipe culvert dia 1.2m | Re-construction |
| 79 | 106+070 | Pipe culvert dia 1.2m | Re-construction |
| 80 | 106+225 | Pipe culvert dia 1.2m | Re-construction |
| 81 | 106+460 | Pipe culvert dia 1.2m | New |
| 82 | 106+580 | Pipe culvert dia 1.2m | Re-construction |
| 83 | 106+800 | Pipe culvert dia 1.2m | Re-construction |
| 84 | 106+905 | Pipe culvert dia 1.2m | Re-construction |
| 85 | 107+090 | Pipe culvert dia 1.2m | New |
| 86 | 107+470 | Pipe culvert dia 1.2m | Re-construction |
| 87 | 107+625 | Pipe culvert dia 1.2m | Re-construction |
| 88 | 107+705 | Pipe culvert dia 1.2m | Re-construction |
| 89 | 107+990 | Pipe culvert dia 1.2m | Re-construction |
| 90 | 108+165 | Pipe culvert dia 1.2m | Re-construction |
| 91 | 108+430 | Pipe culvert dia 1.2m | Re-construction |
| 92 | 108+690 | Pipe culvert dia 1.2m | Re-construction |
| 93 | 108+960 | Pipe culvert dia 1.2m | New |
| 94 | 109+210 | Pipe culvert dia 1.2m | New |
| 95 | 109+410 | Pipe culvert dia 1.2m | New |
| 96 | 109+620 | Pipe culvert dia 1.2m | New |
| 97 | 109+770 | Pipe culvert dia 1.2m | Re-construction |
| 98 | 109+960 | Pipe culvert dia 1.2m | New |
| 99 | 110+070 | Pipe culvert dia 1.2m | New |
| 100 | 110+250 | Pipe culvert dia 1.2m | New |
| 101 | 110+540 | Pipe culvert dia 1.2m | New |
| 102 | 110+740 | Pipe culvert dia 1.2m | New |
| 103 | 110+910 | Pipe culvert dia 1.2m | New |
| 104 | 111+055 | Pipe culvert dia 1.2m | Re-construction |
| 105 | 111+350 | Pipe culvert dia 1.2m | New |
| 106 | 111+500 | Pipe culvert dia 1.2m | New |
| 107 | 111+750 | Pipe culvert dia 1.2m | New |
| 108 | 112+040 | Pipe culvert dia 1.2m | New |
| 109 | 112+140 | Pipe culvert dia 1.2m | New |
| 110 | 112+415 | Pipe culvert dia 1.2m | Re-construction |
| 111 | 112+510 | Pipe culvert dia 1.2m | Re-construction |
| 112 | 112+855 | Pipe culvert dia 1.2m | Re-construction |
| 113 | 112+960 | Pipe culvert dia 1.2m | New |
| 114 | 113+200 | Pipe culvert dia 1.2m | Re-construction |
| 115 | 113+310 | Pipe culvert dia 1.2m | Re-construction |
| 116 | 113+390 | Pipe culvert dia 1.2m | Re-construction |
| 117 | 113+480 | Pipe culvert dia 1.2m | Re-construction |
| 118 | 113+680 | Pipe culvert dia 1.2m | Re-construction |
| 119 | 113+930 | Pipe culvert dia 1.2m | Re-construction |
| 120 | 113+995 | Pipe culvert dia 1.2m | Re-construction |
| 121 | 114+030 | Pipe culvert dia 1.2m | Re-construction |
| 122 | 114+125 | Pipe culvert dia 1.2m | Re-construction |
| 123 | 114+230 | Pipe culvert dia 1.2m | Re-construction |
| 124 | 114+290 | Pipe culvert dia 1.2m | Re-construction |
| 125 | 114+500 | Pipe culvert dia 1.2m | Re-construction |

| Sl. No. | Chainage (km) | Type / Opening of Culvert (m) | Remarks |
|---|---|---|---|
| 126 | 114+630 | Pipe culvert dia 1.2m | Re-construction |
| 127 | 114+940 | Pipe culvert dia 1.2m | New |
| 128 | 115+115 | Pipe culvert dia 1.2m | Re-construction |
| 129 | 115+320 | Pipe culvert dia 1.2m | Re-construction |
| 130 | 115+390 | Pipe culvert dia 1.2m | Re-construction |
| 131 | 115+535 | Pipe culvert dia 1.2m | Re-construction |
| 132 | 115+690 | Pipe culvert dia 1.2m | Re-construction |
| 133 | 115+770 | Pipe culvert dia 1.2m | Re-construction |
| 134 | 115+830 | Pipe culvert dia 1.2m | Re-construction |
| 135 | 116+150 | Pipe culvert dia 1.2m | New |
| 136 | 116+310 | Pipe culvert dia 1.2m | Re-construction |
| 137 | 116+520 | Pipe culvert dia 1.2m | Re-construction |
| 138 | 116+660 | Pipe culvert dia 1.2m | Re-construction |
| 139 | 116+725 | Pipe culvert dia 1.2m | Re-construction |
| 140 | 116+830 | Pipe culvert dia 1.2m | Re-construction |
| 141 | 116+940 | Pipe culvert dia 1.2m | Re-construction |
| 142 | 117+045 | Pipe culvert dia 1.2m | Re-construction |
| 143 | 117+110 | Pipe culvert dia 1.2m | Re-construction |
| 144 | 117+180 | Pipe culvert dia 1.2m | Re-construction |
| 145 | 117+285 | Pipe culvert dia 1.2m | Re-construction |
| 146 | 117+365 | Pipe culvert dia 1.2m | Re-construction |
| 147 | 117+445 | Pipe culvert dia 1.2m | Re-construction |
| 148 | 117+570 | Pipe culvert dia 1.2m | Re-construction |
| 149 | 117+630 | Pipe culvert dia 1.2m | Re-construction |
| 150 | 117+690 | Pipe culvert dia 1.2m | Re-construction |
| 151 | 117+790 | Pipe culvert dia 1.2m | Re-construction |
| 152 | 117+885 | Pipe culvert dia 1.2m | Re-construction |
| 153 | 118+120 | Pipe culvert dia 1.2m | New |
| 154 | 118+320 | Pipe culvert dia 1.2m | Re-construction |
| 155 | 118+385 | Pipe culvert dia 1.2m | Re-construction |
| 156 | 118+500 | Pipe culvert dia 1.2m | Re-construction |
| 157 | 118+750 | Pipe culvert dia 1.2m | Re-construction |
| 158 | 118+890 | Pipe culvert dia 1.2m | Re-construction |
| 159 | 119+040 | Pipe culvert dia 1.2m | New |
| 160 | 119+280 | Pipe culvert dia 1.2m | New |
| 161 | 119+560 | Pipe culvert dia 1.2m | Re-construction |
| 162 | 119+710 | Pipe culvert dia 1.2m | Re-construction |
| 163 | 119+800 | Pipe culvert dia 1.2m | Re-construction |
| 164 | 119+870 | Pipe culvert dia 1.2m | Re-construction |
| 165 | 120+060 | Pipe culvert dia 1.2m | New |
| 166 | 120+250 | Pipe culvert dia 1.2m | New |
| 167 | 120+440 | Pipe culvert dia 1.2m | New |
| 168 | 120+520 | Pipe culvert dia 1.2m | Re-construction |
| 168 | 120+610 | Pipe culvert dia 1.2m | New |
| 170 | 120+760 | Pipe culvert dia 1.2m | Re-construction |
| 171 | 120+855 | Pipe culvert dia 1.2m | Re-construction |
| 172 | 120+990 | Pipe culvert dia 1.2m | Re-construction |
| 173 | 121+180 | Pipe culvert dia 1.2m | Re-construction |
| 174 | 121+300 | Pipe culvert dia 1.2m | Re-construction |

| Sl. No. | Chainage (km) | Type / Opening of Culvert (m) | Remarks |
|---|---|---|---|
| 175 | 121+560 | Pipe culvert dia 1.2m | New |
| 176 | 121+800 | Pipe culvert dia 1.2m | New |
| 177 | 122+020 | Pipe culvert dia 1.2m | New |
| 178 | 122+195 | Pipe culvert dia 1.2m | Re-construction |
| 179 | 122+280 | Pipe culvert dia 1.2m | Re-construction |
| 180 | 122+320 | Pipe culvert dia 1.2m | Re-construction |
| 181 | 122+555 | Pipe culvert dia 1.2m | Re-construction |
| 182 | 122+620 | Pipe culvert dia 1.2m | Re-construction |
| 183 | 122+895 | Pipe culvert dia 1.2m | Re-construction |
| 184 | 122+995 | Pipe culvert dia 1.2m | Re-construction |
| 185 | 123+055 | Pipe culvert dia 1.2m | Re-construction |
| 186 | 123+160 | Pipe culvert dia 1.2m | Re-construction |
| 187 | 123+385 | Pipe culvert dia 1.2m | Re-construction |
| 188 | 123+480 | Pipe culvert dia 1.2m | Re-construction |
| 189 | 123+520 | Pipe culvert dia 1.2m | Re-construction |
| 190 | 123+585 | Pipe culvert dia 1.2m | Re-construction |
| 191 | 123+730 | Pipe culvert dia 1.2m | Re-construction |
| 192 | 123+890 | Pipe culvert dia 1.2m | Re-construction |
| 193 | 123+980 | Pipe culvert dia 1.2m | Re-construction |
| 194 | 124+040 | Pipe culvert dia 1.2m | Re-construction |
| 195 | 124+075 | Pipe culvert dia 1.2m | Re-construction |
| 196 | 124+165 | Pipe culvert dia 1.2m | Re-construction |
| 197 | 124+250 | Pipe culvert dia 1.2m | Re-construction |
| 198 | 124+315 | Pipe culvert dia 1.2m | Re-construction |
| 199 | 124+420 | Pipe culvert dia 1.2m | Re-construction |
| 200 | 124+670 | Pipe culvert dia 1.2m | Re-construction |
| 201 | 124+720 | Pipe culvert dia 1.2m | Re-construction |
| 202 | 124+880 | Pipe culvert dia 1.2m | Re-construction |
| 203 | 124+970 | Pipe culvert dia 1.2m | Re-construction |
| 204 | 125+030 | Pipe culvert dia 1.2m | Re-construction |
| 205 | 125+120 | Pipe culvert dia 1.2m | Re-construction |
| 206 | 125+200 | Pipe culvert dia 1.2m | Re-construction |
| 207 | 125+270 | Pipe culvert dia 1.2m | Re-construction |
| 208 | 125+310 | Pipe culvert dia 1.2m | Re-construction |
| 209 | 125+390 | Pipe culvert dia 1.2m | Re-construction |
| 210 | 125+470 | Pipe culvert dia 1.2m | Re-construction |
| 211 | 125+540 | Pipe culvert dia 1.2m | Re-construction |
| 212 | 125+640 | Pipe culvert dia 1.2m | Re-construction |
| 213 | 125+780 | Pipe culvert dia 1.2m | Re-construction |
| 214 | 125+970 | Pipe culvert dia 1.2m | Re-construction |
| 215 | 126+170 | Pipe culvert dia 1.2m | Re-construction |
| 216 | 126+455 | Pipe culvert dia 1.2m | Re-construction |
| 217 | 126+575 | Pipe culvert dia 1.2m | Re-construction |
| 218 | 126+650 | Pipe culvert dia 1.2m | Re-construction |
| 219 | 126+690 | Pipe culvert dia 1.2m | Re-construction |
| 220 | 126+880 | Pipe culvert dia 1.2m | Re-construction |
| 221 | 127+040 | Pipe culvert dia 1.2m | Re-construction |
| 222 | 127+170 | Pipe culvert dia 1.2m | Re-construction |
| 223 | 127+285 | Pipe culvert dia 1.2m | Re-construction |

| Sl. No. | Chainage (km) | Type / Opening of Culvert (m) | Remarks |
|---|---|---|---|
| 224 | 127+520 | Pipe culvert dia 1.2m | Re-construction |
| 225 | 127+660 | Pipe culvert dia 1.2m | Re-construction |
| 226 | 127+890 | Pipe culvert dia 1.2m | Re-construction |
| 227 | 128+050 | Pipe culvert dia 1.2m | Re-construction |
| 228 | 128+130 | Pipe culvert dia 1.2m | New |
| 229 | 128+265 | Pipe culvert dia 1.2m | Re-construction |
| 230 | 128+430 | Pipe culvert dia 1.2m | Re-construction |
| 231 | 128+515 | Pipe culvert dia 1.2m | Re-construction |
| 232 | 128+820 | Pipe culvert dia 1.2m | Re-construction |
| 233 | 128+940 | Pipe culvert dia 1.2m | Re-construction |
| 234 | 129+120 | Pipe culvert dia 1.2m | Re-construction |
| 235 | 129+420 | Pipe culvert dia 1.2m | New |
| 236 | 129+720 | Pipe culvert dia 1.2m | New |
| 237 | 129+980 | Pipe culvert dia 1.2m | New |
| 238 | 130+210 | Pipe culvert dia 1.2m | New |
| 239 | 130+380 | Pipe culvert dia 1.2m | Re-construction |
| 240 | 130+680 | Pipe culvert dia 1.2m | New |
| 241 | 130+850 | Pipe culvert dia 1.2m | New |
| 242 | 131+040 | Pipe culvert dia 1.2m | New |
| 243 | 131+250 | Pipe culvert dia 1.2m | New |
| 244 | 131+440 | Pipe culvert dia 1.2m | New |
| 245 | 131+580 | Pipe culvert dia 1.2m | New |
| 246 | 131+820 | Pipe culvert dia 1.2m | Re-construction |
| 247 | 132+100 | Pipe culvert dia 1.2m | New |
| 248 | 132+300 | Pipe culvert dia 1.2m | New |
| 249 | 132+430 | Pipe culvert dia 1.2m | New |
| 250 | 132+620 | Pipe culvert dia 1.2m | New |
| 251 | 132+820 | Pipe culvert dia 1.2m | New |
| 252 | 133+040 | Pipe culvert dia 1.2m | New |
| 253 | 133+220 | Pipe culvert dia 1.2m | New |
| 254 | 133+410 | Pipe culvert dia 1.2m | New |
| 255 | 133+640 | Pipe culvert dia 1.2m | Re-construction |
| 256 | 133+850 | Pipe culvert dia 1.2m | New |
| 257 | 133+990 | Pipe culvert dia 1.2m | New |
| 258 | 134+090 | Pipe culvert dia 1.2m | New |
| 259 | 134+250 | Pipe culvert dia 1.2m | New |
| 260 | 134+480 | Pipe culvert dia 1.2m | New |
| 261 | 134+710 | Pipe culvert dia 1.2m | Re-construction |
| 262 | 134+920 | Pipe culvert dia 1.2m | New |
| 263 | 135+220 | Pipe culvert dia 1.2m | New |
| 264 | 135+380 | Pipe culvert dia 1.2m | New |
| 265 | 135+510 | Pipe culvert dia 1.2m | Re-construction |
| 266 | 135+700 | Pipe culvert dia 1.2m | New |
| 267 | 135+940 | Pipe culvert dia 1.2m | Re-construction |
| 268 | 136+150 | Pipe culvert dia 1.2m | Re-construction |
| 269 | 136+200 | Pipe culvert dia 1.2m | Re-construction |
| 270 | 136+400 | Pipe culvert dia 1.2m | New |
| 271 | 136+550 | Pipe culvert dia 1.2m | Re-construction |
| 272 | 136+850 | Pipe culvert dia 1.2m | Re-construction |

| Sl. No. | Chainage (km) | Type / Opening of Culvert (m) | Remarks |
|---|---|---|---|
| 273 | 137+140 | Pipe culvert dia 1.2m | New |
| 274 | 137+340 | Pipe culvert dia 1.2m | New |
| 275 | 137+550 | Pipe culvert dia 1.2m | Re-construction |
| 276 | 137+700 | Pipe culvert dia 1.2m | New |
| 277 | 137+940 | Pipe culvert dia 1.2m | Re-construction |
| 278 | 138+165 | Box Culvert 2mx2m | Re-construction |
| 279 | 138+310 | Pipe culvert dia 1.2m | Re-construction |
| 280 | 138+500 | Pipe culvert dia 1.2m | Re-construction |
| 281 | 138+610 | Pipe culvert dia 1.2m | Re-construction |
| 282 | 138+760 | Pipe culvert dia 1.2m | Re-construction |
| 283 | 138+920 | Pipe culvert dia 1.2m | Re-construction |
| 284 | 138+960 | Pipe culvert dia 1.2m | Re-construction |
| 285 | 139+050 | Pipe culvert dia 1.2m | Re-construction |
| 286 | 139+250 | Pipe culvert dia 1.2m | New |
| 287 | 139+440 | Pipe culvert dia 1.2m | Re-construction |
| 288 | 139+700 | Pipe culvert dia 1.2m | Re-construction |
| 289 | 139+925 | Box Culvert 2mx2m | Re-construction |
| 290 | 140+210 | Pipe culvert dia 1.2m | Re-construction |
| 291 | 140+450 | Pipe culvert dia 1.2m | New |
| 292 | 140+910 | Pipe culvert dia 1.2m | New |
| 293 | 141+200 | Pipe culvert dia 1.2m | New |
| 294 | 141+350 | Pipe culvert dia 1.2m | New |
| 295 | 141+500 | Pipe culvert dia 1.2m | New |
| 296 | 141+660 | Pipe culvert dia 1.2m | New |
| 297 | 141+830 | Pipe culvert dia 1.2m | New |
| 298 | 142+040 | Pipe culvert dia 1.2m | New |
| 299 | 142+150 | Pipe culvert dia 1.2m | Re-construction |
| 300 | 142+320 | Pipe culvert dia 1.2m | New |
| 301 | 142+680 | Pipe culvert dia 1.2m | New |
| 302 | 142+880 | Pipe culvert dia 1.2m | New |
| 303 | 143+050 | Pipe culvert dia 1.2m | New |
| 304 | 143+220 | Pipe culvert dia 1.2m | New |

**Note:**

1. The indication of Remarks shown in the Table, either of New or Re-construction, are just as an initial reference. Final decision shall be made by the Contractor based on his own evaluation, and detailed design.
2. The culvert location planned as Table above shall be adjusted accordingly to the exact location of cross-water stream or existing culvert located based on the topographic survey performed by the Contractor for the final drawings of the Detailed Design.
3. Width of culvert shall be reconciled as per cross section at that location
4. Cross road culvert to be provided at the location of Major Junction/ Minor Junctions for proper drainage facilities and utility purposes etc. if required shall be decided by Authority/Authority Engineer and shall not be treated as change of scope.

### 7.2.4 Widening of Existing Culverts

All existing culverts, which are not to be reconstructed, shall be widened up to the roadway width of the Project Highway & as per the typical cross section given in section 7 of the Manual. Repairs and strengthening of existing structures where required shall be carried out.

| S. No | Culvert Location | Type, span, height and width of existing culvert (m) | Repairs to be carried out [specify] |
|---|---|---|---|
| NIL | | | |

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

| S. No. | Location at km | Type of repair required |
|---|---|---|
| NIL | | |

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

**7.2.7** It is clarified that during development of the project highway if any existing culvert in addition to above is identified or as per site requirement new culvert for drainage is required these shall be constructed as per standards set forth in schedule-D and as per instructions of the Authority/Authority Engineer. The same shall deemed to be covered within the scope of work

## 7.3 Bridges

### 7.3.1 Existing bridges to be re-constructed/widened:

(i) The Existing bridges at the following locations shall be reconstructed:

| Sl. No. | Existing Chainage (km) | Design Chainage (km) | Span Arrangement | Type | Proposed width (m) |
|---|---|---|---|---|---|
| 1 | 142+363 | 140+700 | 1 x 6.0 | RCC Slab | 12.00 |

(ii) The following narrow bridges shall be widened:

| Sl. No. | Location (km) | Existing width (m) | Extent of widening (m) | Cross-section at deck level for widening @ |
|---|---|---|---|---|
| NIL | | | | |

### 7.3.2 Additional new bridges

New bridges at the following locations on the project highway shall be constructed. GADs for the new bridges are attached in the drawings folder.

| Sl. No. | Location (km) | Total length (m) | Remarks, if any |
|---|---|---|---|
| NIL | | | |

### 7.3.3 Repair/Rehabilitation/ Bearing expansion joints of existing sub structure and reconstruction of super structure of existing minor bridges:

| S. No. | Existing Chainage (km) | Design Chainage (km) | Existing width of Super structure | Proposed width of Super structure | Span arrangement | Proposed Type of Super Structure | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | 90+380 | 90+080 | 8.50 | 12.00 | 1 x 12.80 | RCC Girder | - |
| 2 | 91+740 | 91+395 | 11.00 | 11.00 | 1 x 8.80 | RCC Slab | - |
| 3 | 103+540 | 103+240 | 8.50 | 12.00 | 1 x 11.50 | RCC Girder | - |
| 4 | 139+505 | 137+825 | 8.50 | 8.50 | 2 x 9.00 + 1 x 17.50 | RCC Slab | Only super structure end span of 9.00 m to be replaced |
| 5 | 142+710 | 141+000 | 8.50 | 8.50 | 3 x 9.75 | RCC Slab | - |
| 6 | 143+620 | 141+940 | 8.50 | 8.50 | 1 x 7.5 | RCC Slab | - |

### 7.3.4 Drainage system for bridge deck

An effective drainage system for bridge decks shall be provided as specified in paragraph 7.20 of the Manual

### 7.3.5 Structures in marine environment

The Project Alignment does not lie in Marine Alignment.

## 7.4 Slope Protection Structures

**7.4.1** Structures for Slope protection and Retaining Walls shall be designed and constructed as stipulated in Schedule-D: Specification and Standards.

