

Prepared for:

**The Administration of the Union  
Territory of Ladakh  
PWD (R&B)**



Project:

**Detailed Project Report (DPR) for preparation of various Road/Tunnel projects of Public Works (R&B) Department, UT of Ladakh - Highway tunnel across Fotu La Pass (1.7 Km approx.) along with its approaches on Zojila - Leh - Kargil Road**

Subject:

**FOTULA TUNNEL  
TECHNICAL SPECIFICATIONS- (HIGHWAY)  
VOLUME-4D**

Prepared by:



**M/s RITES Ltd.**  
(Schedule 'A' Enterprise of Government of India)

Shikhar,  
Plot No. 01, Sector 29,  
Gurgaon 122001  
Tel: +91-124-28 18 570  
Email:  
rcedtunneling@googlegroups.com

00	25.02.2025	Draft Issue	ADL	RSD	LK
Rev.	Date	Description	Originator	Checked	Approved
Document No: <b>UTES_00081_FOTULA_TS-H_VOL-4D_R0</b>			Revision: <b>0</b>		



## **Disclaimer**

This document has been prepared for the titled project or named part thereof and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and prior written authority of M/s RITES Ltd. being obtained. M/s RITES Ltd. accepts no responsibility or liability for the consequences of this document being used for a purpose other than the purposes for which it was commissioned. Any person using or relying on the document for such other purpose agrees and will by such use or reliance be taken to confirm his agreement to indemnify M/s RITES Ltd. for all loss or damage resulting therefrom. M/s RITES Ltd. Accepts no responsibility or liability for this document to any party other than the person by whom it was commissioned.

## Table of Contents

1. PREAMBLE.....	1
1.1.1 General.....	1
1.1.2 Inclusive Documents .....	1
1.1.4 Measurement and Payment.....	1
1.1.5 Defective Works .....	2
1.2 SITE INFORMATION .....	2
2.1 PART-I: General Technical Specifications.....	2
2.2 PART-II: Particular Technical Specifications.....	2
SECTION 100 GENERAL.....	4
CLAUSE 105 SCOPE OF WORK.....	4
CLAUSE 106 CONSTRUCTION EQUIPMENT .....	4
CLAUSE 111 PRECAUTIONS FOR SAFEGUARDING THE ENVIRONMENT.....	5
Sub Clause 111.6 Pollution from Hot Mix Plant, WMM Plant, Batching Plant & Crusher and Other Construction Machinery .....	7
Sub Clause 111.8 Sanitation and Waste Disposal in Construction Camp.....	11
Sub Clause 111.10 Damage to Existing road/ CD Structures.....	12
Sub Clause 111.11 Use of Nuclear Gauges .....	12
Sub Clause 111.12 Environmental Monitoring .....	12
1. Ambient Air Quality Standards (National) CPCB 2009 .....	12
2. Water quality Standards (IS 10500: 2012).....	15
Sub Clause 111.13 Protection of Existing Trees .....	18
Sub Clause 111.14 Disposal of Materials outside Work Site .....	18
Sub Clause 111.14.2 Construction of Water Recharge pits.....	19
Sub Clause 111.14.3 Construction of Silt Fences and Silt Traps .....	20
Sub Clause 111.14.5 Provision for Oil Interceptors: .....	22
Sub Clause 111.17 Emergency Response.....	22



CLAUSE 112 ARRANGEMENT FOR TRAFFIC DURING CONSTRUCTION.....	23
The use of fly ash in temporary diversions shall not be permitted.....	24
Sub Clause 112.6 Measurements for Payment and Rate .....	24
CLAUSE 114 SCOPE OF RATES FOR DIFFERENT ITEMS OF WORK.....	25
CLAUSE 120 FIELD LABORATORY .....	25
“Sub Clause 120.2 Description.....	26
Replace Sub-Clause 120.4 with the following: “Sub Clause 120.4 Maintenance .....	31
SECTION 200 SITE CLEARANCE .....	32
Sub Clause 201.5 Delete 1st sentence in the 1st Paragraph in Sub-Clause 201.5 and add the following sentence. ....	32
CLAUSE 202 DISMANTLING CULVERTS, BRIDGES AND OTHER STRUCTURES/PAVEMENTS.....	32
SECTION 300 EARTHWORK, EROSION CONTROL AND DRAINAGE	
CLAUSE 301 EXCAVATION FOR ROADWAY AND DRAINS .....	33
Sub Clause 301.8 Measurements for Payment.....	33
Table 300-2: Compaction Requirements for Embankment and Sub-grade.....	34
SECTION 400 SUB-BASES, BASES (NON-BITUMINOUS) AND SHOULDERS.....	35
Sub Clause 401.3 Construction Operations.....	36
401.3.1: Preparation of Sub grade.....	36
CLAUSE 406 WET MIX MACADAM SUB-BASE/BASE .....	37
Sub-Clause 406.3 Construction Operations      Sub Clause 406.3.4 Spreading of Mix .....	37
Sub-Clause 406.3.5    Compaction.....	37
CLAUSE 409 CEMENT CONCRETE KERB AND KERB WITH CHANNEL .....	37
CLAUSE 410 FOOTPATHS AND SEPARATORS .....	38
410.2.    Materials .....	38
410.3.    Construction Operations.....	38
410.3.4    Precast cement concrete tiles: .....	38

410.4	Measurements for Payment.....	39
410.5	Rates.....	39
	SECTION 500 BASES AND SURFACE COURSES (BITUMINOUS).....	39
	CLAUSE 501 GENERAL REQUIREMENTS FOR BITUMINOUS PAVEMENT LAYERS.....	39
	Sub-Clause 501.2.1 .....	39
	Sub Clause 501.6 Compaction.....	40
	CLAUSE 502 PRIME COAT OVER GRANULAR BASE .....	40
	Sub Clause 502.8 Rate .....	40
	“502.8. Rate .....	40
	Sub Clause 503.8 Rate .....	41
	“503.8. Rate .....	41
	CLAUSE 505 DENSE BITUMINOUS MACADAM .....	41
	Sub-Clause 505.2.2 Coarse Aggregates .....	41
	Sub-Clause 507.2.2 Coarse Aggregates.....	42
	Sub-Clause 507.9 Rate .....	42
	CLAUSE 508 CLOSE GRADED PREMIX SURFACING/MIXED SEAL SURFACING .....	42
	Sub Clause 508.2 Materials Sub-Clause 508.2.1 Binder .....	43
	Sub-Clause 508.2.2 Coarse Aggregates .....	43
	Sub-Clause 508.2.3 Fine Aggregates.....	43
	Sub-Clause 508.3 Constructions Operations.....	43
	Sub Clause 508.8 Rate .....	43
	CLAUSE 516 MASTIC ASPHALT.....	43
	Fine Aggregates.....	44
	Sub-Clause 516.4.5 Spreading.....	44
	Sub-clause 801.4 Installation .....	44
	Sub-clause 801.5 Measurement for Payment.....	44