**7.4.2** Structures for Retaining Walls and other works to be constructed for slope protection shown in the following Table are tentative, however these works are to be provided as per site requirement:

Wet Masonry Retaining Wall (H≤3m)

| Chainage | | Length (m) |
|---|---|---|
| Start | Start | |
| 85+080 | 85+100 | 10 |
| 85+240 | 85+360 | 60 |
| 85+520 | 85+620 | 50 |
| 85+860 | 86+080 | 100 |
| 86+480 | 86+580 | 20 |
| 86+680 | 86+780 | 40 |
| 86+920 | 87+120 | 100 |
| 87+280 | 87+520 | 160 |
| 87+620 | 87+660 | 20 |
| 87+740 | 87+800 | 30 |
| 87+880 | 88+040 | 30 |
| 88+140 | 88+160 | 20 |
| 88+240 | 88+340 | 20 |
| 88+420 | 88+460 | 20 |
| 88+720 | 88+740 | 10 |
| 89+000 | 89+560 | 170 |

| Chainage | | Length (m) |
|---|---|---|
| Start | Start | |
| 119+080 | 119+100 | 10 |
| 119+400 | 119+580 | 70 |
| 119+660 | 119+820 | 70 |
| 120+040 | 120+200 | 60 |
| 120+460 | 120+800 | 100 |
| 120+920 | 120+980 | 30 |
| 121+080 | 121+120 | 20 |
| 121+200 | 121+340 | 40 |
| 121+980 | 122+000 | 10 |
| 122+100 | 122+220 | 30 |
| 122+400 | 122+420 | 10 |
| 122+540 | 122+580 | 20 |
| 122+780 | 123+340 | 150 |
| 123+620 | 123+720 | 20 |
| 123+900 | 123+940 | 20 |
| 124+100 | 124+140 | 20 |

Wet Masonry Retaining Wall (H≤3m)

| Chainage | | Length (m) |
|---|---|---|
| Start | Start | |
| 89+700 | 89+780 | 20 |
| 89+900 | 89+920 | 10 |
| 90+140 | 90+180 | 20 |
| 90+440 | 90+520 | 30 |
| 90+600 | 90+640 | 20 |
| 90+800 | 91+180 | 130 |
| 91+340 | 91+440 | 30 |
| 91+520 | 91+680 | 50 |
| 92+000 | 92+020 | 10 |
| 92+800 | 93+120 | 120 |
| 93+200 | 93+280 | 20 |
| 93+380 | 101+080 | 225 |
| 101+160 | 101+180 | 10 |
| 101+580 | 101+600 | 10 |
| 101+840 | 101+860 | 10 |
| 101+960 | 102+220 | 70 |
| 102+300 | 102+340 | 20 |
| 102+440 | 102+680 | 100 |
| 102+760 | 102+780 | 20 |
| 102+960 | 102+980 | 10 |
| 103+360 | 103+480 | 30 |
| 103+620 | 103+640 | 10 |
| 104+280 | 104+320 | 20 |
| 104+740 | 104+820 | 40 |
| 105+060 | 105+320 | 80 |
| 105+480 | 106+200 | 200 |
| 106+340 | 106+360 | 10 |
| 106+480 | 106+500 | 10 |
| 106+620 | 106+640 | 10 |
| 106+960 | 106+980 | 10 |
| 107+540 | 108+260 | 270 |
| 108+340 | 108+560 | 80 |
| 108+640 | 108+820 | 90 |
| 109+040 | 109+200 | 60 |
| 109+360 | 109+400 | 20 |
| 111+200 | 111+280 | 40 |
| 111+840 | 111+880 | 20 |
| 112+120 | 112+180 | 30 |
| 112+520 | 112+640 | 60 |
| 112+760 | 112+840 | 40 |
| 113+020 | 113+140 | 40 |
| 113+420 | 113+460 | 20 |
| 113+860 | 113+880 | 20 |
| 114+540 | 114+580 | 20 |
| 115+560 | 115+580 | 10 |
| 115+700 | 115+720 | 10 |

| Chainage | | Length (m) |
|---|---|---|
| Start | Start | |
| 124+280 | 124+300 | 10 |
| 124+660 | 124+680 | 10 |
| 124+760 | 125+180 | 100 |
| 125+300 | 125+400 | 30 |
| 125+500 | 125+520 | 10 |
| 125+680 | 125+840 | 50 |
| 126+180 | 126+240 | 30 |
| 126+340 | 126+360 | 10 |
| 126+500 | 126+560 | 50 |
| 126+640 | 126+660 | 10 |
| 126+780 | 126+800 | 10 |
| 126+980 | 127+000 | 10 |
| 127+100 | 127+120 | 10 |
| 127+360 | 127+380 | 10 |
| 127+600 | 127+640 | 20 |
| 127+720 | 127+740 | 10 |
| 128+360 | 128+760 | 150 |
| 128+840 | 128+900 | 30 |
| 128+980 | 129+320 | 130 |
| 129+400 | 129+520 | 50 |
| 129+800 | 129+860 | 20 |
| 130+000 | 130+340 | 130 |
| 130+460 | 130+580 | 40 |
| 130+740 | 130+800 | 30 |
| 130+980 | 131+020 | 20 |
| 131+140 | 131+460 | 110 |
| 131+640 | 131+720 | 40 |
| 131+820 | 132+060 | 70 |
| 132+140 | 132+160 | 10 |
| 132+560 | 132+740 | 60 |
| 132+820 | 132+980 | 50 |
| 133+220 | 133+300 | 30 |
| 133+440 | 133+460 | 10 |
| 133+620 | 133+640 | 10 |
| 133+780 | 133+820 | 20 |
| 133+940 | 134+020 | 20 |
| 134+180 | 134+220 | 30 |
| 134+320 | 134+460 | 40 |
| 134+760 | 134+920 | 80 |
| 135+020 | 135+120 | 40 |
| 135+340 | 135+380 | 20 |
| 135+460 | 135+580 | 40 |
| 135+660 | 135+700 | 20 |
| 136+440 | 136+740 | 110 |
| 136+860 | 136+900 | 20 |
| 137+400 | 137+600 | 50 |

Wet Masonry Retaining Wall (H≤3m)

| Chainage | | Length (m) | Chainage | | Length (m) |
|---|---|---|---|---|---|
| Start | Start | | Start | Start | |
| 115+860 | 115+920 | 30 | 137+940 | 137+980 | 20 |
| 116+440 | 116+620 | 50 | 138+200 | 138+240 | 20 |
| 116+880 | 116+900 | 10 | 138+440 | 138+860 | 110 |
| 117+500 | 117+520 | 10 | 139+000 | 139+020 | 10 |
| 117+640 | 117+680 | 20 | 139+100 | 139+240 | 50 |
| 117+900 | 117+960 | 30 | 139+560 | 139+600 | 20 |
| 118+060 | 118+180 | 60 | 140+040 | 140+080 | 20 |
| 118+360 | 118+380 | 10 | 140+400 | 140+440 | 20 |
| 118+840 | 118+880 | 20 | 140+780 | 140+840 | 30 |
| Total Length: | | | | | 6,125 |

Wet Masonry Retaining Wall (H>3m≤7m)

| Chainage | | Length (m) | Chainage | | Length (m) |
|---|---|---|---|---|---|
| Start | End | | Start | End | |
| 85+140 | 85+160 | 10 | 101+320 | 101+340 | 10 |
| 86+660 | 86+680 | 10 | 101+460 | 101+580 | 40 |
| 87+360 | 87+380 | 20 | 101+700 | 101+840 | 50 |
| 88+160 | 88+240 | 70 | 102+120 | 102+260 | 40 |
| 88+340 | 88+360 | 10 | 102+380 | 102+440 | 30 |
| 89+600 | 89+700 | 50 | 102+620 | 102+800 | 50 |
| 89+780 | 90+060 | 60 | 125+140 | 125+160 | 10 |
| 90+460 | 90+480 | 20 | 125+240 | 125+260 | 10 |
| 91+440 | 91+520 | 60 | 130+520 | 130+540 | 10 |
| 92+820 | 93+000 | 50 | 137+480 | 137+500 | 10 |
| 93+080 | 93+140 | 20 | 138+040 | 138+060 | 10 |
| 93+540 | 93+560 | 10 | 138+140 | 138+160 | 10 |
| 93+920 | 93+940 | 10 | 139+080 | 139+100 | 10 |
| 101+040 | 101+100 | 20 | 139+420 | 139+520 | 30 |
| 85+140 | 85+160 | 10 | 101+320 | 101+340 | 10 |
| 86+660 | 86+680 | 10 | 101+460 | 101+580 | 40 |
| 87+360 | 87+380 | 20 | 101+700 | 101+840 | 50 |
| 88+160 | 88+240 | 70 | 102+120 | 102+260 | 40 |
| 88+340 | 88+360 | 10 | 102+380 | 102+440 | 30 |
| 89+600 | 89+700 | 50 | 102+620 | 102+800 | 50 |
| 89+780 | 90+060 | 60 | 125+140 | 125+160 | 10 |
| 90+460 | 90+480 | 20 | 125+240 | 125+260 | 10 |
| 91+440 | 91+520 | 60 | 130+520 | 130+540 | 10 |
| 92+820 | 93+000 | 50 | 137+480 | 137+500 | 10 |
| 93+080 | 93+140 | 20 | 138+040 | 138+060 | 10 |
| 93+540 | 93+560 | 10 | 138+140 | 138+160 | 10 |
| 93+920 | 93+940 | 10 | 139+080 | 139+100 | 10 |
| 101+040 | 101+100 | 20 | 139+420 | 139+520 | 30 |
| Total Length: | | | | | 740 |

Wet Masonry Gravity Wall (H=1.5m and 2m)

| Chainage | | Length (m) | Chainage | | Length (m) |
|---|---|---|---|---|---|
| Start | End | | Start | End | |
| 85+180 | 85+260 | 40 | 125+100 | 125+120 | 20 |
| 85+380 | 85+420 | 40 | 125+200 | 125+220 | 20 |
| 85+520 | 85+540 | 20 | 125+540 | 125+560 | 20 |
| 86+280 | 86+300 | 20 | 125+740 | 125+820 | 60 |
| 89+520 | 89+560 | 40 | 125+980 | 126+000 | 20 |
| 90+560 | 90+580 | 20 | 126+800 | 126+820 | 20 |
| 92+520 | 92+560 | 40 | 127+800 | 127+820 | 20 |
| 93+260 | 93+320 | 40 | 129+040 | 129+060 | 20 |
| 93+440 | 93+580 | 60 | 129+200 | 129+300 | 80 |
| 93+680 | 93+700 | 20 | 129+780 | 129+800 | 20 |
| 93+780 | 93+800 | 20 | 130+000 | 130+020 | 20 |
| 94+160 | 94+180 | 20 | 130+320 | 130+400 | 60 |
| 101+460 | 101+600 | 60 | 130+640 | 130+660 | 20 |
| 102+180 | 102+280 | 40 | 130+940 | 130+960 | 20 |
| 102+480 | 102+500 | 20 | 131+140 | 131+200 | 40 |
| 103+220 | 103+240 | 20 | 131+580 | 131+600 | 20 |
| 104+140 | 104+160 | 20 | 131+700 | 131+720 | 20 |
| 104+940 | 104+980 | 40 | 132+680 | 132+700 | 20 |
| 105+420 | 105+440 | 20 | 133+200 | 133+220 | 20 |
| 106+000 | 106+080 | 40 | 133+660 | 133+700 | 40 |
| 107+840 | 107+860 | 20 | 134+060 | 134+140 | 40 |
| 108+160 | 108+180 | 20 | 134+280 | 134+300 | 20 |
| 113+920 | 113+940 | 20 | 134+560 | 134+580 | 20 |
| 114+380 | 114+400 | 20 | 134+700 | 134+720 | 20 |
| 116+840 | 116+860 | 20 | 134+880 | 134+900 | 20 |
| 117+040 | 117+080 | 40 | 135+280 | 135+340 | 40 |
| 118+000 | 118+020 | 20 | 136+720 | 136+740 | 20 |
| 118+320 | 118+340 | 20 | 137+500 | 137+520 | 20 |
| 119+860 | 119+880 | 20 | 137+920 | 137+940 | 20 |
| 120+000 | 120+060 | 60 | 138+060 | 138+080 | 20 |
| 120+240 | 120+340 | 40 | 138+340 | 138+360 | 20 |
| 120+760 | 120+940 | 80 | 138+440 | 138+460 | 20 |
| 124+020 | 124+060 | 40 | 138+540 | 138+660 | 60 |
| 124+420 | 124+440 | 20 | 138+880 | 138+900 | 20 |
| 124+600 | 124+620 | 20 | 139+120 | 139+200 | 40 |
| 124+740 | 124+760 | 20 | 139+440 | 139+460 | 20 |
| 124+880 | 124+900 | 20 | | | |
| Total Length: | | | | | 2,140 |

Wet Masonry Gravity Wall (H=3.0m and 4.0m)

| Chainage | | Length (m) | Chainage | | Length (m) |
|---|---|---|---|---|---|
| Start | End | | Start | End | |
| 85+200 | 85+320 | 60 | 118+620 | 118+640 | 20 |
| 85+420 | 85+520 | 60 | 118+880 | 118+940 | 60 |
| 88+740 | 88+920 | 140 | 119+300 | 119+320 | 20 |
| 89+460 | 89+520 | 60 | 120+080 | 120+100 | 20 |
| 90+000 | 90+040 | 40 | 120+520 | 120+540 | 20 |
| 90+200 | 90+260 | 40 | 120+900 | 121+040 | 60 |
| 90+880 | 90+940 | 60 | 121+420 | 121+440 | 20 |
| 91+580 | 91+660 | 40 | 123+980 | 124+020 | 40 |
| 92+580 | 92+600 | 20 | 124+820 | 124+840 | 20 |
| 92+880 | 92+900 | 20 | 125+280 | 125+300 | 20 |
| 93+240 | 93+340 | 60 | 125+760 | 125+780 | 20 |
| 93+620 | 93+640 | 20 | 128+800 | 128+820 | 20 |
| 93+720 | 93+980 | 80 | 129+220 | 129+240 | 20 |
| 101+100 | 101+160 | 40 | 130+080 | 130+100 | 20 |
| 101+280 | 101+320 | 40 | 130+200 | 130+240 | 40 |
| 101+400 | 101+440 | 40 | 130+660 | 130+680 | 20 |
| 101+840 | 101+860 | 20 | 130+900 | 130+920 | 20 |
| 102+280 | 102+300 | 20 | 131+020 | 131+100 | 60 |
| 102+440 | 102+460 | 20 | 131+380 | 131+400 | 20 |
| 102+560 | 102+700 | 60 | 132+600 | 132+680 | 40 |
| 102+980 | 103+000 | 20 | 132+840 | 132+860 | 20 |
| 103+240 | 103+300 | 60 | 133+700 | 133+740 | 40 |
| 103+420 | 103+500 | 80 | 133+900 | 133+920 | 20 |
| 104+040 | 104+140 | 100 | 134+080 | 134+100 | 20 |
| 106+980 | 107+020 | 40 | 134+640 | 134+740 | 40 |
| 107+860 | 107+880 | 20 | 135+340 | 135+380 | 40 |
| 108+300 | 108+320 | 20 | 137+900 | 137+920 | 20 |
| 108+480 | 108+500 | 20 | 138+040 | 138+060 | 20 |
| 108+920 | 108+940 | 20 | 138+180 | 138+200 | 20 |
| 109+220 | 109+280 | 60 | 138+300 | 138+580 | 120 |
| 111+660 | 111+680 | 20 | 138+940 | 138+960 | 20 |
| 114+620 | 114+640 | 20 | 139+200 | 139+220 | 20 |
| 116+660 | 116+740 | 60 | | | |
| Total Length: | | | | | 2,460 |

Wet Masonry Gravity Wall (H=5.0m and 6.0m)

| Chainage | | Length (m) | Chainage | | Length (m) |
|---|---|---|---|---|---|
| Start | End | | Start | End | |
| 85+120 | 85+140 | 20 | 102+580 | 102+620 | 40 |
| 90+220 | 90+240 | 20 | 102+880 | 102+900 | 20 |
| 90+400 | 90+420 | 20 | 105+260 | 105+280 | 20 |
| 91+560 | 91+580 | 20 | 106+080 | 106+100 | 20 |
| 91+660 | 91+760 | 100 | 118+600 | 118+620 | 20 |
| 92+000 | 92+020 | 20 | 124+660 | 124+700 | 40 |
| 92+600 | 92+620 | 20 | 131+860 | 131+880 | 20 |
| 93+220 | 93+240 | 20 | 132+880 | 132+900 | 20 |
| 93+500 | 93+520 | 20 | 133+180 | 133+200 | 20 |
| 101+440 | 101+560 | 60 | 138+160 | 138+180 | 20 |
| 101+740 | 101+800 | 40 | | | |
| Total Length: | | | | | 600 |

Reinforced Earth Retaining Wall (H=7.0m and 8.0m)

| Chainage | | Length (m) | Chainage | | Length (m) |
|---|---|---|---|---|---|
| Start | End | | Start | End | |
| 88+820 | 88+840 | 20 | 93+860 | 93+880 | 20 |
| 91+760 | 92+080 | 300 | 101+660 | 101+680 | 20 |
| 93+160 | 93+180 | 20 | 104+580 | 104+600 | 20 |
| Total Length: | | | | | 400 |

Seeding and Mulching (Soil Cut Slope)

| Chainage | | Area ($m^2$) | Chainage | | Area ($m^2$) |
|---|---|---|---|---|---|
| Start | End | | Start | End | |
| 85+020 | 85+160 | 323 | 115+560 | 116+000 | 790 |
| 85+240 | 85+440 | 949 | 116+120 | 116+140 | 70 |
| 85+520 | 85+660 | 441 | 116+440 | 116+640 | 401 |
| 85+840 | 86+080 | 1,228 | 116+780 | 116+800 | 121 |
| 86+480 | 86+580 | 332 | 116+880 | 116+900 | 48 |
| 86+660 | 86+800 | 324 | 117+000 | 117+100 | 350 |
| 86+920 | 87+120 | 1,575 | 117+220 | 117+260 | 139 |
| 87+260 | 87+520 | 1,893 | 117+480 | 117+680 | 306 |
| 87+620 | 87+660 | 407 | 117+840 | 118+180 | 735 |
| 87+740 | 87+800 | 228 | 118+340 | 118+580 | 618 |
| 87+880 | 88+040 | 738 | 118+700 | 118+880 | 315 |
| 88+120 | 88+620 | 1,763 | 119+040 | 119+220 | 453 |
| 88+720 | 88+740 | 39 | 119+400 | 119+820 | 953 |
| 89+000 | 90+060 | 3,829 | 119+900 | 119+920 | 111 |
| 90+140 | 90+180 | 181 | 120+040 | 120+220 | 836 |
| 90+420 | 90+520 | 1,113 | 120+360 | 120+800 | 1,355 |
| 90+600 | 90+680 | 279 | 120+880 | 121+120 | 414 |
| 90+800 | 91+800 | 3,004 | 121+200 | 121+380 | 614 |
| 91+900 | 92+040 | 333 | 121+580 | 121+600 | 47 |
| 92+740 | 94+223 | 7,065 | 121+700 | 121+720 | 111 |

Seeding and Mulching (Soil Cut Slope)

| Chainage | | Area ($m^2$) | Chainage | | Area ($m^2$) |
|---|---|---|---|---|---|
| Start | End | | Start | End | |
| 101+020 | 101+180 | 483 | 121+860 | 122+420 | 1,359 |
| 101+320 | 101+340 | 456 | 122+520 | 122+660 | 351 |
| 101+460 | 101+600 | 1,075 | 122+760 | 123+480 | 1,612 |
| 101+700 | 101+860 | 924 | 123+620 | 123+720 | 208 |
| 101+960 | 102+820 | 4,271 | 123+900 | 123+940 | 157 |
| 102+940 | 102+980 | 134 | 124+060 | 124+140 | 226 |
| 103+060 | 103+100 | 176 | 124+280 | 124+420 | 182 |
| 103+360 | 103+760 | 475 | 124+660 | 125+400 | 1,745 |
| 104+140 | 104+180 | 163 | 125+500 | 125+520 | 35 |
| 104+280 | 104+320 | 45 | 125+680 | 125+840 | 356 |
| 104+400 | 104+560 | 197 | 125+960 | 125+980 | 53 |
| 104+640 | 104+960 | 1,067 | 126+140 | 126+800 | 1,698 |
| 105+040 | 105+380 | 836 | 126+960 | 127+200 | 582 |
| 105+460 | 106+200 | 1,618 | 127+300 | 127+480 | 492 |
| 106+280 | 106+500 | 359 | 127+560 | 127+640 | 227 |
| 106+620 | 106+780 | 439 | 127+720 | 127+740 | 13 |
| 106+860 | 106+980 | 199 | 127+820 | 127+840 | 63 |
| 107+120 | 107+180 | 106 | 127+980 | 128+080 | 382 |
| 107+540 | 108+260 | 2,976 | 128+220 | 128+240 | 34 |
| 108+340 | 108+840 | 1,949 | 128+360 | 129+540 | 2,649 |
| 108+940 | 109+200 | 708 | 129+760 | 129+860 | 178 |
| 109+340 | 109+420 | 155 | 130+000 | 130+360 | 788 |
| 109+860 | 109+920 | 159 | 130+460 | 130+620 | 449 |
| 110+100 | 110+120 | 43 | 130+740 | 131+020 | 372 |
| 110+340 | 110+360 | 43 | 131+100 | 131+540 | 1,445 |
| 110+440 | 110+460 | 37 | 131+640 | 132+160 | 1,525 |
| 111+100 | 111+300 | 626 | 132+320 | 133+100 | 2,450 |
| 111+520 | 111+580 | 181 | 133+200 | 133+820 | 1,468 |
| 111+840 | 112+000 | 379 | 133+940 | 134+020 | 327 |
| 112+120 | 112+180 | 159 | 134+100 | 134+240 | 539 |
| 112+320 | 112+400 | 342 | 134+320 | 134+920 | 1,709 |
| 112+500 | 112+840 | 1,005 | 135+000 | 135+120 | 244 |
| 112+980 | 113+160 | 546 | 135+340 | 136+120 | 1,571 |
| 113+260 | 113+280 | 71 | 136+200 | 136+280 | 268 |
| 113+380 | 113+460 | 107 | 136+420 | 136+920 | 1,194 |
| 113+620 | 113+640 | 58 | 137+260 | 137+640 | 650 |
| 113+720 | 113+900 | 691 | 137+940 | 138+240 | 576 |
| 114+180 | 114+200 | 167 | 138+380 | 138+860 | 815 |
| 114+300 | 114+360 | 279 | 139+000 | 139+280 | 1,036 |
| 114+520 | 114+600 | 188 | 139+420 | 139+600 | 381 |
| 114+840 | 114+900 | 197 | 140+040 | 140+080 | 92 |
| 115+000 | 115+120 | 177 | 140+320 | 140+440 | 63 |
| 115+360 | 115+380 | 46 | 140+720 | 140+840 | 177 |
| 115+460 | 115+480 | 47 | | | |
| Total Area: | | | | | 89,932 |

Turfing (Embankment)

| Chainage | | Area ($m^2$) | Chainage | | Area ($m^2$) |
|---|---|---|---|---|---|
| Start | End | | Start | End | |
| 85+020 | 85+180 | 617 | 101+480 | 102+560 | 1,519 |
| 85+260 | 85+380 | 51 | 102+640 | 103+220 | 1,861 |
| 85+460 | 87+300 | 46,976 | 103+300 | 103+420 | 976 |
| 87+440 | 88+140 | 1,605 | 103+500 | 104+040 | 2,606 |
| 88+240 | 88+800 | 2,202 | 104+160 | 107+540 | 22,627 |
| 88+920 | 89+440 | 1,708 | 107+620 | 112+500 | 12,826 |
| 89+560 | 91+440 | 18,925 | 112+600 | 120+880 | 21,770 |
| 91+520 | 91+640 | 261 | 120+960 | 123+980 | 9,686 |
| 92+080 | 92+980 | 5,357 | 124+060 | 125+740 | 4,972 |
| 93+060 | 93+220 | 168 | 125+820 | 129+200 | 7,794 |
| 93+340 | 94+223 | 1,813 | 129+300 | 133+660 | 10,500 |
| 101+020 | 101+400 | 922 | 133+740 | 143+309 | 36,934 |
| Total Area: | | | | | 214,676 |

### 7.4.3 Special Requirement For Hill Road

In accordance with Section 13 of the Manual (from IRC: SP: 73-2015), IRC: SP: 1998 & recommended practice for treatment of embankment and road side slopes for erosion control (first revision) IRC: 56-2011 and relevant IRC codes & The cutting slope surface except on Hard Rock classified as per Clause 301.2 of MORTH Specifications for Road and Bridge Works shall be protected by the Seeding and Mulching as per Clause 301.8 of MORTH Specification, and the embankment slope shall be protected by Turfing as per Clause 301.7 of MORTH Specification.

### 7.4.4 Slope Protection

As the project involve cutting of existing hill slopes, it is imperative that slopes are stabilized for insuring longevity of the slopes and the roads. Slope stability, erosion control and landslide correction accomplished in accordance with IRC:SP 48-1998 reference may be drawn from IRC:56-2011.

**Note-** The contractor shall be responsible for accurate assessment of the actual requirement as per site situation & prepare design for slope protection & stabilization as per the specification & standard stipulated in schedule 'D' and submit the same to the AE for review through the proof consultant and implement it accordingly thereafter.

**Any increase in quantity over the above the tentative qty. as mentioned in above table or through change in specification will not be considered as change of scope.** Therefore contractor shall make thorough investigation as site and assess the requirement of slope protection and slide prone zone and other safety features at his own before submission of bid.

**7.4.5 Disposal of Debris: -** as per Manual.

## 8. TRAFFIC CONTROL DEVICES AND ROAD SAFETY WORK.

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

(a) Traffic/Road Signs:

Traffic/Road signs include roadside signs, ,curb mounted and delineators along the entire Project Highway.

Overhead traffic signs: - Full width Overhead signs: 2 nos. (Start and end of Project road)

(b) Pavement Marking:

Pavement markings shall cover road marking for the entire Project Highway.

(c) Safety Barrier:

Provide roadside safety barriers along the project highway at the locations as suggested in the Manual.

(d) Hazardous Locations:

The safety measures shall be provided at all hazardous/sinking/land slide locations in consultation with the Authority's Engineer.

(d) Pedestrian facilities:

The Pedestrian facilities shall be provided as per para 9.8 of Manual.

**8.2** Specifications of the reflective sheeting shall be as per Clause 9.2.3 of the Manual

## 9. Spoil Banks

Spoil bank shall be proposed in accordance with the Clause 3.1 of Schedule-D (Specification and Standard for the Construction).

Tentative locations for spoil banks are indicated below. However, the actual number, each location and volume of spoil banks shall be determined by the Contractor with approval of Authority's Engineer/Authority.

Any variation in number, each location and volume of spoil banks in this Schedule-B shall not constitute a Change of Scope.

| S. No. | Design Chainage (km) | Side | Maximum Capacity (Rough Estimation) (Cum) |
|---|---|---|---|
| 1 | 88+000 | RHS, 800m | 47,000 |
| 2 | 105+800 | LHS | 4,000 |
| 3 | 109+900 | RHS | 86,000 |
| 4 | 115+500 | RHS | 58,000 |
| 5 | 119+600 | RHS | 16,000 |
| 6 | 125+000 | RHS | 77,000 |
| 7 | 130+700 | LHS | 15,000 |
| 8 | 135+100 | RHS | 22,000 |
| 9 | 139+100 | RHS | 12,000 |

Note: Maximum capacity indicates the approximated capacity roughly estimated for each spoil bank. These quantities of capacity shall be confirmed by the Contractor based on his final

design drawings and the Plan for Earthworks submitted for review and approval by the Authority's Engineer.

## 10. COMPULSORY AFFORESTATION

The number of trees which are required to be planted by the Agency as compensatory afforestation should be as per Forest Conservation Act, thrice the number of trees to be cut.

## 11. SPECIAL REQUIREMENTS FOR HILL ROAD

The requirements in Hill/sleep road sections be followed as per Hill Road Manual (IRC: SP: 48-1998) and as per provisions in the Manual.

## 12. CHANGE OF SCOPE

The length of Structures and bridges specified here in above 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.

**SCHEDULE - C**
(See Clause 2.1)

# PROJECT FACILITIES

## 1. Project Facilities

The Contractor shall construct the Project Facilities in accordance with the provisions of this Agreement. Such Project Facilities shall include:

(a) Road Boundary Stone;

(b) 5th km and km stones

(c) 200 m stone

(d) Bus-bays and bus shelters;

## 2. Description of Project Facilities

**(a) Road Boundary Stone:** shall be provided in accordance with the provisions of Section 12 of the Manual.

**(b) 5th km and km stones:** shall be provided in accordance with the provisions of Section 12 of the Manual.

**(c) 200 m stone:** shall be provided in accordance with the provisions of Section 12 of the Manual.

**(d) Bus-Bays and Bus Shelters:-**
The Contractor shall provide minimum 16 nos. of Bus Bays with Bus Shelter on both side along the project highway. Tentative locations for Bus Bays are indicated below, however, the same shall be finalized as per suitability of location and site requirement in consultation with the Authority's Engineer/ Authority.

| No. | Village/Town |
|---|---|
| 1 | BABADAM |
| 2 | CHAMPAREA |
| 3 | GANOL |
| 4 | RONGANHiran |
| 5 | DAP. OF AGRICULTURE RONGKHON |
| 6 | TURA |
| 7 | DADAUNGIRI |
| 8 | RUBBER |
| 9 | PURAKASHYA |
| 10 | CHOKPOT |
| 11 | MOROPGRE |
| 12 | RENGSIPARA |
| 13 | RENDAPARA |
| 14 | MEGUPARA |
| 15 | PURAKHASIA |
| 16 | DALU |

## 3. Facilities for the Authority and the Authority's Engineer

The facilities to be provided for the Authority and the Authority's Engineer, comprehending the Site Offices and Accommodation shall be as follows:

**Table 1: Facilities for the Authority and the Authority's Engineer to be provided by the Contractors**

| **Section** | **Package** | **Offices** *(Note 1)* | **Accommodation** *(Note 2)* | |
|---|---|---|---|---|
| | | | **Staff** | **Period** (months) |
| Phase-I NH51 | Package 9:<br><br>KM85+000 to KM94+226 and KM101+000 to KM143+279 | Core Office Type 2<br><br>Location: Tura<br>Period: 48 months | - Team Leader (National):.....1<br>- National Experts .....7<br>- Sub-Professional Staff .....7<br>- Office Supporting Staff.....4<br><br>- Authority (Site Staff) .....1 | General .....36<br>T/L: .....39<br>R/E: .....48<br>Field Eng.1: .....48<br>Supporting Staff:.....48 |

Note (1): Site Office: The layout shall be prepared by the Contractor and submitted for review and approval by the Authority's Engineer. The locations shown in this table are tentative and shall be confirmed by the Authority's Engineer.

Note (2): Accommodation: Depending upon the Authority's Engineer acceptance, rental of existing buildings will be allowed depending the proximity of the works to the nearby cities or towns, and comfortability.

### 3.1 Site Office for the Authority and the Authority's Engineer

#### 3.1.1 Construction of Site Offices

The basic layout of each site office shall be prepared by the Contractor and submitted to the Authority's Engineer for review and respective acceptance.

The building shall comply with India's applicable specifications for architectural and structural works for buildings.

**a.** Basic Layout

The layout shall be prepared in accordance with the number of staff shown in Table-1 to accommodate properly the following (note: the plan area shown below are the minimum requirement to be considered):

(1) Core Office – Office Type 2: (to be located nearby Tura)

- Minimum Area: 270 sqm
  - One office room for Team Leader (private arrangement) ..... 25 sqm
  - One office room for the Authority's representative (private arrangement) ..... 25 sqm
  - One office room for experts visiting the Site or meetings for coordination..... 30 sqm
  - One office room for National Experts ..... 40 sqm

- One office room for Sub-Professional Staff ..... 40 sqm
- One reception/administration office room ..... 40 sqm
- A kitchen (Pantry) plan area well equipped with sink, draining board, cupboards, shelving, etc. ..... 12 sqm
- Male (1) and Female (1) toilets with shower and wash-hand basin facilities for the sole use of the Authority's representative, International Experts, National Experts, and administration staff (office manager and secretary) ..... 2 units
- Male (2) toilets for Sub-Professional and Supporting staff ..... 2 units
- Corridor for connecting all rooms (approx..20 sqm) .....1.50 m width
- Parking for the vehicles used by the Authority's Engineer and visitor's vehicles ..... 6 veh.

**b.** Basic Requirements

The Contractor shall, not later than 7 days after the starting date, submit full details of the Design Drawings to the Authority's Engineer, including floor plans, elevations, construction principles and materials, before commencing the erection of the facilities.

The Contractor shall be responsible for raising the ground (if necessary), grading and drainage in the vicinity of the building(s), with suitable access and walkways. The Contractor shall construct a covered hard-standing parking area, for the exclusive use of the Authority's Engineer and his visitors and respective access road to the parking area. The access road shall be paved and hard enough in order to be transited even during heavy rains. Outside lighting shall be installed around the buildings and the parking area, and appropriate signs shall be erected to indicate the purpose of the facilities.

All facilities shall conform to current fabrication standards for the required types. The facilities described above shall represent the minimum requirements. The Contractor shall provide all additional incidentals and necessary items, so that the facilities will be completely adequate and satisfactory in every respect for their intended use. Painting both the exterior and the interior shall be as agreed with the Authority's Engineer.

The building shall be completed with all services connected with clean water supply by water bowser (including elevated water tank and the tower for capacity of 2,000 liters for Office Type 2), electricity and sewerage. Each room shall be provided with at least four electrical outlet sockets. All power shall be 220V-240V, 50Hz except where otherwise agreed by the Authority's Engineer. All rooms shall be illuminated by fluorescent lighting. Each toilet shall be provided with a flushing toilet and warm water hand washing and shower facilities and extractor fans.

Telephone services (minimum 1 telephone line and 3 extension lines completed with equipment for the office), including international direct dialing shall be provided. In addition, extra lines shall be provided for facsimile and internet

connections. Each office shall be equipped with a telephone connected to the main reception telephone.

Offices and meeting rooms shall be air-conditioned. The air-conditioning may be either individual units or a central ducted system and shall be adequate to maintain temperature of not more than 24°C (dry bulb) at a relative humidity of 50% during the hottest season of the year. The noise level of the air-conditioning while working should be sufficiently low to allow normal voice level discussions to take place.

Office rooms shall be capable of providing at all times environmental conditions suitable for the operation of specified electronic office equipment.

The building shall be weather proof, fire protected, heat-insulated and secured. Windows shall give adequate light and ventilation and be protected with metal mosquito-proof gauze and have security bars and Venetian, or other approved sun blinds. Ceiling height above the floor level shall be at least 2.75 m. All internal walls shall be sound insulated. Floors shall be PVC tile covered. In toilets and other washing areas the floors shall have drains to assist cleaning.

### 3.1.2 Maintaining and Servicing of the Offices

The construction of the new office building for the Authority's Engineer shall be completed within 60 days since the date of commencement of the Contract and shall be equipped and maintained by the Contractor to the satisfaction of the Authority's Engineer until 3 months after the issue of a Completion Certificate for the Works or such earlier time as instructed by the Authority's Engineer whereupon the furniture shall be removed and any internal partition walls modified as required by the Authority's Engineer.

The Contractor shall provide all laborers, materials and equipment for maintaining and cleaning offices, furniture and fittings. The Contractor shall replace and/or restore, as directed, any facilities or parts thereof that become damaged, worn out, lost or stolen. The Contractor shall provide an adequate stock of all expendable and consumable items including refreshments, clean water supply and drinking water, paper towels, toilet rolls, soaps, washing up liquid, brooms/mops and shall ensure proper and continuing functioning of all components and parts of the facilities during the contract period.

The Offices shall be provided with waste disposal material and these shall be emptied and disposed of daily by the Contractor.

### 3.1.3 Equipment and Expenses for Running-Off the Offices

The Contractor shall provide the following furniture and equipment to be used by the Authority's Engineer at Site.

**Furniture and Equipment for Site Offices (each office)**

| Item | Unit | Quantity | Remarks |
|---|---|---|---|
| Refrigerator (deodorizer and no-frost system) | unit | 1 | Office Type 2: 150 liters' minimum capacity |
| Water Dispenser (19 liters capacity including bottles and 6 spares bottles/gallon) | set | 1 | Office Type 2 |
| Electric Kitchen Stove | unit | 1 | Size and model shall be discussed |
| Electric Kettle | unit | 1 | |
| Diesel Generator Set | | 1 | Office Type 2: 60 KVA |

## 3.2 Accommodation for the Authority and the Authority's Engineer Staff

### 3.2.1 Temporary Accommodation (initial period)

(1) General

Immediately after the date for Commencement of Works, during the first 3 months or until the permanent installations are prepared and approved, the Contractor shall provide rented houses as per the accommodation for all staff of the Authority's Engineer.

The accommodation shall be equipped with security grilles and mosquito netting, and shall be fully furnished and equipped with new items by the Contractor to the satisfaction of the Authority's Engineer, including curtains, linen, blankets, glassware, cutlery, crockery and kitchen utensils.

Each house shall be wired to permit the use of standby generators as well as mains for the supply of electricity. The generators shall be fitted with automatic starting switchgear if so directed by the Engineer. Covered, hard standing areas for positioning generators and storing fuel shall be provided.

Each house designated for the Team Leader and National Experts shall be provided with one telephone line and internet connection. Telephone installation shall be made by the Contractor but the cost of calls shall be paid by the Authority's Engineer staff.

Each house shall be provided with a TV (including cable and satellite connection). The installation shall be made by the Contractor but the cost of calls shall be paid by the Authority's Engineer staff.

Each house shall be provided with hot and cold water in the kitchen and the bathrooms.

The Contractor shall provide watchmen for security purposes to the approval of the Authority's Engineer.

The accommodation shall be available and ready for occupation within the number of days approved by the Authority's Engineer after the Commencement Date.

In the event that the Contractor fails to provide the required accommodation within the time specified or subsequently agreed by the Authority's Engineer, the Contractor shall provide, at no cost to the Employer, suitable hotel accommodation until such time as the accommodation is ready for occupation.

When a house is no longer required by the Authority's Engineer, all furniture, fittings and equipment provided by the Contractor for that house shall become the property of the Contractor.

(2) Housing Types

- ✧ House for the Authority near to Core Office (Central Team: 1 per 1 person)

  One detached house, internal floor area approximately 60sqm, comprising 1 x sitting room, 1 x dining room, 1 x bedroom with attached bathrooms, 1 x kitchen. Split type air-conditioners to the sitting room, dining room and

bedrooms. Moreover, a garage for one vehicle and fully equipped quarters for two servants shall be provided.

- ✧ Team Leader (Authority's Engineer)

  One detached house, internal floor area approximately 60sqm, comprising 1 x sitting room, 1 x dining room, 1 x bedroom with attached bathrooms, 1 x kitchen. Split type air-conditioners to the sitting room, dining room and bedrooms. Moreover, a garage for one vehicle and fully equipped quarters for two servants shall be provided.

- ✧ National Experts (1 per 3 experts + 1 per 4 experts)

  Two detached houses, internal floor area approximately 80sqm (for 3 experts) and 100sqm (for 4 experts), each comprising: 1 x sitting room, 1 x dining room, 1 x bedroom per expert with attached bathrooms, 1 x kitchen. Split type air-conditioners to the sitting room, dining room and bedrooms. Moreover, a fully equipped quarter for one servants shall be provided.

- ✧ Sub-Professional Staff and Office Supporting Staff (1 per 3 persons + 2 per 4 persons)

  Three detached houses, internal floor area approximately 60sqm (for 3 persons) and 80sqm (2 x for 4 persons), each comprising: 1 x sitting room, 1 x dining room, 1 x bedroom per person, 1 x bathroom, 1 x kitchen. Split type air-conditioners to the sitting room, dining room and bedrooms. Moreover, a fully equipped quarter for one servants shall be provided.

- ✧ Secretary or Ladies Staff (1 per 2 persons)

  One detached house, internal floor area approximately 50sqm, comprising 1 x sitting room, 1 x dining room, 1 x bedroom per staff, 1 x bathroom, 1 x kitchen. Split type air-conditioners to the sitting room, dining room and bedrooms. Moreover, a fully equipped quarter for one servants shall be provided.

(3) Maintenance

The Contractor shall be responsible for supplying all utilities, including electricity (whether by mains or generator), water, timber for open fires, drainage and telephone services, and shall meet the cost of these services, except the cost of telephone calls.

The Contractor shall maintain the accommodation, and all furniture, fittings and equipment, whether supplied by him or not, in good repair and to the satisfaction of the Authority's Engineer as long as such accommodation is occupied by the staff of the Authority's Engineer for the purposes of the Contract.

### 3.2.2 Construction of Houses for Accommodation (after lasted the initial period)

The procedures and standards for construction approved for the construction of the Site Offices will be applied for the construction of houses for accommodation of the staff of the Authority's Engineer.

The layout and design of the houses shall maintain equivalency with the houses approved for the Initial Period.

The location and house type shall be submitted for review and approval to Authority's Engineer.

The Initial Period will be defined and proposed by the Contractor based on the approved Construction Programme but not later than 3 months or the period accepted by the Authority's Engineer.

# SCHEDULE – D

(See Clause 2.1)

## SPECIFICATIONS AND STANDARDS

1. Construction

   The Contractor shall comply with the Specifications and Standards set forth in Annex-I of this Schedule-D for construction of the Project Highway.

2. Design Standards

   The Project Highway including Project Facilities shall conform to design requirements set out in the following documents:

   Manual of Specifications and Standards for Two- Laning of Highways (IRC: SP: 73-2015) and Hill road manual (IRC SP 48:1998), referred to herein as the Manual.

**Annex-I**

(Schedule-D)

# Specifications and Standards for Construction

## 1. Specification and Standards

All Materials, works and construction operations shall conform to the Manual of Specifications and Standards for Two-Lanning of Highways (IRC: SP: 73-2015), referred to as the Manual, and MORTH Specifications for Road and Bridge Works. Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Engineer in charge.

## 2. Deviations from the Specifications and Standards

2.1. The terms "Concessionaire", "Independent Engineer" and "Concession Agreement" used in the Manual shall be deemed to be substituted by the terms "Contractor", "Authority's Engineer" and "Agreement" respectively.

2.2. Notwithstanding anything to the contrary contained in Paragraph 1 above, the following Specifications and Standards shall apply to the Project Highway, and for purposes of this Agreement, the aforesaid Specifications and Standards shall be deemed to be amended to the extent set forth below:

| S. No | Clause Referred in Manual | Provisions as per Manual | Modified Provision |
|---|---|---|---|
| 1 | TCS Fig. 2.1<br>Fig. 2.11<br>Fig. 2.12<br>Fig. 2.13 | Typical Cross Section as per Manual | TCS as modified and specified under Typical Cross Section para 2.11 of Schedule-B |
| 2 | Section – 2 of Manual | Geometrical Design standards and General features specified under various para's | As per para 2 of Schedule-B |
| 3 | Existing Bridges | If the width of additional widening is less than 0.5 m on either side, the widening of the structure may be dispensed with and traffic shall be guided with the help of crash barriers in a transition of 1 in 30 on either | The existing bridge proposed to be repaired and rehabilitated as specified in schedule B. |

| S. No | Clause Referred in Manual | Provisions as per Manual | Modified Provision |
|---|---|---|---|
| 4 | Layout & Design of Bus Bays | For hilly areas, where there is a general constraint on space, the layout indicated in fig 12.3 may be adopted for Bus bay | The width & length has been designed as per available space in field. |
| 5 | Particular Specifications | - | As per para 3 given below |

**3. Particular Specifications**

**3.1 Earthworks: Re-Usable and Unsuitable Materials**

In addition, and without detriment to the requirements specified in Section 4 of the Manual and Section 301 of the MORTH Specifications for Road and Bridge Works related to the re-use and unsuitable material, the following requirements shall be included:

**c.** Previous to perform the earthworks for road construction (minimum 28 days before commencement of earthworks), the Contractor shall submit for review and approval by the Authority's Engineer, a "Plan for Earthworks" detailed by sections showing the cutting and embankment with respective hauling distances, quantities and location of the re-usable material and respective spoil-banks for wasting of unsuitable material, not re-usable material or exceeding material (from the balance between cutting excavation and fill embankment works), and respective time schedule. The Plan for Earthworks shall be updated and reviewed periodically every 3 months or when required by the Authority's Engineer.

**d.** When unsuitable material below sub-grade level in cut or below embankment foundation level is planned to be removed, the soil left in place after the removal of the unsuitable material shall be compacted to a depth of 20 cm and a density of 90 percent of the maximum dry density determined according to the relevant specifications.

**e.** The material to be disposed of as Unsuitable Material shall not be wasted until it is duly approved or directed by the Authority's Engineer.

**f.** Unsuitable Material shall be removed and disposed of in waste areas provided by the Contractor in such a manner as to present a neat appearance and not to obstruct drainages to any highway nor to cause injury to highway works or property. If it becomes necessary for the Contractor to locate or relocate any waste areas, the Contractor shall obtain previously the approval from the Authority's Engineer to commence the operation for spreading any waste.

**g.** The Contractor is responsible to perform and follow all the required procedures to obtain respective authorizations for the usage of the areas where it is intended to waste the unsuitable material or to open quarries for borrow material.