Clause 802 OVERHEAD SIGNS .....	45
CLAUSE 803 ROAD MARKINGS .....	45
Sub Clause 803.8.11 Measurement for Payment.....	45
CLAUSE 805 DISTANCE INDICATOR POST .....	45
CLAUSE 807 BOUNDARY STONES.....	46
Sub Clause 809.5 Rate .....	46
CLAUSE 811 CRASH BARRIER.....	46
Sub Clause 811.2.1 Materials .....	46
Sub Clause 811.2.2 Construction Operations .....	47
CLAUSE 811.3 Metal Beam Crash Barrier .....	47
Sub-Clause 811.3.3 Installation of Posts .....	47
Sub-Clause 811.3.7 Measurements for Payment .....	48
Sub Clause 811.3.8 Rate.....	48
811.3.8.....	49
Sub Clause 813.12: Measurement .....	49
SECTION 1000 MATERIALS FOR STRUCTURES .....	49
CLAUSE 1002 SOURCES OF MATERIALS .....	49
CLAUSE 1006 CEMENT .....	49
CLAUSE 1007 COARSE AGGREGATES .....	50
CLAUSE 1014 STORAGE OF MATERIALS.....	50
SECTION 1500 FORMWORK.....	50
CLAUSE 1502 MATERIALS .....	50
CLAUSE 1506 PRECAUTIONS .....	51
Clause 1513 Rate .....	51
SECTION 1600 STEEL REINFORCEMENT CLAUSE 1602 GENERAL.....	51
CLAUSE 1603 PROTECTION OF REINFORCEMENT .....	51

CLAUSE 1605 PLACING OF REINFORCEMENT .....	51
Structural depth d (mm) Tolerance (mm) .....	52
SECTION 1700 STRUCTURAL CONCRETE CLAUSE 1705 ADMIXTURES .....	52
CLAUSE 1706 SIZE OF COURSE AGGREGATE .....	52
Clause 1707 EQUIPMENT.....	53
CLAUSE 1715 HIGH PERFORMANCE CONCRETE.....	53
CLAUSE 1800 PRESTRESSING .....	54
SECTION 2000 BEARINGS.....	54
Sub-Clause 2005.4.5 Inspection Certificate.....	54
Sub-Clause 2005.4.6 Quality Control Certificate.....	54
CLAUSE 2009 MEASUREMENTS FOR PAYMENT .....	54
CLAUSE 2011 TAR PAPER BEARING.....	54
CLAUSE 2100 OPEN FOUNDATIONS.....	55
CLAUSE 2104 WORKMANSHIP .....	55
Sub Clause 2104.3 Construction.....	55
SECTION 2200 SUB-STRUCTURE .....	55
CLAUSE 2210 RATE .....	55
SECTION 2500 RIVER TRAINING AND PROTECTION WORK CLAUSE 2504 PITCHING/REVTMENT ON SLOPES .....	56
CLAUSE 2507 CURTAIN WALL AND FLEXIBLE APRON .....	56
SECTION 2700 WEARING COAT AND APPURTENANCES .....	56
Sub-Clause 2703.5.2 Materials .....	56
Sub-Clause 2703.5.3 Construction Operations.....	57
Sub-Clause 2703.5.4 Tolerance .....	57
Sub-Clause 2703.5.5 Measurements for Payment.....	57
Sub-Clause 2703.5.6 Rate .....	57
Sub-Clause 2703.6 POLYSULPHIDE RUBBER JOINT SEALANT.....	58

CLAUSE 2706 WEEP HOLES .....	59
CLAUSE 2708 MEASUREMENT FOR PAYMENT .....	59
SECTION 2900 PIPE CULVERTS.....	59
CLAUSE 2911 RATE .....	60
SECTION 3000 MAINTENANCE OF ROAD.....	60
ADDITIONAL TECHNICAL SPECIFICATIONS.....	60
1. Measurement for Payment.....	61
CLAUSE A-2 CHUTE DRAIN FOR HIGH EMBANKMENT SECTIONS .....	61
Clause A-2.2 Materials .....	61
Clause A-2.3 Construction Operations.....	61
Clause A-2.4 Measurements for Payment.....	62
Clause A-2.5 Rate .....	62
Clause A-3.2 Painting on New Surface Clause A-3.2.1 Preparation of surface.....	62
Clause A-3.2.2 Application.....	63
Clause A-3.3 Lettering and Numbering on New Surface.....	63
Clause A-3.4 Measurement for payment.....	63
Clause A-3.5 Rate.....	63
CLAUSE A-4 CONTROLLED BLASTING Clause A-4.1 GENERAL .....	64
Clause A-4.2 CONTROLLED BLASTING.....	64
Clause A-4.3 PROTECTIVE MEASURES .....	64
Clause A-4.4 BLASTING WITHIN CERTAIN LIMITS.....	64
Clause A-4.5 PRECAUTIONS AFTER BLASTING .....	65
Clause A-4.6 PERSONNEL .....	66
CLAUSE A-5 INTER LOCKING CONCRETE BLOCKS.....	67
Clause A-5.2 Unit of measurement .....	67
Clause A-5.3 Rate .....	67

CLAUSE A-5A INTER LOCKING CONCRETE BLOCKS FOR RAISED PEDESTRIAN CROSSING .....	67
Clause A-5A.2 Unit of measurement.....	68
Clause A-5A.3 Rate .....	68
CLAUSE A-6 UTILITY DUCTS.....	68
Clause A-6.3 Laying of Pipes.....	68
Clause A-6.4 Jointing.....	68
Clause A-6.5 Back Filling.....	68
Clause A-6.6 Closing of Ends.....	69
Clause A-6.7 Measurement of Payments.....	69
Clause A-6.8 Rate .....	69
CLAUSE A-8 Specific Provisions for Protection of the Environment.....	69
CLAUSE A 9-1        SIGNBOARDS.....	69
CLAUSE A 9-2    PROVISION OF AUTHORITY'S ENGINEER'S FACILITIES AND SERVICES        70	
Table A9.1: Equipment for Authority's Engineer's Offices .....	73
Table A9.2: Consumables for Authority's Engineer's Main Office & Site Office (if any).....	76
Table A9.3: Safety Equipment for Authority's Engineer's Main Office & Site Office (if any) .	77

## TECHNICAL SPECIFICATIONS

### 1. PREAMBLE

- 1.1 The Technical Specifications contained herein shall be read in conjunction with the other Bidding Documents as specified in Volume-V.

#### 1.1.1 General

The Technical Specifications covering the materials and the workmanship aspects are included in this section. These specifications cover the items of civil and non-civil works coming under scope of this document. All work shall be carried out in conformity with the same. These specifications are not intended to cover the minute details. The works shall be executed in accordance with good practices followed for achieving high standards of workmanship, thus ensuring safety and durability of the construction. All codes and standards referred to in these specifications shall be the latest thereof unless otherwise stated.

#### 1.1.2 Inclusive Documents

The provisions of Special Conditions of Contract, those specified elsewhere in the tender document, as well as tender drawings and notes, or other specifications issued in writing by the Authority's Engineer shall form part of the Technical Specifications of this project.