**h.** The relevant and applicable provisions "Environmental Control and Protection" shall be adhered to the Plan for Earthworks for the hauling and disposal of unsuitable materials.

**i.** Spoil Banks:

The following requirements shall be satisfied for the proper implementation of Spoil-Banks:

- ✧ The Contractor shall submit, at least 15 days before commencing the works for any Spoil-Bank, for review and approval by the Authority's Engineer a detailed plan for implementation of the Spoil-Banks that are being considered in his "Plan for Earthworks" showing the location, capacity, time schedule and method statement for construction
- ✧ The Spoil-Banks shall be constructed applying the same technical specifications used for road embankment construction regarding preparation of the ground, leveling, thickness and compaction of each layer.
- ✧ The drainage to be implemented in the Spoil-Banks shall be constructed following the applicable standards for road drainage and in accordance with the drawings prepared by the Contractor in accordance with the Article 10: "Design and Construction of the Project Highway" of the Contract Agreement, and reviewed & approved by the Authority's Engineer.

The Spoil-Banks shall be design in accordance with the requirements shown in **Table-1** and the typical arrangement shown in **Figure-1**.

**Table-1: Requirements for Design and Construction Spoil Banks**

| **Design Conditions:** | | |
|---|---|---|
| **Item** | **Description** | **Criteria** |
| - Topography | Depression or hilly | Prevention against disasters due to landslide and collapse |
| - Ground Inclination | Less than 22° | ditto |
| - Embankment' Size | Embankment height shall be 30m or less | ditto |
| - Land's Use | Land is not urbanized | Environmental protection |
| - Environment | Not considered as environmental nature reservation. Residential areas (if any) shall not located at downstream of spoil bank. | ditto |
| **Design Requirements:** | | |
| **Item** | | **Remarks** |
| - Installation of open drain or canal | | Drain is treated from upstream |
| - Installation of surface drainage system | | Slope feet and berms |
| - Installation of underground drainage | | Swamps and Valley |
| - Installation of internal-horizontal drainage of embankment | | Reduction of water filtration in the embankment and prevention against superficial collapse |
| - Implementation of the works for Slope Protection | | Turfing or Seeding |
| - Construction of retaining wall in the lower edge | | Prevention against collapse |
| - Installation of check dam structure on the upstream inlets | | Concrete Wall |
| - Implementation of the works for scouring prevention along downstream outlet | | Gabion Mat |
| **Special Provisions on the Specifications:** | | |
| **Item** | **Description** | **Special Provision** |
| - Drainage | Works for channels drainages | 50 years return period |
| | Gutters | 25 years return period<br>Minimum 40cm x 40cm |
| | Horizontal drainage sheet<br>(50cm width, 2m interval) | Every 5m height; L=20m |
| - French Drain | Large Drain Basin | Perforated pipes of 300mm minimum diameter shall be applied |
| | Small Drain Basin | Perforated pipes of 100mm minimum diameter shall be applied |
| - Slope Protection | Sodding | As the standards |
| - Retaining Wall | Retaining wall by Gabion or Gravity Type | As the standards |
| - Embankment | Compaction and layer thickness | Compaction of embankment equal or higher than 90% shall be secured. Layer thickness same than road embankment. |

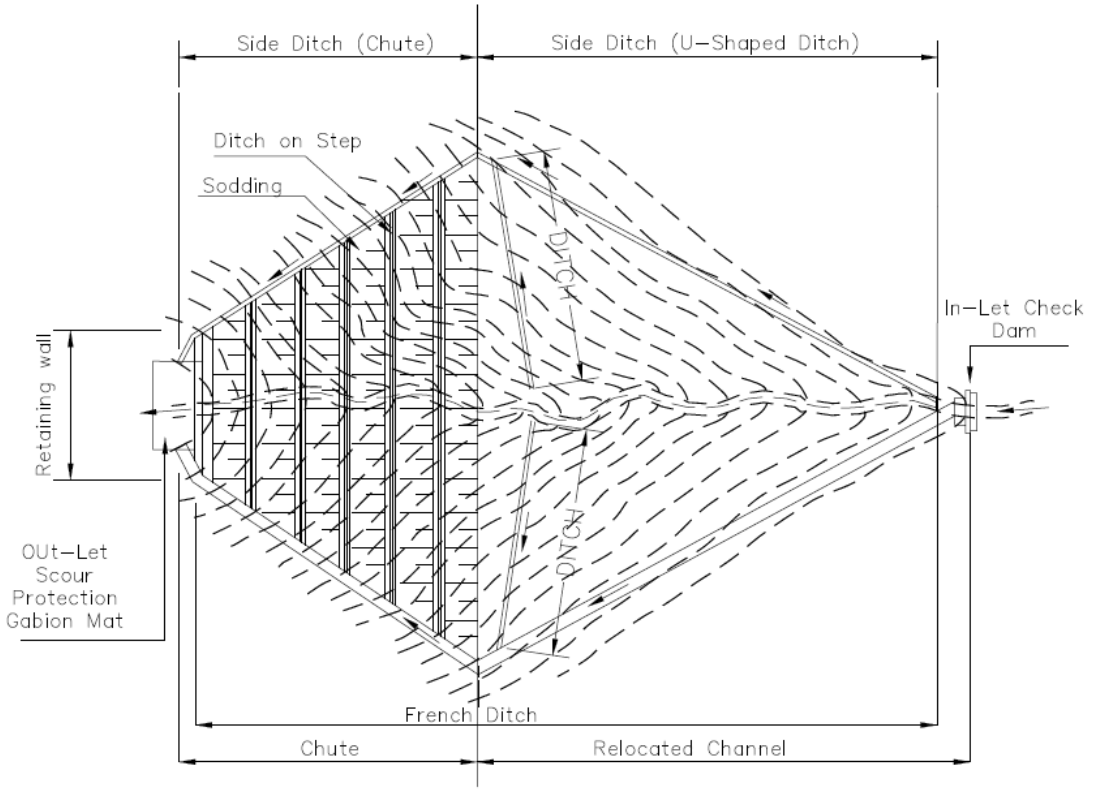



**Figure-1(a): Typical Arrangement for Spoil Banks: Plan**

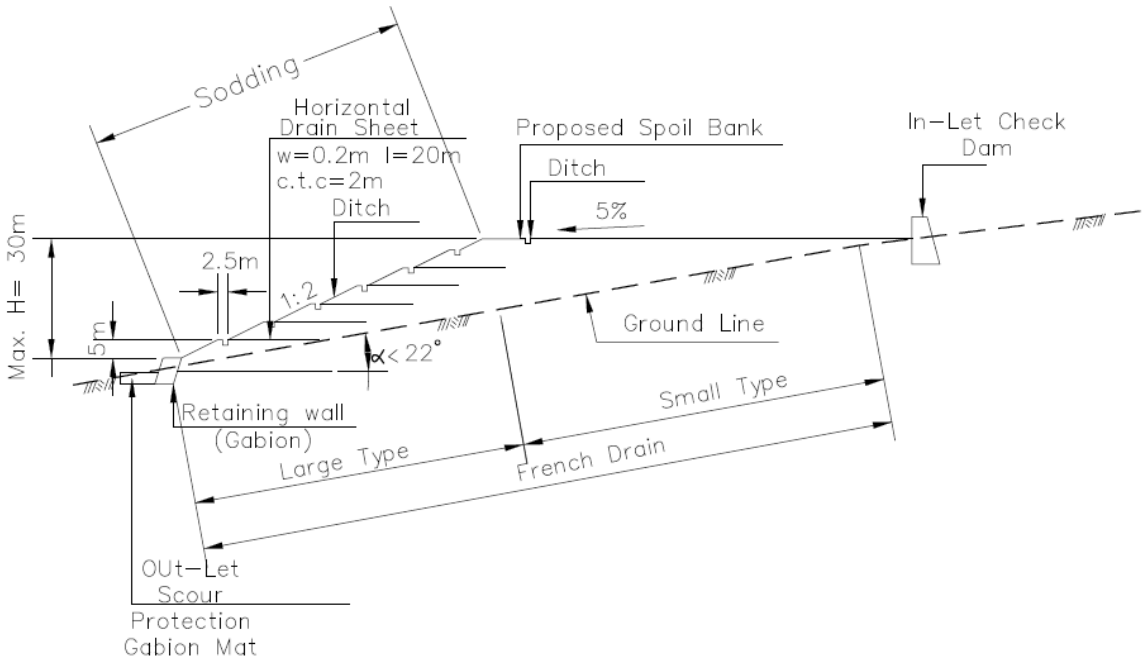



**Figure-1(b): Typical Arrangement for Spoil Banks: Profile**

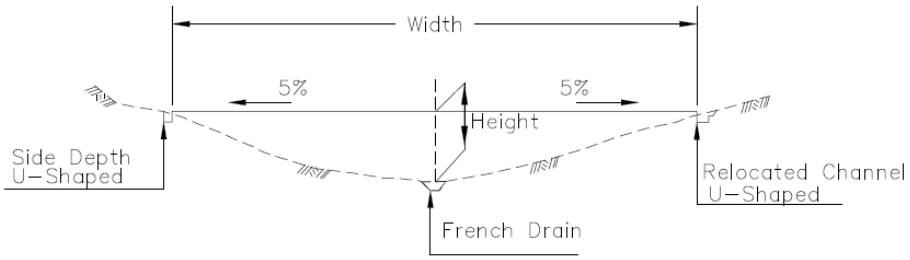



**Figure-1(c): Typical Arrangement for Spoil Banks: Cross Section of French Drain**

**j.** Supplementary Works in Case of Disasters by Landslides

The works to be performed in the event of disasters due to landslides, slope failure or soil/rock collapses, etc. occurred during the construction period shall be treated by the Contractor under the following conditions and requirements:

- The material from the disaster area which is disrupting the traffic or operation of the Project road shall be removed and treated as unsuitable material, and shall be disposed in a Spoil Bank in accordance with these specifications.
- The slopes remaining after the effect of the disaster shall be re-arranged and the affected drainages shall be reestablished.
- The quantities and costs for these works will be deemed to be covered in the quoted price and no separate or additional payments will be made under this account.

## 3.2 Design and Construction Specification for Slope Prevention Works

Slope protection of NH54 shall be designed in accordance with requirements and design conditions described in these Specifications and the requirements specified by IRC: SP 102-2014: "Guidelines for Design and Construction of Reinforced Soil Walls" as applicable. The preliminary design drawings are to be used as per reference.

### 3.2.1 Sub-Surface Drainage

**k.** General

In conducting groundwater drainage works, it is important to investigate groundwater conditions, surrounding facilities, etc. beforehand in consideration of its purpose.

**l.** Planning

The sub-surface drainage shall be able to drain promptly the groundwater that is affecting the landslide activity, taking it to in/outside of the landslide.

The following items shall be considered for preparation of the planning for sub-drainage drainage:

i) Implementation of boreholes of a diameter of 66mm or more to drain shallow groundwater.

ii) The free groundwater shall be drained during the time of rain.

iii) The planned height for groundwater drawdown shall be about 3 m at the landslide layer thickness of about 20 m.

iv) Evaluation of the effect shall be made taking into account the water level before construction, the water level after construction, and the amount of discharge water.

**m.** Investigation

The groundwater investigation shall be conducted during the rainy season and the dry season and grasp the groundwater level affecting the landslide activity.

The investigation on the groundwater level shall be conducted by using boring holes carried out on the landslide that will be treated.

**n.** Save Record

Changes in the groundwater level shall be recorded and kept by the responsible person in order to contribute to the evaluation and engineering judgment of the effect of the design / countermeasure work.

**o.** Material

The following material and respective method for application shall be used:

i) *Groundwater Drainage*: Strainer-processed drainage pipes shall be inserted.

ii) *Drainage Pipe*: PVC pipe (VP-50 [outer diameter 60 mm, inner diameter 51 mm]) shall be used.

iii) *Strainer*: The strainer or slotted type shall be processed for the total length. The diameter of strainer is 2 to 5 mm.

iv) *Protection of Strainer*: Strainers shall be wrapped or covered with a polyethylene sheet for protection to prevent from clogging and disruption.

**p.** Design and Construction

The design and construction of sub-surface drainage shall apply the following basic procedure or method:

i) Placement in-site of the drainage pipes

ii) Radial or parallel arrangement of the drainage pipes without affecting to other facilities located nearby or around the area

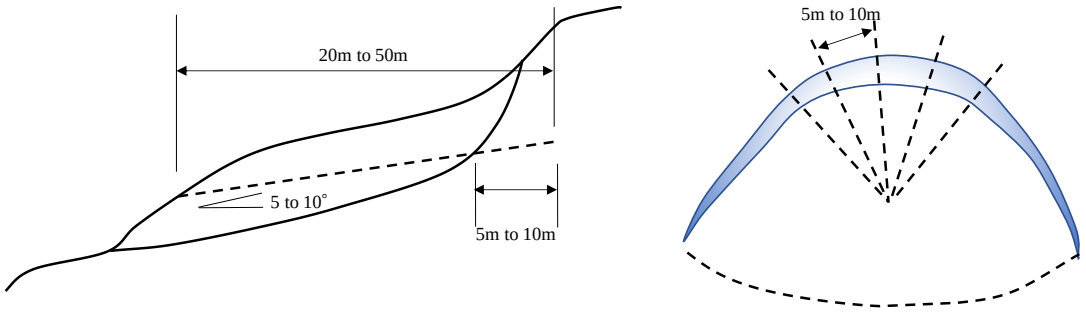
iii) Confirmation of the angle for installation of the drainage pipes. Drainage pipes shall be installed upwardly 5° to 10°.

iv) Confirmation of the length of drainage pipes:

- All pipes shall be about 20m to 50m long
- The pipes shall be inserted into the sliding surface in 5m to 10m and shall be installed with a spacing of 5m to 10m

vi) Protection of drilling mouth

- The drilling mouth shall be set on a stable ground.
- To install gabions or concrete walls so that the discharged water does not wash out sediment around the drain outlet.




**q.** Maintenance

The works for maintenance of the drainage system shall take into account the following main items:

i) Inspection of drainage operative efficiency

The main objective of the groundwater drainage system is to drain promptly all the groundwater at the time of heavy rain.

In order to secure the drainage in good and efficient operative efficiency conditions, periodically inspection is necessary to observe the quantity of drained water immediately after heavy rain to confirm the landslide activity and drainage function.

The period for periodically inspection shall be about 3 to 5 years.

ii) Inspection of drainage pipe

After 10 years or more, the drainage pipe might be clogged at the drilling mouth by the effect of ferric oxide. Therefore, it is necessary to perform regularly inspection of the facilities that have been over operating 10 years or longer period.

Based on the results of the inspection, after confirmation of the existence or absence of clogging, the works for cleaning and washing shall be applied as necessary.

**r.** Applicable Design Standard

Followings are IRC Specifications, Standards and Design codes majorly applied for the design;

- IRC: Special Report: State of the Art: Landslide Correction Techniques. Sub-Clause 7.8
- IRC: SP 48 -1998: Hill Road Manual. Sub-Clause 11.6.3

### 3.2.2 Rockfall Prevention Fence and Rockfall Prevention Retaining Wall

a. Rockfall Prevention Fence

✧ General

Rockfall prevention fence is a countermeasure installed besides the road to prevent against the rocks falling from the slopes.

For the design of rockfall prevention fence, it is necessary to assume the external forces that will be applied on the structure. The assumed falling-rock weight, falling speed, direction of action on the protection fence, action position, etc. are different depending on the topography, geology, weathering condition of the slope, and vegetation on each site. Therefore, in designing a rockfall prevention, it is necessary to estimate the value that seems to be the most appropriate on the basis of the investigation at the site and experience of falling rocks in the past.

✧ Design Concept

Rockfall prevention fences are effective as countermeasures against falling rocks of relatively small scale, and the type and size shall be determined according to the situation of the slope. Rockfall prevention fences have the following types:

i) *Wire Rope and Wire Mesh Type*: Using H steel as a support, wire rope and wire mesh are attached to it.

ii) *H Steel Type*: H steel is used as a support, horizontal steel of H steel and expanded metal are attached, and usually old tires are applied as cushioning material.

iii) *High Energy Absorption Type*: A mechanism that easily absorbs energy by elastic-plastic deformation of members such as net (wire mesh), wire rope or strut is incorporated.

✧ Load

The load is the falling-rock load. The falling-rock for design is assumed as a rock with a maximum diameter of 50 cm, a falling height of 10 m or less (within the site range), and with an unit volume weight 26 kN/m3.

✧ Allowable maximum displacement amount and possible absorbed energy

Allowable maximum displacement amount and possible absorbed energy shall be calculated.

b. Rockfall Prevention Retaining Wall

✧ General

*Rockfall Prevention Retaining Wall* is usually built as gravity type concrete retaining wall. The basic idea is to convert the kinetic energy of the falling

rock into deformation energy of the supporting ground and to stop the falling-rock by absorbing it.

For the design, it is necessary to consider the stability of the *Rockfall Prevention Retaining Wall* and reinforcement of the cross section of the structure, taking into consideration the topography and geology as well as the expected falling rock weight, falling height.

✧ Stability of Retaining Wall during Rockfall Collision

Stability of retaining wall during rockfall collision shall be considered.

✧ At Ordinary Times, At Deposition, During Earthquake

Stability of retaining wall at ordinary times, at deposition, during earthquake shall be considered.

c. Applicable Design Standard

The following are IRC Specifications, Standards and Design codes majorly applied for the design;

- IRC: Special Report State of the Art: Landslide Correction Techniques. Sub-Clause 7.3.6 and Sub-Clause 7.9
- IRC: SP 48 -1998: Hill Road Manual. Sub-Clause 8.2.1
- IRC: 78-2014 Standard Specifications and Code of Practice for Road Bridges Section VII Foundation and Substructure (Revised Edition). Sub-Clause 710.7
- IRC: 24-2010 Standard Specifications and Code of Practice for Road Bridges Section V Steel Road Bridge (Third Revision). Clause 502.

The following specifications of JIS (Japanese Industrial Standards) or equivalent shall be applied for the materials:

- JIS G 3101: H steel
- JIS G 3525: Wire rope
- JIS G 3552: Wire net

### 3.2.3 Anchor Works

**s.** Design

✧ General

i) In designing an anchor, consideration should be given to safety, workability and economic efficiency so as to conform to the purpose, and to have no harmful influence on surrounding structures, buried objects and so on.

ii) In designing an anchor, in principle, a basic test shall be conducted. If it cannot be carried out before design, it shall be carried out immediately after the start of construction to confirm the validity of the design.

✧ Investigation

i) General investigation: (investigation other than geotechnical investigation)

- literature investigation
- investigation of adjacent structures and their influence
- investigation of buried objects of underground
- surrounding investigation
- investigation of construction conditions.

ii) Geotechnical investigation:

- Investigation on corrosion
- Investigation for design anchor force
- Investigation for finding the installation position of anchor bodies
- Investigation for finding the extreme pull-out force of anchor
- Investigation for design of reaction force body
- Investigation on workability
- Investigation of groundwater

iii) Basic investigation test:

- Pull out test (test to set limiting friction resistance and ultimate bearing resistance of the ground)
- Long term test (Test to presume of decrease tendency of residual tensile force of anchor planned for important structures)

iv) Save record:

- Materials related to the investigation of anchor shall be kept by the responsible person.

✧ Material

i) General:

- Materials shall comply with the IRC's prescribed standards, international standards, Japanese Industrial Standards or equivalent approved by the Authority's Engineer.
- When materials used for anchors are being assembled, materials that do not affect adversely to other materials shall be used.

ii) Grout:

- Cement-based grout: Cement shall conform the requirements of Section 1000 of the Specifications for Road and Bridge Works of MORTH.
- When grouts other than cement-based grout are used, those having required quality and performance shall be used.

iii) Tendon

- Materials of tendon shall conform the requirements of Section 1009 of the Specifications for Road and Bridge Works of MORTH. Also, it shall obtain approval from the Authority's Engineer.
- When steel material is used as a tensile material constituting tendon, it is necessary to use one conforming to the standards and standards of public institutions (JIS G 3536-2008, JIS G 3109-2008, JIS G 3137-2008).
- When continuous fiber reinforcement material is used as a tensile material constituting tendon, it is necessary to use one conforming to the standards of JSCE-E 131-1999 (Japan Society of Civil Engineering).

iv) Fixture

- The fixture shall have a structure and strength that does not break or impair the performance of the anchor before the tensile material is broken.
- The fixing tool shall have a structure adapted to the structure and purpose of use.

v) Other materials

- Head Cap: The head cap shall protect the anchor head and shall have a leak prevention function and strength and durability of the anticorrosive material.
- Bearing Pressure Plate: The bearing pressure plate shall have a shape and strength suitable for the fixture and the structure.
- Sheath: The sheath shall have undamaged abrasion resistance and strength, durability and water tightness against harmful substances when assembling, transporting, inserting and grouting of the tendon.
- Others: The other materials shall be of a shape and material that does not interfere with the function of the anchor, depending on the type of anchor and purpose of use.

✧ Corrosion protection

i) General:

Considering the corrosive environment around the structure, the service period and the importance of the structure, the anchor shall be ensured corrosion prevention so that the function of the anchor is maintained during its use period.

ii) Anticorrosive materials:

The following, or others proposed by the Contractor and approved by the Authority's Engineer, are the applicable anticorrosive materials:

- Filler: Greases, petrolatums, synthetic resins are often used.
- Covering material (sheath): Synthetic resin (polyethylene, polypropylene, etc.), stainless steel, steel materials and so on.
- Coating material: Galvanizing, anti-rust plating, epoxy material and so on.

iii) Anticorrosion method

- The anticorrosive structure of the anchor body shall not interfere with the structure of the anchor body which transmits the tensile force to the ground.
- Corrosion protection of the tension part should be a structure that combines the sheath and other anticorrosive material and shall be able to follow the change of the tension.
- The anti-corrosion structure of the anchor head shall not interfere maintenance and management such as lift-off test or re-tension.
- Since the risk of corrosion is particularly high at the boundary between the tension part and the anchor body or between the tension part and the anchor head part, corrosion protection shall be performed in a reliable manner.

✧ Design

i) Anchor arrangement

- *Anchor arrangement plan*: Anchor placement shall be planned taking into consideration the overall stability including the surrounding ground of the structure fixed by the anchor, the influence on the adjacent structure, the geology and so on.
- *Tilt angle of anchor*: The tilt angle of anchor shall be determined to ensure that a given anchor can be constructed. But, angles between -5° and + 5° may effect on the anchor strength by residual slime or grout breathing, so this range should be avoided.
- *Anchor body installation interval*: The installation interval of the anchor bodies shall be determined in consideration of the interaction of the anchors. Generally, an interval of 1.5 m or more shall be secured.

ii) Anchor length

- *Anchor Free Length*: In principle, the minimum length of the anchor free length shall be 4 m, and the anchor free length shall be determined in consideration of the thickness of the earth covering, the stability of the entire structure system and so on.
- *Tendon Free Length*: Tendon's free length shall be determined to allow for deformation and to ensure the required tension.
- *Anchor length*: In principle, the length of the anchor is 3 m or more and 10 m or less, and it shall be determined in consideration of the

drawing force of the ground and grout, and the binding force of grout and tendon.

iii) Anchor body

The anchor body shall have a required strength and durability during tension or service period and have a structure that can reliably transmit the anchor force to the ground. The compressive strength of grout such as cement paste and mortar used for anchor bodies shall be 24N/mm$^2$ or more in consideration of durability against deterioration of grout during service period.

iv) Anchor head

- The anchor head, that is, the fixing tool and the pressure bearing plate is a part provided for reliably transmitting the anchor force to the structure or the ground. It shall have a required strength against the anchor force and be a structure that does not cause harmful deformation.
- The anchoring force decreases with time due to creep of the ground and relaxation of the tensile material. Therefore, when it can be predicted that re-tension is required, the tensile material constituting the tendon shall use a tensile margin which has sufficient length or a fixing tool which can be re-strained.

v) Anchor force

- The design anchor force (Td: the tensile force used for the design): Td shall not exceed the allowable anchor force (Ta).
- The allowable anchor force (Ta) shall be examined for the following three items, and the smallest value shall be adopted:

  - Tendon allowable tensile stress (Tas)

  The tendon allowable tensile force (Tas) shall be set to a smaller value among the Tendon's ultimate tensile force (Tus: the tensile force obtained from the maximum test force prescribed by JIS such as steel used for tendon) and the tendon's yield tensile force (Tys: the tensile force obtained from the test force against 0.2% permanent elongation prescribed by JIS such as steel used for tendon) multiplied by the reduction rate.

  - Allowable binding force of Tendon (Tab)

  Tendon's allowable binding force (Tab: the value obtained by dividing the ultimate binding force of Tendon by the safety factor) shall be a value considering the stress transmission method from tendon to grout material and design standard strength of grout material.

  - Allowable pull-out force of anchor (Tag)

  The allowable pull-out force (Tag) of the anchor shall be a value obtained by dividing the ultimate pull-out force (Tug: the value at

which the resistance due to adhesion, friction or bearing occurring between the ground and the anchor body becomes the ultimate limit state) of the anchor by the safety factor.

vi) Tension force at fixing time

The tension force at fixing time shall be determined depending on the purpose of use, considering the stability of the entire structure including the ground.

- *Initial tensile force*: Maximum tensile force when tensioning and fixing the anchor head.
- *Tension force at fixing time*: Tensile force acting on tendon after fixing time is completed.
- *Residual tensile force*: It is the tensile force that ultimately acts on tendon due to ground creep, relaxation of tensile material, and other external forces.

vii) Basic investigation test

- *Pull-out test*: The pull-out test is carried out to confirm the ultimate pull-out force of the anchor and its behavior, and to determine various constants parameters used for anchor's design. For the anchor used in the pull-out test, the specifications of the anchor shall be specified so that the ultimate pull-out force can be confirmed.

  From the test results, it is possible to calculate the ultimate skin friction resistance (τa) or the ultimate bearing resistance (qu) of the anchor body.

  - Test Anchor

  The test anchor shall be carried out in the same way as the anchor to be used. The planned maximum load shall be planned so that ultimate destruction occurs between the ground and the anchor body and can be pulled out.

  - Loading Method

  The loading method shall be carried out in a multi-cycle system in which the relationship between load and elastic displacement amount and plastic displacement amount can be obtained. The number of cycles is decided by the responsible technician's judgment.

- *Long term test*: Long term tests are performed to confirm the long-term behavior of the anchor and to determine the constants used for designing the anchor. The test anchor used for the long-term test shall be carried out with an anchor constructed under the same use conditions as the actually-used anchor
- *Test load*: The maximum load for test shall be as follows:
  - PC steel material: yield tensile load × 0.9 or less

- Continuous fiber reinforcement material: ultimate tensile load × 0.75 or less

**t.** Construction

✧ General

In anchor construction, ground conditions, environmental conditions, construction contents and on-site construction conditions shall be grasped to ensure safety, disaster prevention and the surrounding environment conservation. In addition, construction plans shall be formulated to satisfy the design specifications and obtain appropriate quality. Construction shall be carried out by specialized workers under the guidance of responsible technicians who have sufficient knowledge and experience regarding anchors.

✧ Construction plan

i) When constructing an anchor, a construction plan document that defines the construction method, construction management method, and management standard at each construction stage shall be prepared in order to construct an anchor that satisfies the design specifications.

The standard items described in the construction plan document are as follows:

- construction purpose
- construction outline
- plan/design condition
- process
- construction management organization table
- equipment used
- material used
- temporary plan
- work procedure, construction procedure
- construction management, quality control plan
- safety management plan
- technical document, brochure, etc.
- others

ii) The construction plan should take into consideration safety and environmental conservation at the site and its surroundings, and maintenance and management of the anchor.

✧ Construction and construction management

i) Construction and construction management of anchors shall be implemented based on the construction plan.

ii) In the construction of anchors, if a situation different from the conditions assumed at the time of planning occurs, it is necessary to promptly investigate the cause and take appropriate measures as necessary.

✧ Material storage

i) The materials to be used (fixtures, tendons, other materials for processing) shall be kept so as not to impair their functions. The storage location should be level so as not to touch the ground. In addition, it is necessary to take into consideration not to adversely affect the quality due to adhesion of rain water, moisture, salt, mud and the like.

ii) At the time of storage of materials, safety data sheets such as material chemical substances (injection material, rust preventive material, waterproof material, etc.,) should be clearly showed so that the workers can view them at any time as necessary.

✧ Drilling

i) Drilling of the anchor shall satisfy the control value specified in the construction plan concerning the position, hole diameter, length, direction, etc. indicated in the design documents. In drilling, the following points shall be considered:

- The drilling method shall be able to prevent the collapse of the hole wall and be adopted a method that can reliably perform tendon insertion and grout injection. For this reason, it is necessary to select an appropriate method with casing drilling as a standard.
- The control value of drilling precision shall be determined in consideration of the importance of the structure, purpose of use, anchor specification, etc. so that the anchor will not adversely affect other existing structures. Also, it is necessary to set so that the anchors to be constructed do not interfere with each other.
- It is necessary to estimate the position and layer thickness of the installation ground of the anchor body based on the color / state of the slime discharged during drilling and the drilling speed, etc., and to confirm the validity as the installation ground.

ii) If there is concern about the influence on the surrounding ground due to the drilling of the anchor, it shall be prevented by an appropriate method.

iii) In the case where the groundwater level is higher than the drilling mouth, or in the case of artesian water, spouting of considerable water or sediment is assumed from the drilling mouth during the anchor construction, and the state that adversely affects the quality of grout of the anchor body is presumed. If such a situation is assumed, appropriate measures shall be taken to prevent this condition until the anchor body is completed.

iv) Cleaning in the drilling hole shall be carried out by a method using fresh water or air depending on ground conditions and construction conditions. Drilling of soft rocks with slaking properties such as mudstone and tuff

shall be taken care as drilling surfaces tend to become muddy and there is a possibility that prescribed skin friction resistance cannot be obtained.

v) In the case of the ground such as gravel, talus or rocks with many cracks, there is a concern that grout of the anchor body may flow out into the ground. In this case, it is necessary to conduct pre-injection with grout.

✧ Assembling and processing Tendon

i) Tendon shall be assembled so as not to impair its function based on design specifications. Since assembly and processing are carried out using parts such as a sheath and a centralizer, each component shall be handled carefully.

ii) Tendon shall ensure the covering of the predetermined grout and assemble to be located it in the center of the hole.

iii) Cutting of tendon is not a method of applying heat such as gas cutting, but it shall be done using a disk cutter and so on so as not to impair its characteristics.

✧ Tendon handling

Tendon shall be handled carefully so as not to scratch, bend sharply, or destroy anticorrosive material. The tendon of the anchor body to which the grout adheres shall be handled carefully so as not to adhere to the oil or soil that impairs the function.

✧ Insertion and retaining of Tendon

Insertion of the tendon shall be performed precisely in a predetermined position so as not to cause harmful damage or deformation and hold the tendon so as not to move until the grout hardens.

✧ Injection

The injection is performed by replacement injection, pressurized injection and filling injection.

i) Substitution Injection:

Replacement injection shall start from the lowest part of the anchor hole in order to smooth drainage and exhaust air in the hole. The work shall be carried out continuously without interruption until the grout having the same properties (the same degree of concentration) as the injected grout is discharged from the drilling mouth.

ii) Pressurized injection:

Methods of pressurized injection include casing pressurization and packer pressurization. The injection shall be carried out by using an appropriate method according to the ground conditions around the anchor body.

iii) Filling Injection:

This purpose is to increase the anticorrosion function of the free length part by filling the gap between the outside of the anchor free long sheath and the

ground with grout, and to control the looseness and weathering of the ground around the hole wall.

✧ Curing

The anchor shall be cured so as not to adhere foreign matter or not to receive deformation and vibration such as impairing function during the period from the end of the grout injection to the tension of the tendon and from the fixing to the head treatment.

✧ Tension and fixings

i) After the grout reaches the predetermined strength, the predetermined test load and displacement characteristics shall be confirmed by the aptitude test / confirmation test, and the initial tensioning force shall be introduced to obtain the required residual tensile force.

ii) The anchor head fixing work shall be carried out so as to obtain a predetermined fixing tension force. The allowable error of the installation angle at the anchor head shall be ± 5 ° or less.

iii) The initial tensile force shall be determined taking into consideration the set amount (the length by which the tension material is drawn in fixing the anchor).

iv) The tensioning device shall be calibrated.

✧ Head treatment

i) On the back of the anchor head, head treatment shall be carried out in the manner shown in the design documents before tensioning / fixing in order to prevent corrosion at the boundary between the anchor head part and the free length part of the anchor.

ii) The head treatment of the anchor shall be carried out quickly after tension and fixing for the purpose of corrosion prevention and protecting of the anchor head. Specifically, the anchor head shall be covered with a cap, and the cap shall be filled with an anticorrosive material such as rust preventive oil.

✧ Record

At the stage of anchor maintenance management, necessary data shall be recorded and saved.

✧ Acceptance inspection

i) Aptitude test

The aptitude test is carried out in order to check whether the design and construction of the anchor are appropriate from the load-displacement amount characteristic by loading up to a predetermined load in multiple cycles with an anchor to be actually used.

The test shall be selected from a part of the anchors actually used and shall be 5% of the construction quantity and 3 or more in consideration of the

ground on which the anchor body is installed, the specifications of the anchor, the setting method.

ii) Confirmation test

The confirmation test is carried out to load the anchor actually used up to a predetermined load in one cycle and to confirm that the anchor is safe against the designed anchor force. The anchor used for the confirmation test shall be carried out against all anchor except for the anchor used for the aptitude test.

✧ Maintenance and management

i) General

- The anchor shall be conducted inspections and investigations, etc. systematically, to maintain the original function. Inspections are basically based on periodic inspections, but if abnormal weather such as heavy rain or earthquakes occurred, they shall be checked promptly as necessary.
- As a result of inspection, if it is judged necessary, soundness investigation should be carried out, and appropriate measures shall be taken against anchors considered to be problematic in soundness.

ii) Inspection of anchor

- *Inspection item*: It shall be decided in consideration of the site situation.
- *Duration and Frequency of Inspection*: The inspection shall be continued, and its frequency shall be determined in consideration of the anchor's purpose, application, circumstances, etc.
- *Records*: It is necessary to record the inspection result and evaluate it. Based on that, it is necessary to judge whether further detailed soundness investigation is necessary or not.

iii) Soundness investigation of anchor

- *Investigation method*: As for investigation of soundness of anchor, preliminary investigation shall be carried out and gather materials necessary for planning soundness investigation. Based on that, it is necessary to select an appropriate method considering the condition of the target anchor and the site conditions, etc. The soundness investigation plan shall be planned in detail in consideration of safety and environmental conservation at the site and its surroundings, regarding the implemental method of investigations and tests and the construction management method. The investigation and test items of the soundness investigation are as follows. a) visual inspection in head detail investigation, b) exposure investigation in head detail investigation, c) lift-off test, d) head back investigation, e) monitoring

- *Evaluation of investigation results*: The necessity and method of countermeasures shall be considered by evaluation of soundness from the investigation results.

iv) Measures

The countermeasures shall be planned after clarifying the purpose of durability improvement measures, repair / reinforcement, renewal, etc.

v) Record

Maintenance records related to inspection / soundness investigation / countermeasures shall be preserved during the service period of the anchor.

**u.** Applicable Design Standard

Followings are IRC Specifications, Standards and Design codes majorly applied for the design;

- IRC: Special Report: State of the Art: Landslide Correction Techniques. Sub-Clause 7.3
- Ministry of Road Transport & Highways: Specifications for Road and Bridge Works (Fifth Revision) 2013; Section 1700: Structural Concrete.

Followings are design and construction standard of Japanese Geotechnical Society and Anchor materials of JIS (Japanese Industrial Standards). The materials shall be JIS or equivalent.

- Ground anchor design and construction standard: JGS 4101-2012 (Japan Society of Civil Engineering).
- Concrete standard specifications: Civil Engineering Society

### 3.2.4 Rock Bolt Works

**a.** Design

✧ General

It is a feature to stabilize the slope by the reinforcement effect of the ground by reinforcing material.

✧ Material

Materials shall comply with the IRC's prescribed standards, international standards, Japanese Industrial Standards, and/or equivalent, and with the approval of the Authority's Engineer.

i) Reinforcing material

- Reinforcing material shall conform the requirements of Section 1000 of the Specifications for Road and Bridge Works of MORTH.
- The reinforcing material shall have a predetermined tensile strength, flexural rigidity and durability.

- The reinforcing material shall be a fully threaded hollow bar steel (self-piercing rod: JIS G 4051 or equivalent: permissible load of 129 kN, yield load of 196 kN) or full screw steel (SD 490-D 22: JIS G 3112 or equivalent: permissible load of 96.8 kN, Yield load 190 kN) shall be used.
- In order to ensure durability, the reinforcing material shall be subjected to surface treatment (hot dip galvanizing treatment, etc.).

ii) Bearing pressure plate

- The bearing pressure plate shall have a predetermined strength (JIS G 3101 or equivalent).
- In order to ensure durability, the bearing pressure plate shall be subjected to surface treatment (hot dip galvanizing treatment, etc.).

iii) Injection material

- The injection material shall ensure pulling resistance force, and shall be superior adhesion, fast strength.
- For cement used for injection material, ordinary Portland cement (JIS R 5210 or equivalent) or blast furnace cement (JIS R 5211 or equivalent) shall be used.

✧ Design

The design of the lock bolt shall be designed so that stability is ensured by sufficient consideration of ground conditions, groundwater condition, surrounding structures etc.

i) Fixing length

The fixing length of the reinforcing material shall be set so as to satisfy the required deterring force against the assumed surface collapse.

ii) Installation angle of reinforcing material

The installation angle of the reinforcing material shall be perpendicular to the sliding surface. However, on a natural slope, it shall be perpendicular to the average slope gradient.

iii) Length of reinforcing material

The length of the reinforcing material shall be equal to or more than "assumed collapse layer thickness + fixing length + surplus length".

**b.** Construction

✧ General

i) In rock bolt construction, ground conditions, environmental conditions, construction contents and construction conditions shall be grasped to ensure safety, disaster prevention and the surrounding environment conservation.

ii) Construction plans shall be formulated to satisfy the design specifications and obtain appropriate quality.

iii) Construction shall be carried out by specialized workers under the guidance of responsible technicians who have sufficient knowledge and experience regarding rock bolt.

✧ Construction plan

i) When constructing the lock bolt, a construction plan shall be prepared to satisfy the design specifications. The standard items described in the construction plan document are as follows.

- construction purpose,
- construction outline
- plan / design condition
- process
- construction management
- quality control plan
- safety management plan
- technical document, brochure

ii) The construction plan should take into consideration safety and environmental conservation at the site and its surroundings, and maintenance and management.

✧ Construction and construction management

i) Construction and construction management of rock bolt shall be implemented based on the construction plan.

ii) In the construction of rock bolt, if a situation different from the conditions assumed at the time of planning occurs, it is necessary to promptly investigate the cause and take appropriate measures as necessary.

✧ Drilling

Drilling methods include self-drilling, rotary drilling and leg hammer drilling. Drilling shall select an appropriate excavator in consideration of geological and topographical conditions. Drilling shall be carried out based on the design drawing and guided by the Authority's Engineer.

✧ Insertion of reinforcing material

Immediately after the excavation is completed, the lock bolt shall be easily inserted into the borehole to the specified depth. Materials "oil, mud, rust" that reduce the adhesion between lock bolt and grout shall be cleaned before insertion. When using a casing, a spacer shall be attached so that the reinforcing material is arranged in the center of the hole so that mud etc. does not adhere.

✧ Injection

i) Before grout injection, air shall be sent to wash the inside of the hole.

ii) Injection is carried out from the bottom of the hole and shall be injected until the cement milk is discharged from the hole mouth.

iii) The water cement ratio is 40% to 50%.

✧ Curing

After the grout injection is completed, the lock bolt shall be cured so as not to receive deformation or vibration that may impair the function.

✧ Acceptance inspection (Confirmation test)

i) In order to confirm whether or not the fixing power of the reinforcing material satisfies the design value, an acceptance inspection (confirmation test) shall be carried out.

ii) The number of tests shall be 3 or more and 3% or more of the total number.

iii) The maximum test load shall be the design load, but it shall not exceed 80% of the allowable stress degree.

iv) The load cycle shall be a single cycle.

✧ Head treatment

i) A bearing pressure plate shall be installed on the reinforcing material head.

ii) The head of the reinforcing material shall be tightened with a nut.

iii) After tensioning, a cap filled with anticorrosive oil shall be installed.

✧ Record

The necessary data for maintenance and management shall be recorded and preserved.

**c.** Applicable Design Standard

Followings are IRC Specifications, Standards and Design codes majorly applied for the design;

- Ministry of Road Transport & Highways: Specifications for Road and Bridge Works (Fifth Revision) 2013

### 3.2.5. Crib Works

**a.** Design

✧ General

The crib works is a construction method aimed at stabilizing the slope by creating a continuous lattice frame against cutting surfaces and natural slopes. In the grating crib works for stabilizing the slope, there are a shotcrete grating crib works and a cast -in -place grating crib works.

✧ Material

i) General

Materials shall comply with the IRC's prescribed standards, international standards, Japanese Industrial Standards, and equivalent, and with the approval of the Authority's Engineer.

ii) Cement

- Cement-based grout: Cement shall conform the requirements of Section 1000 of the Specifications for Road and Bridge Works of MORTH or JIS R 5210, or equivalent.
- When cement other than ordinary Portland cement is used, it must be confirmed that required performance can be obtained beforehand.

iii) Aggregate

- Aggregate shall be clean, rigid, durable and suitable particle size, and free of dirt, mud, organic impurities, chloride, etc.
- Aggregate shall conform the requirements of Section 1000 of the Specifications for Road and Bridge Works of MORTH or JIS A 5005, or equivalent.
- The sand used as fine aggregate shall have a dry density of 2.5 g/cm3 or more and a water absorption of 3.5% or less.
- The fine aggregate shall be chemically and physically stable.
- Hazardous aggregate showing alkali silica reaction shall not be used.

iv) Admixture

- The admixture shall be of quality assured.
- AE agent, water reducing agent and AE water reducing agent used as admixture shall be one conforming the requirements of Section 1000 of the Specifications for Road and Bridge Works of MORTH or JIS A 6204, or equivalent.

v) Reinforcing Streel

- Reinforcing steel shall conform the requirements of Section 1000 of the Specifications for Road and Bridge Works of MORTH or JIS G 3112, or equivalent.
- Reinforcing bars to be used shall use the ones shown in the design drawing.

vi) Wire Mesh and Formwork

- For wire mesh used for shotcrete grating crib works, rhombus wire mesh conforming to JIS G 3552 or welded wire mesh conforming to JIS G 3551 or equivalent shall be standard.
- The material of the formwork for shotcrete shall be selected by checking the quality and carefully examining the construction conditions, spraying conditions, spraying materials, construction method, etc.

✧ Design

i) General

Based on natural conditions and field survey, the design of grating crib works shall be designed taking into consideration its type, function and scope.

ii) Load

- The load acting on the framework is its own weight (framework material and filling material), the assumed load of collapsed soil, ground reaction force.
- The design load shall be the value obtained by multiplying the working load by the load coefficient.

iii) Inspection

Inspection of the grating crib works shall be conducted according to a prescribed procedure (Reference: Designing and Construction Guidelines for Grating Crib Works: Revised Edition 3rd Edition; 2013 National Specific Slope Protection Association).

**b.** Construction

✧ General

i) The construction of the shotcrete grating crib works shall be carried out in accordance with the construction plan in consideration of strength, durability, slope condition, environment etc. sufficiently, further considering the safety of the construction, construction environment, etc.

ii) Construction management shall be performed by a technician with sufficient knowledge concerning construction of the shotcrete crib works.

iii) Construction shall be carried out by specialized workers under the guidance of responsible engineers with sufficient knowledge and experience.

✧ Construction plan

i) When constructing the grating crib work, a construction plan shall be prepared to satisfy the design specifications. The standard items described in the construction plan document are as follows:

- construction purpose
- construction outline
- plan / design condition
- process
- construction management
- quality control plan
- safety management plan
- technical document, brochure

ii) The construction plan should take into consideration safety and environmental conservation at the site and its surroundings, and maintenance and management.

✧ Construction and construction management

i) Construction and construction management of rock bolt shall be implemented based on the construction plan.

ii) In the construction of rock bolt, if a situation different from the conditions assumed at the time of planning occurs, it is necessary to promptly investigate the cause and take appropriate measures as necessary.

✧ Assembling the formwork

i) Those that are likely to affect the quality of spraying mortar such as floating stones on the slope and the root system of vegetation shall be removed.

ii) The formwork shall be assembled so as to satisfy a predetermined standard.