- 1.1.3 The attention of the Contractor is drawn to those clauses of codes which require supporting specification either by the Authority's Engineer or by 'Mutual agreement between the supplier and purchaser'. In such cases, it is the responsibility of the tenderer /Contractor to seek clarification on any uncertainty and obtain prior approval of the Authority's Engineer before taking up the supply/construction. In absence of such prior clarification, the Authority Engineer's choice/design will be final and binding on the contractor without involving separately any additional payment.

#### 1.1.4 Measurement and Payment

The Rate and Measurement for Payment as given in MORTH Specifications for Road and Bridge Works 5th Revision 2013 including amendments given in Part-II Particular Technical Specifications shall not be applicable and shall be replaced by appropriate clauses of Conditions of Contract together with Schedules. Should there be any detail of construction or materials which has not been referred to in the specification or in the Schedules and Drawings but the necessity for which may be implied or inferred there from, or which is usual or

essential to the completion of the work in the trades, the same shall be deemed in the lump sum price quoted by the Contractor.

### 1.1.5 Defective Works

All defective works are liable to be demolished, rebuilt and defective materials replaced by the contractor at his own cost. In the event of such works being accepted by carrying out repairs etc., as specified by the Authority's Engineer the cost of repairs will be borne by the Contractor.

## 1.2 SITE INFORMATION

1.2.1 The information given hereunder and provided elsewhere in these documents is given in good faith by the Employer but the Contractor shall satisfy himself regarding all aspects of site conditions and no claim will be entertained on the plea that the information supplied by the Employer is erroneous or insufficient.

1.2.2 The horizontal alignment is passing through Hilly terrain in most of its length and can cater to the design speed of 20-65 km/hr. The vertical alignment has generally normal gradients as high as 7%.

## GENERAL REQUIREMENTS

The Technical Specifications in accordance with which the entire work described hereinafter shall be constructed and completed by the Contractor shall comprise of the following:

### 2.1 PART-I: General Technical Specifications

The General Technical Specifications shall be the "Specifications for Road and Bridge Works (Fifth Revision, April 2013)", as issued by the Ministry of Road Transport & Highways, Government of India and published by the Indian Roads Congress.

### 2.2 PART-II: Particular Technical Specifications

2.2.1 This Particular Technical Specifications of the Specifications revises certain Causes of MORTH Specifications for Road and Bridge Works 5<sup>th</sup> Revision 2013.

2.2.2 The amendments, if any, issued to the MORTH Specifications for Road and Bridge Works Fifth Revision 2013 shall apply to the relevant Clauses, otherwise as specified in this Section.

2.2.3 These revisions comprise substitutions, modifications or additions to clauses of the MORTH Specifications referred to in Part 1 – General Technical Specifications and accordingly the said Specifications so amended shall form part of the Contract.



2.2.4 The term “Engineer” used in the MORTH Specification shall be deemed to be substituted by the term “Authority’s Engineer”.

2.2.5 The following list shows the Clauses of the MORTH Specifications, which are modified or added by this Particular Technical Specifications:

Section 100:	105, 106, 111, 112, 114 and 120
Section 200:	201 and 202
Section 300:	301, 304, 305, 306 and 309
Section 400:	401, 406, 409 and 410
Section 500:	501, 502, 503, 504, 505, 507, 508, 510 and 516
Section 800:	801, 802, 803, 805, 807, 809, 8.11 and 813
Section 1000:	1002, 1006, 1007, 1008 and 1014
Section 1500:	1501, 1502, 1506 and 1513
Section 1600:	1602, 1603 and 1605
Section 1700:	1705, 1706, 1707 and 1715
Section 1800:	1803
Section 2000:	2005, 2009 and 2011
Section 2100:	2104
Section 2200:	2204 and 2210
Section 2500:	2504 and 2507
Section 2700:	2703, 2706 and 2708
Section 2900:	2906, 2910 and 2911
Section 3000:	3001

#### 2.2.6 Additional Specifications

The Clauses A-1 to A-9 have been added to the “SPECIFICATIONS FOR ROAD AND BRIDGE WORKS” (Fifth Revision, April 2013).

#### **Clause A-1 DIVERSION AND FILLING OF EXISTING WATER COURSES ALONG THE ROAD ALIGNMENT**

- Clause A-2 CHUTE DRAIN FOR HIGH EMBANKMENT SECTIONS**
- Clause A-3 SPECIFICATIONS FOR PAINTING OF STRUCTURES WITH SYNTHETIC ENAMEL PAINT/ WATER PROOFING CEMENT PAINT**
- Clause A-4 CONTROLLED BLASTING**
- Clause A-5 INTER LOCKING CONCRETE BLOCKS**
- Clause A-5A INTER LOCKING PAVER BLOCKS FOR RAISED PEDESTRIAN CROSSING**
- Clause A-6 UTILITY DUCTS**
- Clause A-7 POST CONSTRUCTION SERVICES**
- Clause A-8 ENVIRONMENTAL MANAGEMENT PLAN AS APPROVED**
- Clause A-9 GENERAL ITEMS**

In the absence of any definite provisions on any particular issue in the aforesaid Specifications, reference may be made to the latest codes and specifications of IRC, BIS, BS, ASTM, AASHTO and CAN/CSA in that order. Where even these are silent, the construction and completion of the works shall conform to sound Engineering practice as approved by the Authority's Engineer.

## **SECTION 100 GENERAL.**

### **CLAUSE 105 SCOPE OF WORK**

#### **Sub Clause 105.3**

#### **Add the following to the Sub Clause 105.3**

The QA programme shall also conform to the requirements of EN ISO 9001.

### **CLAUSE 106 CONSTRUCTION EQUIPMENT**

#### **Add the following sub Para (l) after sub Para (k):**

- l) All measuring devices and gauges shall be in good working condition. Measuring devices that can affect product quality shall be calibrated prior to use and at prescribed intervals against certified equipment. Calibration procedures shall be established, maintained and documented and corrective actions taken

when results are unsatisfactory. Calibration of all measuring devices and gauges etc., which the Contractor intends to use in the contract, shall be calibrated from a competent/reputed authority/agency accredited to NABL and the frequency of the calibration shall be as directed by the Authority's Engineer. Accuracy and fitness of measuring devices shall be ensured by proper maintenance.

## **CLAUSE 111 PRECAUTIONS FOR SAFEGUARDING THE ENVIRONMENT**

**Replace entire Clause 111 with the following:**

### **Sub Clause 111.1 General**

This section of Technical Specifications sets out instructions, recommended standards and technical specifications for the design and implementation of Environmental Management Plan (EMP) mitigation works associated with the construction of the project road.

Compliance with these Specifications shall not relieve the Contractor of any responsibility for complying with the requirements of any highway authority in respect of the roads used by him.

The Contractor shall review the plan and submit the Contractor's EMP which will set out the measures he proposes to implement to meet the requirements of the Project EMP. It shall also be accompanied with relevant documents (statements of compliance, certificates of compliance, test reports, etc.), evidencing their conformity with the statutory regulations. Execution of environmental mitigation measures meeting the requirement of Technical Specifications in conformity with applicable legislation shall be the responsibility of the Contractor.