✧ People who handles nozzle

Since the quality of the shotcrete mortar is affected by the skill of the person who handles the nozzle, the skill of that person shall be confirmed in advance.

✧ Spraying and surface treatment

i) At the time of spraying, the rebounding mortar shall be removed and cleaned.

ii) Surface treatment of the grating crib works shall be finished smoothly.

iii) After spraying, the interior of the frame shall be cleaned.

✧ Record

The necessary data for maintenance and management shall be recorded and preserved.

**c.** Applicable Design Standard

Followings are IRC Specifications, Standards and Design codes majorly applied for the design;

- Ministry of Road Transport & Highways: Specifications for Road and Bridge works (Fifth Revision) 2013

### 3.2.6. Non-Frame Works

**a.** Design

✧ General

i) The non-frame works is a construction method to stabilize the slope without cutting trees.

ii) This method is characterized by stabilizing the slope due to the reinforcement effect of the reinforcing material "lock bolt", the bearing

pressure effect of the surface ground by the bearing pressure plate, and the group effect by head connection.

iii) Because the construction material is lightweight and easy to handle, it is excellent for steep slope construction.

✧ Material

i) General

Conform to the chapter on lock bolt.

ii) Reinforcing material

Conform to the chapter on lock bolt.

iii) Bearing pressure plate

Conform to the chapter on lock bolt.

iv) Head coupling material

- The head connecting material shall have sufficient strength to withstand the tensile force.
- Head connecting material consists of wire rope (JIS G 3525 or equivalent), turn buckle (JIS G 3445, JIS G 3101 or equivalent) etc.
- In order to ensure durability, the head connecting material shall be subjected to surface treatment (alloy plating, hot dip galvanizing treatment, etc.).

v) Injection material

Conform r to the chapter on lock bolt.

✧ Design

i) General

The design of the Non-frame works shall be designed so that stability is ensured by sufficient consideration of ground conditions, groundwater condition, surrounding structures etc.

ii) Arrangement of reinforcement

The arrangement of the reinforcing materials shall be arranged so as to draw an equilateral triangle such that the length of one side is 2 m in principle.

iii) Fixing length

Conform to the chapter on lock bolt.

iv) Installation angle of reinforcing material

Conform to the chapter on lock bolt.

v) Length of reinforcing material

Conform to the chapter on lock bolt.

vi) Bearing pressure plate and Head connecting material

Bearing pressure plates shall be arranged in an equilateral triangle shape and connected by a connecting material.

**b.** Construction

✧ General

Conform to the chapter on lock bolt.

✧ Construction plan

Conform to the chapter on lock bolt.

✧ Construction and construction management

Conform to the chapter on lock bolt.

✧ Positioning

i) The arrangement of the reinforcing materials shall be arranged so as to draw an equilateral triangle such that the length of one side is 2 m in principle.

ii) When the bearing pressure plate cannot be placed, it shall be positioned so that the length of one side is 3 m and the total of the three sides does not exceed 7 m.

✧ Scaffolding

i) The scaffold area shall be about 2 m × 2 m in the case of self-drilling.

ii) When the casing is used, the scaffold area should be suitable for the weight of the drilling machine.

✧ Drilling

Conform to the chapter on lock bolt.

✧ Insertion of reinforcing material

Conform to the chapter on lock bolt.

✧ Injection

Conform to the chapter on lock bolt.

✧ Curing

After the grout injection is completed, the lock bolt shall be cured so as not to receive deformation or vibration that may impair the function.

✧ Acceptance inspection (Confirmation test)

Conform to the chapter on lock bolt.

✧ Head treatment

Conform to the chapter on lock bolt.

✧ Head connecting material

Head connecting material shall be properly attached to the bearing pressure plate and tensioned (the slack of the wire is less than 2cm).

✧ Record

Conform to the chapter on lock bolt.

**c.** Applicable Design standard

Followings are IRC Specifications, Standards and Design codes majorly applied for the design:

- Ministry of Road Transport & Highways: Specifications for Road and Bridge works (Fifth Revision) 2013.

### 3.2.7. Reinforced Earth Wall

**a.** General

Reinforced earth wall shall be designed and constructed based on followings guidelines and specifications;

- IRC: SP:102-2014, Guidelines for Design and Construction of Reinforced Soil Wall
- MORTH Specifications for Road and Bridge works (Fifth Revision), 2013
- Japanese design or construction standards for reinforced earth walls or equivalent international standards as necessary

**b.** Elements of Reinforced Earth Wall

✧ Facing Elements

Facing elements shall be designed in accordance with IRC: SP:102-2014 and MORTH Specifications, 2013.

✧ Reinforcement Material

Reinforcement material shall be in accordance with IRC: SP:102-2014 and MORTH Specifications, 2013.

i) Drainage

In order to drain out the water remaining at back of reinforced earth wall, the filter material such as filter geofabric shall be provided properly as shown in the Drawings.

ii) Foundation

In order to avoid the stability failure of the structure, foundation of reinforced earth wall shall be embedded more than 0.5m into rock ground as shown in Drawings.

For reinforced earth wall installed at steep slope terrain, the foundation may be composed as multistage of base concrete as shown in the Drawing. In

addition, rock anchors may be required to provide adequate structural stability in some case as shown in Drawing.

When such advanced foundation was applied, the design, material, construction methodology and etc. shall be proposed by the Contractor and require the approval by the Authority's Engineer.

iii) Others

For reinforced earth wall installed at steep slope terrain, it may be difficult to provide enough width of the wall at back side and length of reinforcement materials adequate without huge excavation of slope terrain. In such case, advanced structural details shall be considered in order to reduce the wall width. One of the method to is "Reinforced soil wall by fixing reinforced material with anchor bar" as shown in the Drawings.

When such advanced method was applied, the design of each members, material, connection details, construction methodology and etc. shall be proposed by the Contractor and require the approval by the Authority's Engineer.

**c.** Design Principles

Basically, reinforced earth wall shall be designed in accordance with IRC:SP: 102-2014 and MORTH Specifications,2013. For the foundation and wall with advanced method applied, the design shall be proposed by the Contractor and require the approval by the Authority's Engineer.

**d.** Construction and Quality Control Tests

Basically, reinforced earth wall shall be constructed in accordance with IRC: SP:102-2014 and MORTH Specifications,2013. For the foundation and wall with advanced method applied, construction methodology and quality control tests shall be proposed by the Contractor and require the approval by the Authority's Engineer.

## Schedule – E

(See Clause 2.1 and 14.2)

## MAINTENANCE REQUIREMENTS

### 1. Maintenance Requirements

1.1. The Contractor shall, at all-time maintain the Project Highway in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits.

1.2 The Contractor shall repair or rectify any Defect or deficiency set forth in Paragraph 2 of this Schedule-E within the time limit specified therein and any failure in this behalf shall constitute non-fulfillment of the Maintenance obligations by the Contractor. Upon occurrence of any breach hereunder, the Authority shall be entitled to effect reduction in monthly lump sum payment as set forth in Clause 14.6 of this Agreement, without prejudice to the rights of the Authority under this Agreement, including Termination thereof.

1.3. All Materials, works and construction operations shall conform to the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (FIFTH REVISION, April 2013)", including latest corrections slips, issued by the Ministry of Surface Transport & Highways, Government of India and published by the Indian Roads Congress.

Where the specifications for a work are not given, Good Industry Practice shall be adopted to the satisfaction of the Authority's Engineer.

### 2. Repair/rectification of Defects and deficiencies

The obligations of the Contractor in respect of Maintenance Requirements shall include repair and rectification of the Defects and deficiencies specified in Annex-I of this Schedule-E within the time limit set forth therein.

### 3. Other Defects and deficiencies

In respect of any Defect or deficiency not specified in Annex-I of this Schedule-E, the Authority's Engineer may, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards, and any deviation or deterioration beyond the permissible limit shall be repaired or rectified by the Contractor within the time limit specified by the Authority's Engineer.

**4. Extension of time limit**

Notwithstanding anything to the contrary specified in this Schedule-E, if the nature and extent of any Defect or deficiency justifies more time for its repair or rectification than the time specified herein, the Contractor shall be entitled to additional time in conformity with Good Industry Practice. Such additional time shall be determined by the Authority's Engineer and conveyed to the Contractor and the Authority with reasons thereof;

**5. Emergency repairs/restoration**

Notwithstanding anything to the contrary contained in this Schedule-E, if any Defect, deficiency or deterioration in the Project Highway poses a hazard to safety or risk of damage to property, the Contractor shall promptly take all reasonable measures for eliminating or minimizing such danger.

**6. Daily inspection by the Contractor**

The Contractor shall, through its engineer, undertake a daily visual inspection of the Project Highway and maintain a record thereof in a register to be kept in such form and manner as the Authority's Engineer may specify. Such record shall be kept in safe custody of the Contractor and shall be open to inspection by the Authority and the Authority's Engineer at any time during office hours.

**7. Pre-monsoon inspection / Post-monsoon inspection**

The Contractor shall carry out a detailed pre-monsoon inspection of all bridges, culverts and drainage system before [1st June] every year in accordance with the guidelines contained in IRC: SP:35. Report of this inspection together with details of proposed maintenance works as required on the basis of this inspection shall be sent to the Authority's Engineer before the [10th June] every year. The Contractor shall complete the required repairs before the onset of the monsoon and send to the Authority's Engineer a compliance report. Post monsoon inspection shall be done by the [30th September] and the inspection report together with details of any damages observed and proposed action to remedy the same shall be sent to the Authority's Engineer.

**8. Repairs on account of natural calamities**

All damages occurring to the Project Highway on account of torrential rains, floods, earthquake or other natural disasters shall be undertaken by the Contractor at its own cost and/or out of the proceeds of insurance.

## Annex – I

## (Schedule-E)

## Repair/rectification of Defects and deficiencies

The Contractor shall repair and rectify the defects and deficiencies specified in this Annex-I of Schedule-E within the time limit set forth in the table below.

| Nature of Defect or deficiency | | Time limit for repair/ rectification |
|---|---|---|
| **ROADS** | | |
| **(a)** | **Carriageway and paved shoulders** | |
| (i) | Breach or blockade | Temporary restoration of traffic within 24 hours; permanent restoration within 15 (fifteen) days |
| (ii) | Roughness value exceeding 2,200 mm in a stretch of 1 km (as measured by a calibrated bump integrator) | 120 (one hundred and twenty) days |
| (iii) | Pot holes | 24 hours |
| (iv) | Any cracks in road surface | 15 (fifteen) days |
| (v) | Any depressions, rutting exceeding 10 mm in road surface | 30 (Thirty) days |
| (vi) | Bleeding/Skidding | 7 (seven) days |
| (vii) | Any other defect/distress on the road | 15 (fifteen) days |
| (viii) | Damage to pavement edges | 15 (fifteen) days |
| (ix) | Removal of debris, dead animals | 6 hours |
| (b) | **Granular earth shoulders, side slopes, drains and culverts** | |
| (i) | Edge drop at shoulders exceeding 40 mm | 7 (Seven) days |
| (ii) | Variation by more than 1% in the prescribed slope of camber/cross fall (shall not be less than the camber on the main carriageway) | 7 (seven) days |
| (iii) | Variation by more than 15% in the prescribed | 30 (thirty) days |

| | | |
|---|---|---|
| | side (embankment) slopes | |
| (iv) | Rain cuts/gullies in slope | 7 (Seven) days |
| (v) | Damage to or silting of culverts and side drains | 7 (Seven) days |
| (vi) | Desilting of drains in urban/semi-urban areas | 24 hours |
| (vii) | Railing, parapets, crash barriers | 7 (Seven) days (Restore immediately if causing safety hazard) |
| **(c)** | **Road side furniture including road sign and pavement marking** | |
| (i) | Damage to shape or position, poor visibility or loss of retro-reflectivity | 48 hours |
| (ii) | Painting of KM stone, railing, parapets, crash barriers | As and when required/Once every year |
| (iii) | Damaged/missing road signs required replacement | 7 (Seven) days |
| (iv) | Damage to road mark ups | 7 (Seven) days |
| **(d)** | **Road lighting** | |
| (i) | Any major failure of the system | 24 hours |
| (ii) | Faults and minor failures | 8 hours |
| **(e)** | **Trees and plantation** | |
| (i) | Obstruction in a minimum head-room of 5 m above carriageway or obstruction in visibility of road signs | 24 hours |
| (ii) | Removal of fallen trees from carriageway | 4 hours |
| (iii) | Deterioration in health of trees and bushes | Timely watering and treatment |
| (iv) | Trees and bushes requiring replacement | 30 (Thirty) days |
| (v) | Removal of vegetation affecting sight line and road structures | 15 (fifteen) days |
| **(f)** | **Rest area** | |
| **(i)** | Cleaning of toilets | Every 4 hours |
| **(ii)** | Defects in electrical, water and sanitary | 24 hours |

| | | |
|---|---|---|
| | installation | |
| **(g)** | **Toll Plaza** | |
| **(h)** | **Other Project Facilities, Rest Area and Approach roads** | |
| (i) | Damage in pedestrian facilities, truck lay-buys, bus-bays, bus-shelters, cattle, crossings, [Traffic Aid Posts, Medical Aid Posts ] and service roads | 15 (fifteen) days |
| (ii) | Damaged vehicles or debris on the road | 4 (Four) hours |
| (iii) | Malfunctioning of the mobile cranes | 4 (four) hours |
| **Bridges** | | |
| **(a)** | **Superstructure** | |
| (i) | Any damage, cracks, spalling/scaling<br>Temporary measures<br>Permanent measures | <br>Within 48 hours<br>Within 15 (fifteen) days or as specified by the Authority's Engineer |
| **(b)** | **Foundations** | |
| (i) | Scouring and/or cavitation | 15 (fifteen) days |
| **(c)** | **Piers, abutments, return walls and wing walls** | |
| (i) | Cracks and damages including settlement and tilting, Spalling, scaling | 30 (thirty) days |
| **(d)** | **Bearings (metallic) of bridges** | |
| (i) | Deformation | 15 (fifteen) days<br>Greasing of metallic bearings once in a year |
| **(e)** | **Joints** | |
| (i) | malfunctioning of joints | 15 (fifteen) days |
| **(f)** | **Other items** | |
| (i) | Deforming of pads in elastomeric bearings | 7 (seven) days |

| | | |
|---|---|---|
| (ii) | Gathering of dirt in bearings and joints; or clogging of spouts, weep holes and vent-holes | 3 (three) days |
| (iii) | Damage or deterioration in kerbs, parapets, handrails and crash barriers | 3 (three) days<br><br>(immediately within 24 hours if posing danger of safety) |
| (iv) | Rain-cuts or erosion of banks of the side slopes of approaches | 7 (seven) days |
| (v) | Damage to wearing coat | 15 (fifteen) days |
| (vi) | Damage or deterioration in approach Slabs, pitching, apron, toes, floor or guide bunds | 30 (thirty) days |
| (vii) | Growth of vegetation affecting the structure or obstructing the waterway | 15 (fifteen) days |
| **(g)** | **Hill Roads** | |
| (i) | Damage to retaining wall/breast wall | 7 (seven) days |
| (ii) | Landslides requiring clearance | 12 (twelve) hours |
| (iii) | Snow requiring clearance | 24 (twenty four) hours |

[**Note:** Where necessary, the Authority may modify the time limit for repair/rectification, or add to the nature of Defect or deficiency before issuing the bidding document, with the approval of the competent authority.]

## Schedule-F

(See Clause 3.1.5(a))

## APPLICABLE PERMITS

1. **Applicable Permits**

The Contractor shall obtain, as required under the Applicable Laws, the following Applicable Permits:

(a) Permission of the State Government for extraction of boulders from quarry;

(b) Permission of Village Panchayat and Pollution Control Board for installation of crushers;

(c) License for use of explosives;

(d) Permission of the State Government for drawing water from river/reservoir;

(e) License from inspector of factories or other competent Authority for setting up batching plant;

(f) Clearance of Pollution Control Board for setting up batching plant;

(g) Clearance of Village Panchayats and Pollution Control Board for setting up asphalt plant;

(h) Permission of Village Panchayats and State Government for borrow earth; and

(i) Any other permits, clearances or approvals required under Applicable Laws.

1.2 Applicable permits, as required, relating to environmental protection and conservation shall have been produced by the Authority in accordance with the provisions of this Agreement

## Schedule-G

(See Clause 7.1.1, 7.5.3 and 19.2)

## FORM OF BANK GUARANTEE

Annex-I

(See Clause 7.1.1)

## PERFORMANCE SECURITY

**The Managing Director,**
**NHIDCL,**
**3rd Floor, PTI Building, 4, Parliament Street,**
**New Delhi-110001**

WHEREAS:

(A) _____ [name and address of contractor] (hereinafter called "the Contractor") and [**NHIDCL**], (**"the Authority"**) have entered into an agreement (the **"Agreement"**) for "**widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya on EPC basis**", subject to and in accordance with the provisions of the Agreement.

(B) The Agreement requires the Contractor to furnish a Performance Security for due and faithful performance of its obligations, under and in accordance with the Agreement, during the Construction Period and Defects Liability Period (as defined in the Agreement) in a sum of Rs. …. Crore (Rupees …. Crore) (the "**Guarantee Amount**").

(C) We, ……..through our branch at ……. (the "**Bank**") have agreed to furnish this bank guarantee (hereinafter called the "**Guarantee**") by way of Performance Security.

NOW, THEREFORE, the Bank hereby, unconditionally and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful performance of the Contractor's obligations during Construction Period and Defects Liability Period under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the guarantee amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of [Executive Director, NHIDCL], that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final, and binding on the Bank, notwithstanding any difference between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other Authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Agreement or to extend the time or period for the compliance with, fulfillment and/or performance of all or any of the obligations of the Contractor contained in the Agreement or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of

the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Agreement or for the fulfillment, compliance and/or performance of all or any of the obligations of the Contractor under the Agreement.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. The Guarantee shall cease to be in force and effect upto 90 (ninety) days after the end of the Defects Liability Period as set forth in Clauses 17.1 of EPC agreement.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in para 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

12. This guarantee shall also be operable at our…… Branch at New Delhi, from whom, confirmation regarding the issue of this guarantee or extension/ renewal

thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.

Signed and sealed this …….. day of ……. 20…….. at ……

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

**NOTE for Issuing Bank** (Not to be included in the BG):-

(i) The bank guarantee(s) contain(s) the name, designation and Code number of the officer(s) signing the guarantee(s).

(ii) The address, telephone no. and other details of the Head Office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing Branch.

(iii) The bank guarantee for Rs. 10,000 and above is signed by at least two officials (or as per the norms prescribed by the RBI in this regard).

(iv) The Bank Guarantee shall be transmitted through SFMS gateway to our banker with following details:

| S. No. | Particulars | Details |
|---|---|---|
| 1 | Name of Beneficiary | National Highways & Infrastructure Development Corporation Limited |
| 2 | Beneficiary Bank Account No. | 90621010002659 |
| 3 | Beneficiary Bank Branch IFSC | SYNB0009062 |
| 4 | Beneficiary Bank Branch Name | Transport Bhawan, New Delhi |
| 5 | Beneficiary Bank Address | Syndicate Bank transport Bhawan, 1st Parliament Street, New Delhi-110001 |

Annex-II

(Schedule-G)

(See Clause 7.5.3)

## Form for Guarantee for Withdrawal of Retention Money

**The Managing Director,**
**NHIDCL,**
**3rd Floor, PTI Building, 4, Parliament Street**
**New Delhi-110001**

WHEREAS:

(A) [Name and address of contractor] (hereinafter called "**the Contractor**") has executed an agreement (hereinafter called the "Agreement") with the [NHIDCL], (hereinafter called "the Authority") for the "**widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya on EPC basis**, subject to and in accordance with the provisions of the Agreement.

(B) In accordance with the Clause 7.5.3 of the Agreement, the Contractor may withdraw the retention money (hereinafter called "**Retention Money**") after furnishing to the Authority a bank guarantee for an amount equal to the proposed withdrawal.

(C) We, ……..through our branch at ……. (the "**Bank**") have agreed to furnish this bank guarantee (hereinafter called the "**Guarantee**") for the amount of Rs. ……Cr. (Rs……. in words) (the "**Guarantee Amount"**).

NOW, THEREFORE, the Bank hereby, unconditionally and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of [Executive Director, NHIDCL], that the Contractor has committed default in the due

and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final, and binding on the Bank, notwithstanding any difference between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other Authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Retention Money and any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Retention Money.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the

Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. The guarantee shall cease to be in force and effect 90 (ninety) days after the end of the Defects Liability Period specified in Clauses 17.1 of the Agreement.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in para 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

12. This guarantee shall also be operable at our…… Branch at New Delhi, from whom, confirmation regarding the issue of this guarantee or extension/ renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.

Signed and sealed this …….. day of ……. 20…….. at ……

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

**NOTE for Issuing Bank** (Not to be included in the BG):-

(iii) The bank guarantee(s) contain(s) the name, designation and Code number of the officer(s) signing the guarantee(s).

(iv) The address, telephone no. and other details of the Head Office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing Branch.

(v) The bank guarantee for Rs. 10,000 and above is signed by at least two officials (or as per the norms prescribed by the RBI in this regard).

(vi) The Bank Guarantee shall be transmitted through SFMS gateway to our banker with following details:

| S. No. | Particulars | Details |
|---|---|---|
| 1 | Name of Beneficiary | National Highways & Infrastructure Development Corporation Limited |
| 2 | Beneficiary Bank Account No. | 90621010002659 |
| 3 | Beneficiary Bank Branch IFSC | SYNB0009062 |
| 4 | Beneficiary Bank Branch Name | Transport Bhawan, New Delhi |
| 5 | Beneficiary Bank Address | Syndicate Bank transport Bhawan, 1st Parliament Street, New Delhi-110001 |

Annex-III

(Schedule-G)

(See Clause 19.2)

## Form for Guarantee for Advance Payment

**The Managing Director,**
**NHIDCL,**
**3rd Floor, PTI Building, 4, Parliament Street,**
**New Delhi-110001**

WHEREAS:

(A) [name and address of contractor] (hereinafter called "**the Contractor**") has executed an agreement (hereinafter called the "Agreement") with the [**NHIDCL**], (hereinafter called "**the Authority**") for the "**widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya on EPC basis)**", subject to and in accordance with the provisions of the Agreement.