The Contractor shall take all precautions for safeguarding the environment during the course of the construction of works. He shall abide by all rules, regulations and laws in force governing pollution and environmental protection that are applicable to the area where the works are situated.

Labour shall be warned against the hunting of wild life, if any. No archaeological site shall be disturbed.

### **Sub Clause 111.1.1 Noise:**

The Contractor shall mitigate against any sustained increase in base line ambient Noise levels at sensitive receptors during construction of work.

All construction operations shall be performed in a manner to minimize noise and vibration. The parameters for noise are detailed Sub Clause 111.12.

Noise levels shall be monitored by the Contractor who shall prior to the commencement of the works, submit to the Authority's Engineer for approval, the method how noise levels shall be measured, locations and the frequency at which he proposes to monitor the noise levels. The Contractor shall submit such agreed records to the Authority's Engineer at weekly intervals for review. If the noise levels are found to be above these standards and it is determined by the Authority's Engineer that these levels are due to the equipment or plant being deployed by the Contractor, the Contractor shall undertake, at his own cost, measures as approved by the Authority's Engineer, to bring these levels down to the specified levels.

#### **Sub Clause 111.2 Borrow pits for Embankment Construction**

Borrow pits shall not be dug within the Right-of-Way of the road. Arable lands shall not be used for earth borrowing. The Contractor shall ensure that proper excavation techniques are used to ensure the geotechnical stability and safety of the borrow area. The excavation shall be carried out in such a way that the area does not inundate during monsoons or generate standing pools of water. The stipulations in Clause 305.2.2 shall govern. The borrow pits shall not be left in a condition likely to cause damage to human and animal life. The Contractor shall seek prior permission from the concerned Authorities for operating the borrow pits.

#### **Sub Clause 111.3 Quarry Operations**

The Contractor shall obtain material from licensed quarries only after the consent of the concerned department or other concerned authorities. The quarry operation shall be undertaken within the purview of the rules and regulations in force.

The Contractor shall ensure scheduling the movement of transport carrying material to and from the site to limit operations to during non-peak hours. The trucks carrying all the dusty material, red earth, moorum and fly ash/ pond, ash shall be covered with a tarpaulin and provided with adequate free board to prevent spillage. End boards shall be provided in loaders to prevent spillage.

Stockpiling of material transportation shall be properly planned so as to ensure that no traffic jam takes place on the highway due to construction traffic.

#### **Sub-Clause 111.4 Control of Soil Erosion, Sedimentation and Water Pollution**

The Contractor shall carry out the works in such a manner that soil erosion is fully controlled, and sedimentation and pollution of natural water courses, ponds, tanks and reservoirs is avoided. The stipulations of Clause 306 shall govern.

#### **Sub Clause 111.5 Precautions against Dust**

The Contractor shall take all reasonable steps to minimize dust nuisance during the construction of the works. All existing highways and roads used by vehicles of the Contractor or any of his sub-contractors or suppliers of materials or plant, and similarly any new roads which are part of the works and which are being used by construction traffic shall be kept clean and clear of all dust / mud or other extraneous material dropped by the said vehicles or their tyres.

All dust / or mud or other extraneous material from the works spreading on these highways shall be immediately cleared by the Contractor. Such clearance shall be effected immediately by manual sweeping and removal of debris, or, if so directed by the Authority's Engineer, by mechanical sweeping and clearing equipment, and all dust, mud and other debris shall be removed entirely from the road surface.

The road surface, including haul road from quarries and plants shall be hosed or watered using suitable equipment to avoid dust pollution. Special care shall be taken to combat dust problem originating from use of fly ash/pond ash.

#### **Sub Clause 111.6 Pollution from Hot Mix Plant, WMM Plant, Batching Plant & Crusher and Other Construction Machinery**

The Contractor shall ensure the use of a relatively new, well maintained hot mix plant (batch type) so that any emission conforms to the MPCB norms and be fitted with a dust extraction unit to avoid prolonged engine powered equipment illness.

Hot Mix Plant, WMM plant, Batching Plant & Crusher etc. shall be located more than 500 m from any community or residence and 1 km away from the sensitive receptors (schools, hospitals), unless otherwise required by the statutory requirements. The Contractor has to obtain necessary consent/clearance from the State Pollution Control Board and/or concerned authority to operate Hot Mix Plant, WMM plant, Batching Plant, DG Set and Crusher etc. before commencement of works.

All vehicles, equipment and machinery needed for construction shall be regularly maintained to ensure that pollution emission levels conform to MPCB norms. All vehicles shall be fitted with silencers.

Construction vehicles, machinery and equipment shall move or be stationed in designated areas to avoid compaction of soil to ensure the preservation of the top soil for agriculture. The Contractor shall be fully responsible for any claims or damages caused to the owners of the property, field and residences in the vicinity and violation of pollution control norms if any.

#### **Sub Clause 11.7 Road Safety**

The Contractor shall:

- provide adequate circuit for traffic flow around construction areas,
- Control speed of construction vehicles through road safety and training of drivers, and provide adequate signage, barriers and flag persons for traffic control.

If there are traffic jams on public roads during construction due to the construction traffic, measures shall be taken to relieve the congestion with the assistance of local traffic police.

Safety of workers undertaking various operations during construction will be ensured. Supervisor must be available in the Contractor's working team for the entire construction period.

The Contractor shall submit the construction safety check list in the format given below filled up to fourth column to the Authority's Engineer by the 5<sup>th</sup> of every month. The Authority's Engineer shall fill up the remaining column of the check list and forward to the Employer within a week period.

Sl. No.	Safety Issues	Yes	No	Non compliance	Corrective Action	Penalty	Remarks
<b>Safety during Construction Stage</b>							
1	Appointment of qualified Construction safety officers						
2	Approval for Construction Safety Management Plan by the Authority's Engineer.						
3	Approval for Traffic Management/control Plan in accordance with IRC: SP: 55-2001						

4	Maintenance of the existing road stretches handed over to the Contractor.						
5	Provision of Temporary Traffic Barriers/Barricades/caution tapes in construction zones						
6	Provision of traffic sign boards						
7	Provision for flags and warning lights						
8	Provision of metal drum/empty bitumen drum delineator, painted in circumferential strips of alternate black and white 100mm wide 2 coats fitted with reflectors 3 Nos of 7.5cm diameter						
9	Providing plastic crash barrier						
10	Provision of adequate staging, form work and access (ladders with handrail) for works at a						
11	Provision of adequate shoring / bracing / barricading / lighting for all deep excavations of more than 3.0 m depth.						
12	Demarcations (fencing, guarding and watching) at construction sites						
13	Provision for sufficient lighting especially for night time work						