(B) In accordance with the Clause 19.2 of the Agreement, the Authority shall make to the Contractor an interest bearing (@ Bank Rate) advance payment (hereinafter called "**Advance Payment**") equal to 10% (ten per cent) of the contract price; and that the Advance Payment shall be made in two installments subject to the Contractor furnishing an irrevocable and unconditional guarantee by a scheduled bank for an amount equivalent to 110% (one hundred and ten percent) of such installment to remain effective till the complete and full repayment of the installment of the Advance Payment as security for compliance with its obligations in accordance with the Agreement. The amount of {first/second} installment of the Advance Payment is Rs. ------ cr. (Rupees ------ crore) and the amount of this Guarantee is Rs. ------- cr. (Rupees ------ crore) (the **"Guarantee Amount")$.**

(C) We, ……..through our branch at ……. (the "**Bank**") have agreed to furnish this bank guarantee (hereinafter called the "**Guarantee**") for the Guarantee Amount.

NOW, THEREFORE, the Bank hereby, unconditionally and irrevoc**ably, guarantee**s and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful repayment on time of the aforesaid installment of the Advance Payment under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority,

upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the guarantee amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of [Executive Director, NHIDCL], that the Contractor has committed default in the due and faithful performance of all or any of its obligations for the repayment of the installment of the Advance Payment under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final, and binding on the Bank, notwithstanding any difference between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other Authority or body, or by the discharge of the Contractor for any reason whatsoever

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Advance Payment or to extend the time or period of its repayment or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Advance Payment.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. The guarantee shall cease to be in force and effect 90 (ninety) days after the end of the one year from the date of payment of the installment of the Advance Payment, as set forth in Clause 19.2 of the Agreement.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in Para 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

12. This guarantee shall also be operable at our…… Branch at New Delhi, from whom, confirmation regarding the issue of this guarantee or extension/ renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.

Signed and sealed this …….. day of ……. 20…….. at ……

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

**NOTE for Issuing Bank** (Not to be included in the BG):-

(v) The bank guarantee(s) contain(s) the name, designation and Code number of the officer(s) signing the guarantee(s).

(vi) The address, telephone no. and other details of the Head Office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing Branch.

(vii) The bank guarantee for Rs. 10,000 and above is signed by at least two officials (or as per the norms prescribed by the RBI in this regard).

(viii) The Bank Guarantee shall be transmitted through SFMS gateway to our banker with following details:

| S. No. | Particulars | Details |
|---|---|---|
| 1 | Name of Beneficiary | National Highways & Infrastructure Development Corporation Limited |
| 2 | Beneficiary Bank Account No. | 90621010002659 |
| 3 | Beneficiary Bank Branch IFSC | SYNB0009062 |
| 4 | Beneficiary Bank Branch Name | Transport Bhawan, New Delhi |
| 5 | Beneficiary Bank Address | Syndicate Bank transport Bhawan, 1st Parliament Street, New Delhi-110001 |

**$ The Guarantee Amount should be equivalent to 110% of the value of the applicable installment**

# Schedule-H

(See Clause 19.3)

## Contract Price Weightages

**1.1** The Contract Price for this Agreement is Rs. 335.19 Cr.

**1.2** Proportions of the Contract Price for different stages of Construction of the Project Highway shall be as specified below :

| Item | Weightage in percentage to the Contract Price | Stage for Payment | Percentage weightage |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| Road works including culverts, widening and repair of culverts. | 75.56% | **A-Widening and strengthening of existing road/Reconstruction/New 2-Lnae realignment** | |
| | | (1) Earthwork up to top of the sub-grade | 10.07% |
| | | (2) Spoil Bank Construction by surplus Soil | 3.92% |
| | | (3) Granular Sub Base | 16.82% |
| | | (4) Wet Mix Mecadam | 19.44% |
| | | (5) Dense Graded Bitumenous Macadam | 23.50% |
| | | (6) Bituminous concrete | 14.01% |
| | | (7) Widening and repair of culverts/Re-Construction and New Construction of Culvert on existing road realignment | 12.23% |
| Minor Bridges / Underpasses / Overpasses | 1.44% | **A.1- New \ Reconstruction of Minor bridges (length>6 and <60 m)** | |
| | | (1) **Foundation + Sub- Structure:** On completion of the foundation work including foundations for wing and return walls, abutments, piers upto the abutment/pier cap | 14.62% |
| | | (2) **Super-structure**: On completion of the super- structure in all respects including wearing coat, bearings, expansion joints, hand rails, crash barriers, road signs & markings, tests on completion etc. complete in all respect. | 3.95% |
| | | (3) **Approaches**: On completion of approaches including Retaining walls, stone pitching, protection works complete in all respect and fit for use. | 3.42% |
| | | **A.2- Reconstruction\Rehabilitation of Super Structure of Minor bridges (length>6 and <60 m)** | |
| | | (1) **Super-structure**: Completion of the super- structure in all respects including wearing coat, bearings, expansion joints, hand rails, crash barriers, road signs & markings, tests on completion etc. complete in all respect. | 78.01% |
| Major Bridge (length > 60m.) works and ROB / RUB/ elevated sections/ flyovers including viaducts, if any | 0.00% | **A.1- Widening and repairs of Major Bridges** | [ Nil ] |
| | | **A.2- New Major Bridges** | [ Nil ] |
| Other works | 23.00% | (i) Toll Plaza | [ Nil ] |

| | | | |
|---|---|---|---|
| | | (ii) Road side drains | 16.58% |
| | | (iii) Road signs, markings, km stones, safety devices and Appurtenances safety & traffic management during construction | 7.76% |
| | | (iv) Project facilities | |
| | | (a) Bus Bays | 12.14% |
| | | (b) Truck lay-byes | [ Nil ] |
| | | (c) Rest areas | [ Nil ] |
| | | (d) Development of Junction | 3.48% |
| | | (e) Office & Vehicle for Authority and Office & Accommodation for Autority's Engineer | 5.46% |
| | | (v) Road side plantation | [ Nil ] |
| | | (vi) Protection works other than approaches to the bridges, Elevated sections / flyovers / grade separators and ROBs / RUBs. | |
| | | (a) Seeding and Mulching | 3.33% |
| | | (b) Turfing with Sods | 1.99% |
| | | (c) Wet Masonry Retaining Wall (H>3m) | 9.52% |
| | | (d) Wet Masonry Retaining Wall (H>3m<7m) | 4.22% |
| | | (f) Gravity Wall (H=1.5m & 2m) | 6.49% |
| | | (g) Gravity Wall (H=3m & 4m) | 13.50% |
| | | (h) Gravity Wall (H=5m & 6m) | 5.45% |
| | | (i) Reinforced Earth Retaining Wall (H=7m & 8m) | 10.07% |
| | | (j) Reinforced Earth Retaining Wall (H=9m & 10m) | Nil |

**1.3** Procedure of estimating the value of work done

1.3.1 Road works.

Procedure for estimating the value of road work done shall be as follows:

Table 1.3.1

| Stage of Payment | Percentage weightage | Payment Procedure |
|---|---|---|
| **A-Widening and strengthening of existing road/Reconstruction/New 2-Lnae realignment** | **100.00** | |
| (1) Earthwork up to top of the sub-grade | 10.07% | Unit of measurement is linear length. Payment of each stage shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length. |
| (2) Spoil Bank Construction by surplus Soil | 3.92% | Unit of measurement is unit. Cost of each Spoil-Bank shall be determined on pro rata basis with respect to the total number of Spoil-Banks and the total volume estimated based on the approved "Plan for Earthworks" |
| (3) Granular Sub Base | 16.82% | Unit of measurement is linear length. Payment of each stage shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length. |
| (4) Wet Mix Mecadam | 19.44% | |
| (5) Dense Graded Bitumenous Macadam | 23.50% | |
| (6) Bituminous Concrete | 14.01% | |
| (7) Widening and repair of culverts/Re-Construction and New Construction of Culvert on existing road realignment | 12.23% | Cost of completed culverts shall be determined pro rata basis with respect to the total no. of culverts. The payment shall be made on the completion of at least five culverts. |

@ For example, if the total length of bituminous work to be done is 100 km, the cost per km of bituminous work shall be determined as follows:

Cost per km= P x weightage for road work x weightage for bituminous work x (1/L)

Where P = Contract Price

L=Total length in km

Similarly, the rates per km for other stages shall be worked our accordingly.

**Note: The length affected due to law and order problems or litigation during execution due to which the Contractor is unable to execute the work, may be deducted from the total project length for payment purposes. The total length calculated here is only for payment purposes and will not affect and referred in other clauses of the Contract Agreement.**

Procedure for estimating the value of work done 1.3.1:

Table 1.3.2

| Stage of Payment | Percentage weightage | Payment Procedure |
|---|---|---|
| **A.1- New \ Reconstruction of Minor bridges (length>6 and <60 m)** | | Cost of each minor bridge shall be determined on pro rata basis with respect to the total linear length of the minor bridges. Payment shall be made on the completion of widening & repair works of a minor bridge. |
| (1) **Foundation + Sub- Structure:** On completion of the foundation work including foundations for wing and return walls, abutments, piers upto the abutment/pier cap | 14.62% | |
| (2) **Super-structure**: On completion of the super- structure in all respects including wearing coat, bearings, expansion joints, hand rails, crash barriers, road signs & markings, tests on completion etc. complete in all respect. | 3.95% | |
| (3) **Approaches**: On completion of approaches including Retaining walls, stone pitching, protection works complete in all respect and fit for use. | 3.42% | |
| **A.2- Reconstruction\Rehabilitation of Super Structure of Minor bridges (length>6 and <60 m)** | | |
| (1) **Super-structure**: Completion of the super- structure in all respects including wearing coat, bearings, expansion joints, hand rails, crash barriers, road signs & markings, tests on completion etc. complete in all respect. | 78.01% | |

1.3.3 **Major Bridge works, ROB/ RUB and Structures**.

Procedure for estimating the value of Major Bridge works, ROB/RUB and Structures shall be as stated in table 1.3.3:

Table 1.3.3

| Stage of Payment | Percentage weightage | Payment Procedure |
|---|---|---|
| **A.1- Widening and repairs of Major Bridges** | [ Nil ] | N/A |
| **A.2- New Major Bridges** | [ Nil ] | |

1.3.4 Other work

Procedure for estimating the value of other works done shall be as stated in table 1.3.4

**Table 1.3.4**

| Stage of Payment | Percentage weightage | Payment Procedure |
|---|---|---|
| (i) Toll Plaza | [ Nil ] | N/A |
| (ii) Road side drains | 16.58% | Unit of measurement is linear length in km. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 % (ten per cent) of the total length. |
| (iii) Road signs, markings, km stones, safety devices and Appurtenances safety & traffic management during constructed | 7.76% | |
| (iv) Project facilities | | Payment shall be made on pro rate basis for completed facilities |
| (a) Bus Bays | 12.14% | |

| Stage of Payment | Percentage weightage | Payment Procedure |
|---|---|---|
| (b) Truck lay-byes | [ Nil ] | |
| (c) Rest areas | [ Nil ] | |
| (d) Development of Junction | 3.48% | |
| (e) Office & Vehicle for Authority and Office & Accommodation for Autority's Engineer | 5.46% | 35% of cost shall be paid on completion and handing over of office and vehicle to the Authority/ Authority's Engineer during first quarter; remaining shall be paid on quarterly basis @ 5% per quarter up to completion period. |
| (v) Road side plantation | [ Nil ] | N/A |
| (vi) Protection works other than approaches to the bridges, Elevated sections / flyovers / grade separators and ROBs / RUBs. | | |
| (a) Seeding and Mulching | 3.33% | Unit of measurement is sqm. Payment shall be made on pro rata basis on completion of a stage in an area of not less than 10% (ten per cent) of the total area; however payment for any reach shall be considered only after work is complete in that reach. |
| (b) Turfing with Sods | 1.99% | |
| (d) Wet Masonry Retaining Wall (H=3m) | 9.52% | Unit of measurement is linear length. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10% (ten per cent) of the total length*. |
| (e) Wet Masonry Retaining Wall (H=7m) | 4.22% | |
| (f) Gravity Wall (H=1.5m & 2m) | 6.49% | |
| (g) Gravity Wall (H=3m & 4m) | 13.50% | |
| (h) Gravity Wall (H=5m & 6m) | 5.45% | |
| (i) Reinforced Earth Retaining Wall (H=7m & 8m) | 10.07% | |
| (j) Reinforced Earth Retaining Wall (H=9m & 10m) | Nil | |

*If actual height of retaining/ gravity wall constructed at site is different than those mentioned in above table, than height for payment purpose shall be considered as the height of wall from the above table which is just less than the actual height of wall. Similar treatment shall be considered for Rockfall Prevention Wall/ Fence. No Change of Scope shall be considered for increase of length/ height/ quantity of above mentioned slope protection works.

2. Procedure for payment for Maintenance

2.1 The cost for maintenance shall be as stated in Clause 14.1.1

2.2 Payment for Maintenance shall be made in quarterly installments in accordance with the provisions of Clause 19.7.

## Schedule-I

(See Clause 10.2)

## DRAWINGS

### 1. Drawings

In compliance of the obligations set forth in Clause 10.2 of this Agreement, the Contractor shall furnish to the Authority's Engineer, free of cost, all Drawings listed in Annex-I of this Schedule-I.

### 2. Additional Drawings

If the Authority's Engineer determines that for discharging its duties and functions under this Agreement, it requires any drawings other than those listed in Annex-I, it may by notice require the Contractor to prepare and furnish such drawings forthwith. Upon receiving a requisition to this effect, the Contractor shall promptly prepare and furnish such drawings to the Authority's Engineer, as if such drawings formed part of Annex-I of this Schedule-I.

## Annex-I
(Schedule-I)

## List of Drawings

A minimum list of the drawings of the various components/elements of the Project Highway and project facilities required to be submitted by the Contractor is given below:-

a. Drawings of horizontal alignment, vertical profile and cross sections.
b. Drawing of Typical Cross-section with details of pavement structures.
c. Drawings cross drainage works.
d. Drawings of Retaining wall works.
e. Drawings of Bridge works.
f. Drawings of Slope Protection works.
g. Drawings of Traffic Safety Facilities works.
h. Drawings of Road Appurtenances works.
i. Drawings of Slope Protection works.
j. Traffic Diversion Plan.

## Schedule-J

(See Clause 10.3.2)

## PROJECT COMPLETION SCHEDULE

### 1. Project Completion Schedule

During Construction period, the Contractor shall comply with the requirements set forth in this Schedule J for each of the Project Milestones and the **Scheduled Completion Date.** Within 15 (fifteen) days of the date of each Project Milestone, the Contractor shall notify the Authority of such compliance along with necessary particulars thereof.

### 2. Project Milestone-I

2.1 Project Milestone-I shall occur on the date falling on the 210th (two hundred and tenth) day from the Appointed Date (the "Project Milestone-I").

2.2 Prior to the occurrence of Project Milestone-I, the Contractor shall have commenced construction of the Project Highway and submitted to the Authority duly and validly prepared Stage Payment Statements for an amount not less than 10% (ten per cent) of the Contract Price.

### 3. Project Milestone-II

3.1 Project Milestone-II shall occur on the date falling on the 450th (four hundred and fiftieth) day from the Appointed Date (the "Project Milestone-II").

3.2 Prior to the occurrence of Project Milestone-II, the Contractor shall have continued with construction of the Project Highway and submitted to the Authority duly and validly prepared Stage Payment Statements for an amount not less than 30% (thirty per cent) of the Contract Price.

### 4. Project Milestone-III

4.1 Project Milestone-III shall occur on the date falling on the 810th (Eight hundred and tenth) day from the Appointed Date (the "Project Milestone-III").

4.2 Prior to the occurrence of Project Milestone-III, the Contractor shall have continued with construction of the Project Highway and submitted to the Authority duly and validly prepared Stage Payment Statements for an amount not less than 60% (sixty per cent) of the Contract Price.

### 5 Schedule Completion Date

5.1 The Scheduled Completion Date shall occur on the 1095th (one thousand and ninety fifth) day from the Appointed Date.

5.2 On or before the Scheduled Completion Date, the Contractor shall have completed construction in accordance with this Agreement.

### 6 Extension of time

Upon extension of any or all of the aforesaid Project Milestones or the Scheduled Completion Date, as the case may be, under and in accordance with the provisions of this Agreement, the Project Completion Schedule shall be deemed to have been amended accordingly.

## Schedule-K

(See Clause 12.1.2)

## Tests on Completion

### 1. Schedule for Tests

1.1 The Contractor shall, no later than 30 (thirty) days prior to the likely completion of construction, notify the Authority's Engineer and the Authority of its intent to subject the Project Highway to Tests, and no later than 10 (ten) days prior to the actual date of Tests, furnish to the Authority's Engineer and the Authority detailed inventory and particulars of all works and equipment forming part of Works.

1.2 The Contractor shall notify the Authority's Engineer of its readiness to subject the Project Highway to Tests at any time after 10 (ten) days from the date of such notice, and upon receipt of such notice, the Authority's Engineer shall, in consultation with the Contractor, determine the date and time for each Test and notify the same to the Authority who may designate its representative to witness the Tests. The Authority's Engineer shall thereupon conduct the Tests itself or cause any of the Tests to be conducted in accordance with Article 12 and this Schedule K.

### 2 Tests

2.1 Visual and physical test: The Authority's Engineer shall conduct a visual and physical check of construction to determine that all works and equipment forming part thereof conform to the provisions of this Agreement. The physical tests shall include: all the tests specified in IRC code, manual and MORTH specifications for the road and Bridge works, 5th revision, 2013.

2.2 Riding quality test: Riding quality of each lane of the carriageway shall be checked with the help of a calibrated bump integrator and the maximum permissible roughness for purposes of this Test shall be [2,000 (two thousand)] mm for each kilometer.

2.3 Tests for bridges: All major and minor bridges shall be subjected to the rebound hammer and ultrasonic pulse velocity tests, to be conducted in accordance with the procedure described in Special Report No. 17: 1996 of the IRC Highway Research Board on Nondestructive Testing Techniques, at two spots in every span, to be chosen at random by the Authority's Engineer. Bridges with a span of 15 (fifteen) meters or more shall also be subjected to load testing.

2.4 Other tests: The Authority's Engineer may require the Contractor to carry out or cause to be carried additional tests, in accordance with Good Industry Practice, for determining the compliance of the Project Highway with Specifications and Standards.

2.5 Environmental audit: The Authority's Engineer shall carry out a check to determine conformity of the Project Highway with the environmental requirements set forth in Applicable Laws and Applicable Permits.

2.6 Safety Audit: The Authority's Engineer shall carry out or cause to be carried out, a safety audit to determine conformity of the Project Highway with the safety requirements and Good Industry Practice.

## 3 Agency for conducting Tests

All Tests set forth in this Schedule-K shall be conducted by the Authority's Engineer or such other agency or person as it may specify in consultation with the Authority.

## 4. Completion Certificate

Upon successful completion of Tests, the Authority's Engineer shall issue the Completion Certificate in accordance with the provisions of Article 12.

## Schedule-L

(See Clause 12.2 and 12.4)

## PROVISIONAL CERTIFICATE

1. I, …….. (Name of the Authority's Engineer), acting as Authority's Engineer, under and in accordance with the Agreement dated …….. (the "**Agreement**"), for construction of the "**widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya on EPC basis"** through ……. (Name of Contractor), hereby certify that the Tests in accordance with Article 12 of the Agreement have been undertaken to determine compliance of the Project Highway with the provisions of the Agreement.

2. Construction Works that are incomplete on account of Time Extension have been specified in the Punch List appended hereto, and the Contractor has agreed and accepted that it shall complete all such works in the time and manner set forth in the Agreement. In addition, certain minor works are incomplete and these are not likely to cause material inconvenience to the users of the Project Highway or other their safety. The contractor has agreed and accepted that as a condition of this Provisional Certificate, it shall complete such minor works within 30 (thirty) days hereof. These minor works have also been specified in the aforesaid punch list.

3. In view of the foregoing, I am satisfied that that Project Highway can be safety and reliably placed in service of the users thereof, and in terms of the Agreement, the Project Highway is hereby provisionally declared fit for entry into operation on this the ……day of …….20 …..

ACCEPTED, SIGNED, SEALED AND DELIVERED

For and on behalf of

CONTRACTOR by Authority's Engineer by:

(Signature)

SIGNED, SEALED AND DELIVERED

For and on behalf of

(Signature)

## COMPLETION CERTIFICATE

1. I, …….. (Name of the Authority's Engineer), acting as Authority's Engineer, under and in accordance with the Agreement dated …….. (the "**Agreement**"), for construction of the "**widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya on EPC basis"** through ……. (Name of Contractor), hereby certify that the Tests in accordance with Article 12 of the Agreement have been successfully undertaken to determine compliance of the Project Highway with the provisions of the Agreement, and I am satisfied that the Project Highway can be safety and reliably placed in service of the Users thereof.

2. It is certified that, in terms of the aforesaid Agreement, all works forming part of Project Highway have been completed, and the Project Highway is hereby declared fit for entry into operation on this the ……..day of ……..20 …..

SIGNED, SEALED AND DELIVERED

For and on behalf of

Authority's Engineer by:

(Signature)

(Name)

(Designation)

(Address)

## Schedule-M

(See Clauses 14.6., 15.2 and 19.7)

## PAYMENT REDUCTION FOR NON-COMPLIANCE

### 1. Payment reduction for non-compliance with the Maintenance Requirements

1.1 Monthly lump sum payments for maintenance shall be reduced in the case of non-compliance with the Maintenance Requirements set forth in Schedule-E.

1.2 Any deduction made on account of non-compliance with the maintenance Requirements shall not be paid even after compliance subsequently. The deduction shall continue to be made every month until compliance is done.

1.3 The Authority's Engineer shall calculate the amount of payment reduction on the basis of weightage in percentage assigned to non-conforming items as given in Paragraph 2.

### 2. Percentage reductions in lump sum payments

2.1 The following percentages shall govern the payment reduction:

| S. No. | Item/Defect/Deficiency | Percentage |
|---|---|---|
| (a) | **Carriageway/Pavement** | |
| (i) | Potholes, cracks, other surface defects | 15% |
| (ii) | Repairs of Edges, Rutting | 5% |
| (b) | **Road, Embankment, Cuttings, Shoulders** | |
| (i) | Edge drop, inadequate crossfall, undulations, settlement, potholes, ponding, obstructions | 10% |
| (ii) | Deficient slopes, raincuts, disturbed pitching, vegetation growth, pruning of trees | 5% |
| (c) | **Bridges and Culverts** | |
| (i) | Desilting, cleaning. vegetation growth, damaged pitching, flooring, parapets, wearing course, footpaths, any damage to foundations | 20% |
| (ii) | Any Defects in superstructures, bearings and sub-structures | 10% |

| | | |
|---|---|---|
| (iii) | Painting, repairs/replacement kerbs, railings, parapets, guideposts/crash barriers | 5% |
| (d) | **Roadside Drains** | |
| (i) | Cleaning and repair of drains | 5% |
| (e) | **Road Furniture** | |
| (i) | Cleaning, painting, replacement of road signs, delineators, road markings, 200 m/km/5th km stones | 5% |
| (f) | **Miscellaneous Items** | |
| (i) | Removal of dead animals, broken down/accidented vehicles, fallen trees, road blockades or malfunctioning of mobile crane | 10% |
| (ii) | Any other Defects in accordance with paragraph 1. | 5% |
| (g) | **Defects in Other Project Facilities** | 5% |

2.2 The amount to be deducted from monthly lump-sum payment for non-compliance of particular item shall be calculated as under:

R=P/100 * M * L1/L

Where: P= Percentage of particular item//Defect/deficiency for deduction

M = Monthly lump-sum payment in accordance with the Bid

L1 = Non-complying length

L = Total length of the road,

R = Reduction (the amount to be deducted for noncompliance for a particular item/Defect/deficiency

The total amount of reduction shall be arrived at by summation of reductions for such items/Defects/deficiency or noncompliance.

For any Defect in a part of one kilometer, the non-conforming length shall be taken as one kilometer.

## Schedule-N

(See Clause 18.1.1)

## SELECTION OF AUTHORITY'S ENGINEER

### 1 Selection of Authority's Engineer

1.1 The provisions of the Model Request for Proposal for Selection of Technical Consultants, issued by the Ministry of Finance in May 2009, or any substitute thereof shall apply for selection of an experienced firm to discharge the functions and duties of an Authority's Engineer.

1.2 The Authority shall invite Expression of Interest from Consulting Engineering firms for bodies corporate to undertake and perform the duties and functions set for in Annexure-I of Schedule-N and thereupon shortlist qualified firms in accordance with pre-determined criteria.

1.3 The Authority shall invite the aforesaid firms in the panel of firms to submit their respective technical and financial offers, each in separate sealed cover. All the technical bids so received shall be opened at pursuant to the evaluation thereof, the Authority shall open the financial bids in respect of each shortlisted firm and the order of priority as among these firms shall be determined on the basis of a weighted evaluation where technical and financial score shall be assigned respective weights of 80:20.

1.4 In the event of termination of the Technical Consultants appointed in accordance with the provisions of above Paragraphs, the Authority shall appoint another firm of Technical Consultants forthwith and may engage a government-owned entity in accordance with the provisions of Paragraph 3 of this Schedule-N.

### 2 Terms of Reference

The Terms of Reference for the Authority's Engineer (the "**TOR**") shall substantially conform with Annex 1 to this Schedule N.

### 3 Appointment of Government entity as Authority's Engineer

Notwithstanding anything to the contrary contained in this Schedule, the Authority may in its discretion appoint a government-owned entity as the Authority's Engineer; provided that such entity shall be a body corporate having as one of its primary functions the provision of consulting, advisory and supervisory services for engineering projects; provided further that a government-owned entity which is owned or controlled by the Authority shall not be eligible for appointment as Authority's Engineer.

Annex – I

(Schedule - N)

## TERMS OF REFERENCE FOR AUTHORITY'S ENGINEER

### 1. Scope

1.1 These Terms of Reference (the "**TOR**") for the Authority's Engineer are being specified pursuant to the EPC Agreement dated..... (the "**Agreement**), which has been entered into between the Ministry of Road Transport and Highways (the "**Authority**") and ..... (the "**Contractor**") for "**widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya on EPC basis (Package 1-1)**" through Engineering, Procurement & Construction (EPC) Contract, and a copy of which is annexed hereto and marked as Annex-A to form part of this TOR.

1.2 The TOR shall apply to construction and maintenance of the Project Highway.

### 2. Definitions and interpretation

2.1 The words and expressions beginning with or in capital letters and not defined herein but defined in the Agreement shall have, unless repugnant to the context, the meaning respectively assigned to them in the Agreement.

2.2 References to Articles, Clauses and Schedules in this TOR shall, except where the context otherwise requires, be deemed to be references to the Articles, Clauses and Schedules of the Agreement, and references to Paragraphs shall be deemed to be references to Paragraphs of this TOR.

2.3 The rules of interpretation stated in Clauses 1.2, 1.3 and 1.4 of the Agreement shall apply, mutatis mutandis, to this TOR.

### 3. General

3.1 The Authority's Engineer shall discharge its duties in a fair, impartial and efficient manner, consistent with the highest standards of professional integrity and Good Industry Practice.

3.2 The Authority's Engineer shall perform the duties and exercise the authority in accordance with the provisions of this Agreement, but subject to obtaining prior written approval of the Authority before determining:

(a) Any Time extension;

(b) Any additional cost to be paid by the Authority to the Contractor;

(c) The Termination Payment; or

(d) Any other matter which is not specified in (a), (b) or (c) above and which creates an obligation or liability on either Party for a sum exceeding Rs. 5,000,000 (Rs. fifty Lakhs).

3.1 The Authority's Engineer shall submit regular periodic reports, at least once every month, to the Authority in respect of its duties and functions under this Agreement. Such reports shall be submitted by the Authority's Engineer within 10 (ten) days of the beginning of every month.

3.4 The Authority's Engineer shall inform the Contractor of any delegation of its duties and responsibilities to its suitably qualified and experienced personnel; provided, however, that it shall not delegate the authority to refer any matter for the Authority's prior approval in accordance with the provisions of Clause 18.2.

3.5 The Authority's Engineer shall aid and advise the Authority on any proposal for Change of Scope under Article 13.

3.6 In the event of any disagreement between the Parties regarding the meaning, scope and nature of Good Industry Practice, as set forth in any provision of the Agreement, the authority's Engineer shall specify such meaning, scope and nature by issuing a reasoned written statement relying on good industry practice and authentic literature.

## 4 Construction Period

4.1 During the Construction Period, the Authority's Engineer shall review the Drawings furnished by the Contractor along with supporting data, including the geo-technical and hydrological investigations, characteristics of materials from borrow areas and quarry sites, topographical surveys, and the recommendations of the Safety Consultant in accordance with the provisions of Clause 10.1.6. The Authority's Engineer shall complete such review and send its observations to the Authority and the Contractor within 15 (fifteen) days of receipt of such Drawings; provided, however that in case of a Major Bridge or Structure, the aforesaid period of 15 (fifteen) days may be extended upto 30 (thirty) days. In particular, such comments shall specify the conformity or otherwise of such Drawings with the Scope of the Project and Specifications and Standards.

4.2 The Authority's Engineer shall review any revised Drawings sent to it by the Contractor and furnish its comments within 10 (ten) days of receiving such Drawings.

4.3 The Authority's Engineer shall review the Quality Assurance Plan submitted by the Contractor and shall convey its comments to the Contractor within a period of 21 (twenty-one) days stating the modifications, if any, required thereto.

4.4 The Authority's Engineer shall complete the review of the methodology proposed to be adopted by the Contractor for executing the Works, and convey its comments to the Contractor within a period of 10 (ten) days from the date of receipt of the proposed methodology from the Contractor.

4.5 The Authority's Engineer shall grant written approval to the Contractor, where necessary, for interruption and diversion of the flow of traffic in the existing lane(s) of the Project Highway for purposes of maintenance during the Construction Period in accordance with the provisions of Clause 10.4.

4.6 The Authority's Engineer shall review the monthly progress report furnished by the Contractor and send its comments thereon to the Authority and the Contractor within 7 (seven) days of receipt of such report.

4.7 The Authority's Engineer shall inspect the Construction Works and the Project Highway and shall submit a monthly Inspection Report bringing out the results of inspections and the remedial action taken by the Contractor in respect of Defects or deficiencies. In particular, the Authority's Engineer shall include in its Inspection Report, the compliance of the recommendations made by the Safety Consultant.

4.8 The Authority's Engineer shall conduct the pre-construction review of manufacturer's test reports and standard samples of manufactured Materials, and such other Materials as the Authority's Engineer may require.

4.9 For determining that the Works conform to Specifications and Standards, the

Authority's Engineer shall require the Contractor to carry out, or cause to be carried out, tests at such time and frequency and in such manner as specified in the Agreement and in accordance with Good Industry Practice for quality assurance. For purposes of this Paragraph 4.9, the tests specified in the IRC Special Publication-11 (Handbook of Quality Control for Construction of Roads and Runways) and the Specifications for Road and Bridge Works issued by MORTH (the "Quality Control Manuals") or any modification/substitution thereof shall be deemed to be tests conforming to Good Industry Practice for quality assurance.

4.10 The Authority's Engineer shall test check at least 20 (twenty) percent of the quantity or number of tests prescribed for each category or type of test for quality control by the Contractor.

4.11 The timing of tests referred to in Paragraph 4.9, and the criteria for acceptance/ rejection of their results shall be determined by the Authority's Engineer in accordance with the Quality Control Manuals. The tests shall be undertaken on a random sample basis and shall be in addition to, and independent of, the tests that may be carried out by the Contractor for its own quality assurance in accordance with Good Industry Practice.

4.12 In the event that results of any tests conducted under Clause 11.10 establish any Defects or deficiencies in the Works, the Authority's Engineer shall require the Contractor to carry out remedial measures.

4.13 The Authority's Engineer may instruct the Contractor to execute any work which is urgently required for the safety of the Project Highway, whether because of an accident, unforeseeable event or otherwise; provided that in case of any work required on account of a Force Majeure Event, the provisions of Clause 21.6 shall apply.

4.14 In the event that the Contractor fails to achieve any of the Project Milestones, the Authority's Engineer shall undertake a review of the progress of construction and

identify potential delays, if any. If the Authority's Engineer shall determine that completion of the Project Highway is not feasible within the time specified in the Agreement, it shall require the Contractor to indicate within 15 (fifteen) days the steps proposed to be taken to expedite progress, and the period within which the Project Completion Date shall be achieved. Upon receipt of a report from the Contractor, the Authority's Engineer shall review the same and send its comments to the Authority and the Contractor forthwith.

4.15 The Authority's Engineer shall obtain from the Contractor a copy of all the Contractor's quality control records and documents before the Completion Certificate is issued pursuant to Clause 12.4.

4.16 Authority's Engineer may recommend to the Authority suspension of the whole or part of the Works if the work threatens the safety of the Users and pedestrians. After the Contractor has carried out remedial measure, the Authority's Engineer shall inspect such remedial measures forthwith and make a report to the Authority recommending whether or not the suspension hereunder may be revoked.

4.17 In the event that the Contractor carries out any remedial measures to secure the safety of suspended works and Users, and requires the Authority's Engineer to inspect such works, the Authority's Engineer shall inspect the suspended works within 3 (three) days of receiving such notice, and make a report to the Authority forthwith, recommending whether or not such suspension may be revoked by the Authority.

4.18 The Authority's Engineer shall carry out, or cause to be carried out, all the Tests specified in Schedule-K and issue a Completion Certificate or Provisional Certificate, as the case may be. For carrying out its functions under this Paragraph 4.18 and all matters incidental thereto, the Authority's Engineer shall act under and in accordance with the provisions of Article 12 and Schedule-K.

## 5. Maintenance Period

5.1 The Authority's Engineer shall aid and advise the Contractor in the preparation of its monthly Maintenance Programme and for this purpose carry out a joint monthly inspection with the Contractor.

5.2 The Authority's Engineer shall undertake regular inspections, at least once every month, to evaluate compliance with the Maintenance Requirements and submit a Maintenance Inspection Report to the Authority and the Contractor.

5.3 The Authority's Engineer shall specify the tests, if any, that the Contractor shall carry out, or cause to be carried out, for the purpose of determining that the Project Highway is in conformity with the Maintenance Requirements. It shall monitor and review the results of such tests and the remedial measures, if any, taken by the Contractor in this behalf.

5.4 In respect of any defect or deficiency referred to in Paragraph 3 of Schedule- E, the Authority's Engineer shall, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards and shall also specify the time limit for repair or rectification of any deviation or deterioration beyond the permissible limit.

5.5 The Authority's Engineer shall examine the request of the Contractor for closure of any lane(s) of the Project Highway for undertaking maintenance/repair thereof, and shall grant permission with such modifications, as it may deem necessary, within 5 (five) days of receiving a request from the Contractor. Upon expiry of the permitted period of closure, the Authority's Engineer shall monitor the reopening of such lane(s), and in case of delay, determine the Damages payable by the Contractor to the Authority under Clause 14.5.

## 6 Determination of costs and time

6.1 The Authority's Engineer shall determine the costs, and/or their reasonableness, that are required to be determined by it under the Agreement.

6.2 The Authority's Engineer shall determine the period of Time Extension that is required to be determined by it under the Agreement.

6.3 The Authority's Engineer shall consult each Party in every case of determination in accordance with the provisions of Clause 18.5.

## 7. Payments

7.1 The Authority's Engineer shall withhold payments for the affected works for which the Contractor fails to revise and resubmit the Drawings to the Authority's Engineer in accordance with the provisions of Clause 10.2.4 (d).

7.2 Authority's Engineer shall -

(a) within 10 (ten) days of receipt of the Stage Payment Statement from the Contractor pursuant to Clause 19.4, determine the amount due to the Contractor and recommend the release of 90 (ninety) percent of the amount so determined as part payment, pending issue of the Interim Payment Certificate; and

(b) within 15 (fifteen) days of the receipt of the Stage Payment Statement referred to in Clause 19.4, deliver to the Authority and the Contractor an Interim Payment Certificate certifying the amount due and payable to the Contractor, after adjustments in accordance with the provisions of Clause 19.10.

7.3 The Authority's Engineer shall, within 15 (fifteen) days of receipt of the Monthly Maintenance Statement from the Contractor pursuant to Clause 19.6, verify the Contractor's monthly statement and certify the amount to be paid to the Contractor in accordance with the provisions of the Agreement.

7.4 The Authority's Engineer shall certify final payment within 30 (thirty) days of the receipt of the final payment statement of Maintenance in accordance with the provisions of Clause 19.16.

## 8. Other duties and functions

The Authority's Engineer shall perform all other duties and functions as specified in the Agreement.

## 9 Miscellaneous

9.1 A copy of all communications, comments, instructions, Drawings or Documents sent by the Authority's Engineer to the Contractor pursuant to this TOR, and a copy of all

the test results with comments of the Authority's Engineer thereon, shall be furnished by the Authority's Engineer to the Authority forthwith.

9.2 The Authority's Engineer shall retain at least one copy each of all Drawings and Documents received by it, including 'as-built' Drawings, and keep them in its safe custody.

9.3 Within 90 (ninety) days of the Project Completion Date, the Authority's Engineer shall obtain a complete set of as-built Drawings, in 2 (two) hard copies and in micro film form or in such other medium as may be acceptable to the Authority, reflecting the Project Highway as actually designed, engineered and constructed, including an as-built survey illustrating the layout of the Project Highway and setback lines, if any, of the buildings and structures forming part of Project Facilities; and shall hand them over to the Authority against receipt thereof.

9.4 The Authority's Engineer, if called upon by the Authority or the Contractor or both, shall mediate and assist the Parties in arriving at an amicable settlement of any Dispute between the Parties.

9.5 The Authority's Engineer shall inform the Authority and the Contractor of any event of Contractor's Default within one week of its occurrence.

## SCHEDULE - O

(See Clauses 19.4.1, 19.6.1, and 19.8.1)

### Forms of Payment Statements

### 1. Stage Payment Statement for Works

The Stage Payment Statement for Works shall state:

(a) The estimated amount for the Works executed in accordance with Clause 19.3.1 subsequent to the last claim;

(b) Amounts reflecting adjustments in price for the aforesaid claim;

(c) The estimated amount of each Change of Scope Order executed subsequent to the last claim;

(d) Amounts reflecting adjustment in price, if any, for (c) above in accordance with the provisions of Clause 13.2.3 (a);

(e) Total of (a), (b), (c) and (d) above;

(f) Deductions:

  (i) Any amount to be deducted in accordance with the provisions of the Agreement except taxes;

  (ii) Any amount towards deduction of taxes; and

  (iii) Total of (i) and (ii) above.

(g) Net claim: (e) – (f) (iii);

(h) The amounts received by the Contractor upto the last claim:

  (i) For the Works executed (excluding Change of Scope orders);

  (ii) For Change of Scope Orders, and

  (iii) Taxes deducted

### 2. Monthly Maintenance Payment Statement

The monthly Statement for Maintenance Payment shall state:

(a) the monthly payment admissible in accordance with the provisions of the agreement;

(b) the deductions for maintenance work not done;

(c) net payment for maintenance due, (a) minus (b);

(d) amounts reflecting adjustments in price under Clause 19.12; and

(e) amount towards deduction of taxes

### 3. Contractor's claim for Damages

**Note**: The Contractor shall submit its claims in a form acceptable to the Authority.

## Schedule-P

(See Clause 20.1)

## INSURANCE

### 1. Insurance during Construction Period

1.1. The Contractor shall effect and maintain at its own cost, from the Appointed Date till the date of issue of the last Completion Certificate, the following insurances for any loss or damage occurring on account of Non Political Event of Force Majeure, malicious act, accidental damage, explosion, fire and terrorism:

(a) insurance of Works, Plant and Materials and an additional sum of [15 (fifteen)] per cent of such replacement cost to cover any additional costs of and incidental to the rectification of loss or damage including professional fees and the cost of demolishing and removing any part of the Works and of removing debris of whatsoever nature; and

(b) Insurance for the Contractor's equipment and Documents brought onto the Site by the Contractor, for a sum sufficient to provide for their replacement at the Site.

1.2 The insurance under paragraph 1.1 (a) and (b) above shall cover the authority and the Contractor against all loss or damage from whatsoever cause arising under paragraph 1.1 other than risks which are not insurable at commercial terms.

### 2. Insurance for Contractor's Defects Liability

The Contractor shall effect and maintain insurance cover for the works from the date of issue of the Completion Certificate until the end of the Defects Liability Period for any loss or damage for which the Contractor is liable and arises from a cuase occurring prior to the issue of Completion Certificate. The Contractor shall also maintain other insurances for maximum sums as may be required under the Applicable Laws and in accordance with Good Industry Practice.

### 3. Insurance against injury to persons and damage to property

3.1. The Contractor shall insure against each Party's liability for any loss, damage, death or bodily injury which may occur to any physical property (except things insured under Paragraph l and 2 of this Schedule or to any person (except persons insured under Clause 20.9), which may arise out of the Contractor's performance of this

agreement and occurring before the issue of the Performance Certificate. This insurance shall be for a limit per occurrence of not less than the amount stated below with no limit on the number of occurrences.

The insurance cover shall be as per the applicable laws of government and procedure in vogue.

3.2 The insurance shall be extended to cover liability for all loss and damage to the Authority's property arising out of the Contractor's performance of this Agreement excluding:

(a) the Authority's right to have the construction works executed on, over, under, in or through any land, and to occupy this land for the Works; and

(b) Damage which is and unavoidable result of the Contractor's obligations to execute the Works.

## 4. Insurance to be in joint names

The insurance under paragraphs 1 to 3 above shall be in the joint names of the Contractor and the Authority.

**SCHEDULE-Q**

**(See Clause 14.10)**

**Tests on Completion of Construction**

1. Riding Quality test:

Riding quality test: Riding quality of each lane of the carriageway shall be checked with the help of a calibrated bump integrator and the maximum permissible roughness for purposes of this Test shall be [2,500 (two thousand five hundred)] mm for each kilometer.

2. Visual and physical test:

The Authority's Engineer shall conduct a visual and physical check of construction to determine that all works and equipment forming part thereof conform to the provisions of this Agreement. The physical tests shall include measurement of cracking, rutting, stripping and potholes and the permissible values are given below: • Area of cracking not more than 2 % area

• Area of rutting with rut depth more than 10 mm - not more than 1 …. % area

• Area of stripping: not more than 2 % area

• Area of potholes: Nil

• Edge drop – Shall not be more than 15 mm

**SCHEDULE-R**

**(See Clause 14.10)**

**Taking Over Certificate**

I, ……. (Name and designation of the Authority's representative) under and in accordance with the Agreement dated

…… (the "Agreement"), for **widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya on EPC basis"** (the "**Project Highway**") on Engineering, Procurement and Construction (EPC) basis through

……. (Name of Contractor), hereby certify that the Tests on completion of Maintenance Period in accordance with Article 14 of the Agreement have been successfully undertaken to determine compliance of the Project Highway with the provisions of the Agreement and I hereby certify that the Authority has Taken over the Project Highway from the Contractor on this day .....

SIGNED, SEALED AND DELIVERED

(Signature)

(Name of Authority's Engineer)

(Address)

**SCHEDULE-S**

**(See Clause 17.7.2)**

**Performance Certificate**

I, ……. (Name and designation of the Authority's representative) under and in accordance with the Agreement dated …… (the "Agreement"), for [construction and maintenance of the **widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya on EPC basis (Package 1-1)** (the "Project Highway") on Engineering, Procurement and Construction (EPC) basis through ……. (Name of Contractor), hereby certify that the Contractor has discharged all its obligations under the Agreement and in accordance with Article 17 of the Agreement I hereby issue Performance Certificate to the Contractor on this day.....

SIGNED, SEALED AND DELIVERED

(Signature)

(Name of Authority's Engineer)

(Address)

## SCHEDULE-T

**(See Clause 19.1.6)**

| Name of Currency | A<br>Amount of Currency | B<br>Rate of Exchange Prevailing on the Base Date<br>(Local Currency per Unit of Foreign Currency | C<br>Local Currency Equivalent | D<br>Percentage of Net Bid Price (NTP)<br>(100 x C) / NTP |
|---|---|---|---|---|
| Local Currency<br>(Indian Rupees) | | | | |
| Foreign Currency 1<br>(Japanese Yen) | | | | |
| Foreign Currency 2<br>(US Dollar) | | | | |
| Net Bid Price | | | | 100.00 |

* Fixed rate of exchange shall be the rate published by RBI of India 28 days prior to deadline for submission of bids i.e. 19.01.2018 (28 days prior to bid submission date i.e. 15.02.2018)

1. Change in scope would require agreement between parties on currency.
2. Regarding damages by the Authority, financing charges for a payment delays will be in corresponding currency amounts.
3. Delay damages will be recovered in currencies in proportion in which contract price is payable.