14	Arrangements for controlled access and entry to Construction zones						
15	Safety arrangements for Road users / Pedestrians						
16	Arrangements for detouring traffic to alternate facilities						
17	Regular Inspection of Work Zone Traffic Control Devices by authorized contractor personnel						
18	Construction Workers safety –Provision of personnel protective equipment's						
19	A. Helmets						
	B. Safety Shoe						
	C. Dust masks						
	D. Hand Gloves						
	E. Safety Belts						
	F. Reflective Jackets						
	G. Earplugs for labor						
20	Workers employed on bituminous works, stone crushers, concrete batching plants etc. provided with protective goggles, gloves, gumboots etc.						
21	Workers engaged in welding work shall be provided with welder protective shields						
22	All vehicles are provided with reverse horns.						
23	All scaffolds, ladders and other safety devices shall be maintained in as safe and sound condition						



24	Regular health checkup for Labour/Contractor's personnel						
25	Ensuring the sanitary conditions and all waste disposal procedures & methods in the camps.						
26	The Contractor shall provide adequate circuit for traffic flow around construction areas, control speed of construction vehicles through road safety and training of drivers, provide adequate signage, barriers and flag persons for traffic control						
27	Provision for insurance coverage to the contractor's personnel						

### **Sub Clause 111.8 Sanitation and Waste Disposal in Construction Camp**

The Contractor shall ensure that construction camps are located at a distance of minimum 200m from water sources. Special attention shall be paid to the sanitary conditions of the camps. The Contractor shall ensure that sufficient measures are taken i.e. provision of garbage tanks and sanitation facilities. Waste in septic tanks shall be cleaned periodically. Garbage shall be collected in suitable containers at each construction site and disposed of daily. The Contractor shall provide adequate measures for the health care of workers and arrange their regular medical check-up to ensure that they do not suffer from any communicable diseases. At every workplace, sufficient potable water supply shall be maintained to avoid waterborne/ water related diseases. If any pits are dug at the construction/ camp sites which are not filled and may then trap water, shall be filled up properly so that no water accumulates.

The construction camps shall conform to the state and national building regulations as applicable.

**Sub Clause 111.9 Substances Hazardous to Health**

The Contractor shall not use or generate any material in the works, which is hazardous to the health of persons, animals or vegetation. Where it is necessary to use some such substance which can cause injury to the health of the workers, the Contractor shall provide suitable protective clothing or appliances to his workers, as recommended by the supplier of the substance.

Sealed containers of hazardous materials shall be stored in a well-ventilated room, well-guarded and secured.

**Sub Clause 111.10 Damage to Existing road/ CD Structures**

Any structural damage caused to the existing roads/structures by the Contractor's construction equipment shall be made good at the Contractor's own cost.

**Sub Clause 111.11 Use of Nuclear Gauges**

Nuclear gauges shall be used only where permitted by the Authority's Engineer. The Contractor shall provide the Authority's Engineer with a copy of the regulations governing the safe use of nuclear gauges he intends to employ and shall abide by such regulations. Without written approval, no such equipment shall be used at any level of the work.

**Sub Clause 111.12 Environmental Monitoring**

In order to carry out periodic checks, environmental monitoring will be carried out by the Client and/or the Authority's Engineer as per schedule provided in the Contractors Environmental Management Plan and, if any measured parameter is found to exceed the acceptable standards specified below, mitigation measures / control measures, as directed by the Authority's Engineer, shall be provided by the Contractor at his own cost. Environmental Monitoring of Air, Noise, Water and Soil parameters shall be carried by the contractor as per the consents and latest environmental norms, guidelines and policies of national and state level environmental authorities. The Contractor shall comply by all obligations and make sure that there are no deviations from them or from the Contract. Environmental standards for Air, Noise and water are outlined below.

**1. Ambient Air Quality Standards (National) CPCB 2009**

S. No.	Pollutants	Time weighted average	Concentration in ambient air		Method of Measurement
			Industrial, Residential, Rural & other Areas	Ecologically Sensitive Area (notified by Central Government)	
1.	Sulphur Dioxide (SO <sub>2</sub> ) µg/m <sup>3</sup>	Annual*	50	20	<ul style="list-style-type: none"> <li>- Improved West and Geake</li> <li>- Ultraviolet Fluoresce</li> </ul>
		24 hours**	80	80	
2.	Nitrogen Dioxide (NO <sub>2</sub> ) µg/m <sup>3</sup>	Annual*	40	30	<ul style="list-style-type: none"> <li>- Modified Jacob &amp; Hochheiser (Na- Arsenite)</li> <li>- Chemiluminescence</li> </ul>
		24 hours**	80	80	
3.	Particulate Matter (size less than 10 µm or PM <sub>10</sub> ) µg/m <sup>3</sup>	Annual*	60	60	<ul style="list-style-type: none"> <li>- Gravimetric</li> <li>- TOEM</li> <li>- Beta attenuation</li> </ul>
		24 hours**	100	100	
4.	Particulate Matter (size less than 2.5 µm or PM <sub>2.5</sub> ) µg/m <sup>3</sup>	Annual*	40	40	<ul style="list-style-type: none"> <li>- Gravimetric</li> <li>- TOEM</li> <li>- Beta attenuation</li> </ul>
		24 hours**	60	60	
5.	Ozone (O <sub>3</sub> ) µg/m <sup>3</sup>	8 hours**	100	100	<ul style="list-style-type: none"> <li>- UV Photometric</li> <li>- Chemiluminescence</li> <li>- Chemical method</li> </ul>
		1 hour **	180	180	
6.	Lead (Pb) µg/m <sup>3</sup>	Annual*	0.5	0.5	<ul style="list-style-type: none"> <li>- ASS/ICP method after</li> <li>- sampling on EPM 2000 or</li> <li>- equivalent filter paper</li> <li>- ED-XRF using Teflon filter</li> </ul>
		24 hours**	1.0	1.0	

7.	Carbon Monoxide (CO) mg/m <sup>3</sup>	8 hour	02	02	- Non Dispersive Infra-Red (NDIR)
		1 hours**	04	04	- Spectroscopy
8.	Ammonia (NH <sub>3</sub> ) µg/m <sup>3</sup>	Annual* 24 hours**	100 400	100 400	- Chemiluminescence - 24 - Indophenol blue method
9.	Benzene (C <sub>6</sub> H <sub>6</sub> ) µg/m <sup>3</sup>	Annual*	05	05	- Gas chromatography based - on continuous analyser - Adsorption and desorption - followed by GC analysis
10.	Benzol (O) Pyrene (BaP) – Particulate phase only ng/m <sup>3</sup>	Annual*	01	01	- Solvent extraction followed - by HPLC/GC
11.	Arsenic (As) ng/m <sup>3</sup>	Annual*	06	06	- AAS/ICP method after - sampling on
12.	Nickel (Ni) ng/m <sup>3</sup>	Annual*	20	20	- AAS/ICP method after - sampling on EPM 2000 or - equivalent filter paper
*	Annual Arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.				

**	24 hourly/8 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed but not on two consecutive days.
----	--

## 2. Water quality Standards (IS 10500: 2012)

S. No.	Parameters	Desirable Limit	Max. Permissible Limits in the absence of alternate source
1.	Colour	5	15
2.	Odour	Agreeable	Agreeable
3.	Taste	Agreeable	Agreeable
4.	Turbidity, NTU	1	5
5.	pH Value	6.5 to 8.5	No relaxation
6.	Total Hardness (as CaCO <sub>3</sub> ), mg/l	200	600
7.	Iron as Fe, mg/l	0.3	No relaxation
8.	Chloride as Cl, mg/l	250	1000
9.	Residual free Chlorine, mg/l	0.2	1.0
10.	Dissolved Solids, mg/l	500	2000
11.	Calcium as Ca, mg/l	75	200
12.	Copper as Cu, mg/l	0.05	1.5
13.	Manganese as Mn, mg/l	0.10	0.3
14.	Sulphate as SO <sub>4</sub> , mg/l	200	400
15.	Nitrate as NO <sub>3</sub> , mg/l	45	No relaxation
16.	Fluoride as F, mg/l	1.0	1.5
17.	Phenolic Compounds as C <sub>6</sub> H <sub>5</sub> OH, mg/l	0.001	0.002
18.	Mercury as Hg, mg/l	0.001	No relaxation
19.	Cadmium as Cd, mg/l	0.003	No relaxation
20.	Selenium as Se, mg/l	0.01	No relaxation
21.	Arsenic as As, mg/l	0.05	No relaxation
22.	Cyanide as CN, mg/l	0.05	No relaxation
23.	Lead as Pb, mg/l	0.01	No relaxation
24.	Zinc as Zn, mg/l	5.0	15.0
25.	Anionic detergent as MBAS, mg/l	0.2	1.0

26.	Chromium as Cr6+, mg/l	0.05	No relaxation
27.	Polynuclear aromatic hydro carbon as PAH, mg/l	0.0001	No relaxation
28.	Mineral Oil, mg/l	0.5	No relaxation

### 3. Ambient Noise Quality Standards in respect of Noise

Area code	Category of Area / Zone	Limits in dB(A) Leq*	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

**Note:-**

1. Day time shall mean from 6.00 a.m. to 10.00 p.m.
  2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
  3. Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority
  4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.
- \* dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

A “decibel” is a unit in which noise is measured.

“A”, in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

**Leq:** It is an energy mean of the noise level over a specified period.

**Note:** The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2000 vide S.O. 1046(E), dated 22.11.2000 and by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2002 vide S.O. 1088(E), dated 11.10.2002, under the Environment (Protection) Act, 1986.

**Sub Clause 111.13 Protection of Existing Trees**

Some of the existing trees within the working area are likely to be cut down during the execution of the Work. The Contractor shall take all necessary measures to ensure safety and protection of the remaining trees from any action whatsoever relating to his construction operations in the adjoining areas.

Prior to the commencement of the works, a joint inspection shall be carried out by the Contractor and the Authority's Engineer and any giant neighbourhood trees recognized locally as important shall be identified. The Authority's Engineer may, if required, direct the Contractor to modify the Engineering designs to accommodate these trees and submit for the Authority's Engineer's approval. The Contractor shall prepare any such modifications to the Engineering design and obtain any approvals that are required, at the Contractor's own cost.

**Sub Clause 111.14 Disposal of Materials outside Work Site**

Notwithstanding other relevant provisions in the contract, the excess material generated by dismantling, excavation, waste material and lubricants, used oil, gasoline and other such substance etc., shall be removed from the site at regular intervals and the site shall kept clean from all such disposable materials. Disposal or burial of such materials within the site shall not be permitted and periodically burnt in an incinerator constructed at each construction site. Such intervals shall not exceed one month under any circumstances. The selection of the disposal site shall be the responsibility of the Contractor and he shall ensure that the selected site does not result in any claim for damages to the Employer and/or the Authority's Engineer against any violation of any existing laws.

**Sub Clause 111.14.1 Disposal Sites**

Selection and location of the disposal sites shall be the sole responsibility of the Contractor. The Contractor shall be solely responsible for obtaining all required approvals and permits to set up and operate the disposal site.

A joint inspection of all proposed disposal sites shall be carried out by the Authority's Engineer and the Contractor prior to approval by the Authority's Engineer.

The selection and location of disposal sites shall be such that:

- No residential area are located downwind side of these locations,



- Disposal sites are located at least 1000 m away from sensitive locations including human settlements, water bodies, notified forest areas, sanctuaries or any other sensitive locations.
- Disposal sites shall not contaminate any water sources, rivers etc. The site shall be located away from the water bodies and disposal site shall be lined properly to prevent infiltration of water.
- The Contractor shall consult with the concerned village/local community about the location of debris disposal site before finalizing the location.
- Permission from the Village/local community shall be obtained for the disposal site selected.
- The Contractor shall resolve all claims arising out of the setting up and operation of the disposal site at his own cost.
- The Contractor may utilize the suitable borrow areas, abandoned quarries and other waste land for the debris disposal, subject to the approval of the Authority's Engineer and concerned authorities.
- The Contractor shall plan the disposal of materials in the following way:
  - Identify the disposal area.
  - Prepare a Contractor's Debris Disposal Plan with design drawings for each identified area and get it approved by the Authority's Engineer.
  - Photograph the present land use and condition of the area.
  - Construct all required structures (e.g. retaining wall).
  - The dumpsites shall be filled only up to the existing ground level with compaction of the debris materials in layers of minimum 300mm thickness.
  - The 30 cm top layer of the disposal pit shall be provided with good earth suitable for development of vegetation/plantation.
  - After levelling, the site shall be suitably rehabilitated by planting local species of grass (turfing), shrubs and other plants as approved by the Authority's Engineer.

#### **Sub Clause 111.14.2 Construction of Water Recharge pits**

Storm water recharge pits shall be located such that it should be in the valley of the surface layout nearby cross drainage structures and other water bodies along the project road. Water recharge pits shall be located at a height of 3 m. above the ground water table of the area as per the Central Ground Water Board norms.

The recharge pits shall be located at a minimum of 1km intervals on each side of the carriageway. Recharge pits shall be constructed by the side of the guiding drains such that all the storm water shall be directed to the recharge pit. Any proposal for the change in number and location of recharge pits by the Contractor shall be reviewed and if found adequate, shall be approved by the Authority's Engineer.

Pits, trenches, abandoned dug wells, recharge wells or abandoned bore wells shall be connected by the rain water harvesting system with the consent of the respective owner or as approved by the Authority's Engineer.

#### **Sub Clause 111.14.3 Construction of Silt Fences and Silt Traps**

Silt fences shall be planned such that each recharge pit will have one silt fence to prevent silt from entering the nearest water bodies and also prevent choking of recharge pit by the silt coming from runoff water and to increase the life of recharge pits.

Silt fences shall be mounted in guiding drains at a distance of between 3 to 5m in the upstream direction depending on the gradient of the guiding drains. A proposal for a change in the number and location of silt fences by the Contractor may be submitted to the Authority's Engineer for approval.

Sand / silt removal facilities such as sand traps, silt traps and sediment basins shall be provided to remove sand / silt particles from run-off.

#### **Sub Clause 111.14.4 Scarified Bitumen Disposal Pits:**

Scarified bitumen generated out of scarification of the existing pavement may be used, with the approval of the Authority's Engineer, for approach roads by mixing it with fresh bitumen or other granular materials to achieve the required strength followed by profiling and compaction.

The remaining portion of the scarified bitumen shall be disposed of safely in a clay lined pit or as directed and approved by the Authority's Engineer. The Contractor shall submit a typical drawing of his proposed clay lined bitumen disposal pit

showing all required dimensions and details, for the approval of the Authority's Engineer.

The selection and location of the bitumen disposal sites shall be the sole responsibility of the contractor subject to the joint inspection and approval of Authority's Engineer. The Contractor shall be responsible for obtaining all approvals and permits required for the set-up and operation of the disposal site.

The selection of sites for the disposal of scarified bitumen shall be made on following basis:

- Selection of bitumen disposal site shall be avoided in the quarry regions. If the disposal site is located in an abandoned quarry, the quarry shall be suitably treated to seal any fractures and fissures. The proposed treatment shall be subject to the approval of the Authority's Engineer.
- Disposal sites shall be located at least 1000 m away from sensitive locations like settlements, water bodies, notified forest areas, sanctuaries or any other sensitive locations.
- Disposal sites shall not contaminate any water sources, rivers etc. The site shall be lined properly to prevent infiltration of water.
- The Contractor shall consult with the concerned village/local community about the location of debris disposal site before finalizing the location.
- Permission from the concerned village/local community shall be obtained for the disposal site selected.
- The Contractor shall resolve all claims arising out of waste disposal at his own cost. The Contractor shall plan the bitumen disposal in the following way:
  - Identify the disposal area.
  - Prepare a Contractors Bitumen Disposal Plan with design drawings for each identified area and get it approved by the Authority's Engineer.
  - Photograph the present land use and condition of the area.
  - Construct all required structures (e.g. retaining wall) along with clay lining and measures to prevent the seepage of bitumen leachate.
  - The dumpsites shall be filled only up to the existing ground level with compaction of the materials in layers of minimum 300mm thickness.

- The 30 cm top layer of disposal pit shall be provided with good earth suitable for development of vegetation/plantation.
- After levelling, the site shall be suitably rehabilitated by planting local species of grass (turfing), shrubs & other plants as approved by the Authority's Engineer.

**Sub Clause 111.14.5 Provision for Oil Interceptors:**

Location of oil interceptors shall be considered such that each construction camp having refuelling stations, oil and lubricants storage places shall have one oil interceptor to stop and separate the floating oils. The number of interceptors maybe increased as the situation demands or during the accidental spillages with the consent or at the direction of the Authority's Engineer.

**Sub Clause 111.15 Occupational Health & Safety**

The Contractor shall prepare and submit to the Authority's Engineer the Occupational Health & Safety Procedures/Practices for the workforce in all quarry sites, plant sites, work sites, camp sites, etc., in accordance with the applicable laws.

**Sub Clause 111.16 Transports of Hazardous Materials**

Transport of hazardous materials, in bulk or in sealed containers, shall meet the requirements of the State regulations. Prior to ordering transport of hazardous material in bulk, the Contractor must obtain the approval of the relevant authority as well as of the Authority's Engineer. The transport of diesel, petrol, gaseous material, chemical and explosives for quarrying shall be governed by safety laws of the local authorities. Precautionary measures and conformity with regulations shall be stated in a Method Statement for the approval of the Authority's Engineer. Sealed containers of hazardous materials shall be stored in a well-ventilated room, well-guarded and secured.

**Sub Clause 111.17 Emergency Response**

The Contractor shall plan and provide remedial measures to be implemented in the event of occurrence of emergencies such as spillages of oil or bitumen or chemicals, fire. The Contractor shall provide the Authority's Engineer with a

statement of the measures he intends to implement in the event of such an emergency, which shall include a statement of how he intends to provide personnel adequately trained to implement such measures.

#### **Sub Clause 111.18 Measurement**

Compliance of all provisions made in this Clause 111 shall be deemed to be incidental to the work and no separate measurement or payment shall be made. The Contractor shall be deemed to have made allowance for such compliance with these provisions in the preparations of his Bid and full compensation for such compliance shall be deemed to be covered by the Bid Price.

### **CLAUSE 112 ARRANGEMENT FOR TRAFFIC DURING CONSTRUCTION**

**Sub Clause 112.1** Add the following at the end of this Sub-Clause:

“The Contractor shall ensure that all the traffic management devices as per Traffic Management Plan approved by the Authority’s Engineer are in position before opening of sites of work.”

#### **Sub-Clause 112.2 Passage of Traffic along a part of the Existing Carriageway under improvement**

**Replace** 2<sup>nd</sup> sentence of 1<sup>st</sup> paragraph of the Sub Clause 112.2 with the following:

The treatment of the shoulder shall consist of providing at least 150mm thick granular (Wet Mix Macadam) base course covered with 20 mm thick Close-Graded Premix Surfacing/Mixed Seal Surfacing (Type B) as per Clause 508 in a width of at least 1.5m such that the total paved width available for traffic including part of the existing road and treated shoulder is not less than 3.75m and the treated shoulder shall be maintained throughout the period during which traffic uses the same to the satisfaction of the Authority’s Engineer.

**Replace the Sub Clause 112.3** of MoRT&H with the following

#### **Sub Clause 112.3 Passage of Traffic along a Temporary Diversion**

In stretches where it is not possible to pass the traffic on part width of the carriageway, a temporary diversion shall be constructed with 5.5 m carriageway

and 2.5 m earthen shoulders on each side (total width of roadway 10.5 m) with the following provision for road crust in the 5.5 m width:

- (i) Earthwork
- (ii) 200 mm (compacted) granular sub-base;
- (iii) 225 mm (compacted) granular base course (Wet Mix Macadam);
- (iv) Priming and Tack Coat and
- (v) 20 mm thick Close-Graded Premix Surfacing / Mixed Seal Surfacing (Type B).

**The use of fly ash in temporary diversions shall not be permitted.**

The location of such stretch, alignment and longitudinal section of diversion including junctions and temporary cross drainage provision shall be as approved by the Authority's Engineer.

The Contractor shall be responsible for the design of temporary diversions and shall submit the designs to the Authority's Engineer for his approval. If the Contractor finds it necessary to construct part of any diversion outside the Right of Way, the temporary use of additional land shall be arranged for by the Contractor at his own risk and cost. Further, as per the Conditions of Contract, the Contractor shall indemnify the Employer and the Authority's Engineer against any claims or proceedings resulting from the occupancy and use of such areas of additional land. Any roadside trees that have to be removed for the construction of temporary diversions shall be at the responsibility and cost of the Contractor.

#### **Sub Clause 112.4 Traffic safety and Control**

#### **Add the following paragraph at the end of the Sub Clause 112.4**

The Provisions made in Bill of Quantities shall be the ceiling for the Contract during the Contract Period. Any additional claims due to damage and theft of these provisions shall be deemed incidental to works. No extra payment shall be made towards additional quantities for these bill items.

**Replace the Sub Clause 112.6 with the following**

#### **Sub Clause 112.6 Measurements for Payment and Rate**

- (i) All arrangements for traffic during construction including provision of temporary cross drainage structures, if required, and treated shoulder as described in Clause 112.2 including their maintenance, dismantling and clearing debris, where necessary, shall be considered as incidental to the works and shall be the Contractor's responsibility, unless provided as a separate payable item in the Bills of Quantities.
- (ii) The construction of temporary diversion including temporary cross drainage structures at the site of bridge reconstruction locations as described in Clause 112.3, shall be payable and measured in linear metre and the unit contract rate shall be inclusive of full compensation for construction (including supply of material, labour, tools, etc.), maintenance, final dismantling, and disposal.

#### **CLAUSE 114 SCOPE OF RATES FOR DIFFERENT ITEMS OF WORK**

##### **Sub Clause 114.2 Add the following at the end of Item (ii) of Clause 114.2:**

“The Contractor shall submit data via electronic media and hard copy to the Authority's Engineer in a form readily compatible with the Authority's Engineer's planning system.”

##### **Sub Clause 114.2 Add the following as item (xix) to sub-clause 114.2:**

“Monthly progress and quarterly progress reports in a format acceptable to the Authority's Engineer. The report shall state the progress which has been achieved compared with the planned progress, illustrate delays in proportion to the progress planned, analyse the consequences and state planned corrective measures. Intermediate progress reports may also be required. The first issue of the detailed programme including the detailed description of the system and the procedures shall be submitted to the Authority's Engineer for acceptance not later than 28 days after the date of receipt of the letter of acceptance.”

##### **Sub Clause 114.2 Add the following as item (xx) to Sub-Clause 114.2**

“Cost of carrying out Topographic Surveys and Auto Level Surveys.”

#### **CLAUSE 120 FIELD LABORATORY**

**Replace Sub-Clause 120.2 with the following:**



**“Sub Clause 120.2 Description**

The Contractor shall arrange to provide a fully furnished and adequately equipped field laboratory. The field laboratory shall be located in close proximity to the Works site. It shall be provided with continuous electricity supply, electrical wiring and points, all necessary electrical fittings and fixtures; potable water supply including pipes, pumps, storage tanks, plumbing, all necessary fittings and fixtures; septic tank, sewer lines, drains; surfaced access road; fencing and security lighting; security services etc.

The Contractor shall prepare a layout drawing and submit to the Authority's Engineer for approval. The floor space requirement for the field laboratory shall be indicated in the drawings and shall not be less than 40 square metres. It shall include office space for the Materials Engineers, one from the Contractor's side and another from the Authority's Engineer's side, space for the installation of equipment, and space for other facilities. The field laboratory shall be fitted complete with laboratory equipment, laboratory tables and cupboards, wash basins, toilet facilities, curing tank around 4m x 2m x 1m in size for the curing of samples, a fume chamber, working platform area of about 1m x 10m against the walls, cupboards above and below the working platform, space for storage of accessories such as sample moulds, space for storage of samples etc. At least 4 racks of slotted angles and M.S. sheets shall also be provided. The furnishing in each of two offices of the Materials Engineers shall include working tables and chairs.

The items of laboratory equipment shall be provided in the field laboratory as per Table 100-2.”

**Replace Table 100-2 with the following:**

**“Table 100-2: List of Laboratory Equipment's**

S. No	Item, Specifications	Nos. required
	<b>A: General</b>	
1)	Weigh Balances	
(a)	5 kg to 20 kg capacity Electronic Type –Accuracy 1 gm	2



(b)	500 gm capacity Electronic Type – Accuracy 0.01 gm	2
(c)	Chemical balance 100gm capacity - Accuracy 0.0001gm	1
(d)	Pan balance 5 kg capacity Electronic Type - Accuracy 0.5 gm	2
(e)	Platform Balance Scale – 300 kg capacity	1
(f)	Triple Beam balance-25kg capacity Accuracy 1gm	2
2)	Oven – electrically operated, thermostatically controlled (including thermometer), stainless steel interior	2
(a)	From 0°C to 220°C – Sensitivity 1°C	
3)	Sieves: as per IS: 460-1962	
(a)	IS Sieves 450 mm internal dia. of sieve sets as per BIS of required sieve sizes complete with lid and pan	2 set
(b)	IS sieve 200 mm internal dia. (brass frame and steel/ or brass wire cloth mesh) consisting of sieve sets of required sieve sizes complete with lid and pan	2 set
4)	Sieve shaker capable of taking 200 mm and 450 mm dia. Sieves electrically operated with time switch assembly (As per BIS)	1
5)	200 tonnes compression testing machine	1
6)	Stop watches 1/5 sec. Accuracy	2
7)	Glassware comprising of Beakers, Pipettes, dishes, measuring cylinders (100 to 1000 cc capacity) glass rods and funnels, glass thermometers range 0°C to 100°C and metallic thermometers range 300°C	1 Dozen each
8)	Hot plates 200 mm dia (1500 watt)	6
9)	Enamel trays	
(a)	600 mm x 450 mm x 50 mm	10
(b)	450 mm x 300 mm x 40 mm	10
(c)	300 mm x 250 mm x 40 mm	6
(d)	Circular plates of 250 mm dia.	6
10)	Water Testing Kit	1
11)	First Aid Box	1
12)	Spatula Set of 100 and 200 long	3
13)	Digging Tools (pixels, shovel, fork etc.)	As reqd.

14)	Miscellaneous tools (sledge hammer, lump hammer, wooden pegs etc.)	As reqd.
15)	Maximum and Minimum Thermometer	2 Set
16)	Rain Gauge	1 Set
17)	Timer 0-60 minutes with alarm & 1/5 sec accuracy.	3 Sets
<b>B: For Soils and Aggregates</b>		
1)	Water still, 3 liter/hr with fittings and accessories	1
2)	Liquid limit device with Casagrande and ASTM grooving tools as per IS: 2720	1
3)	Sampling pipettes fitted with pressure and suction inlets, 10 ml. Capacity	2 set
4)	Compaction apparatus (Proctor) as per IS: 2720 (Part 7) complete with collar, base plate and hammer and all other accessories	1 set
5)	Modified AASHTO compaction apparatus as per IS. 2720 (Part 8) 1983 or Heavy Compaction Apparatus as per IS complete with collar, base plate, hammer and all other accessories	1 set
6)	Sand pouring cylinder with conical funnel and tap and complete as per IS 2720 (Part 28) 1974 including modified equipment	4
7)	Ennore Standard Sand	As Reqd.
8)	Sampling tins with lids 100 mm dia x 75 mm ht ½ kg capacity and miscellaneous items like moisture tins with lid (50 grams) etc.	12
9)	Lab CBR testing equipment for conducting CBR testing, load frame with 5 Tonne capacity, electrically operated with speed control as per IS: 2720 (Part 16) and consisting of following:	1 set
(a)	CBR moulds 150-mm dia – 175-mm ht. complete with collar, base plate etc.	24
(b)	Tripod stands for holding dial gauge holder	24
(c)	CBR plunger with settlement dial gauge holder	1
(d)	Surcharge weight 147-mm dia 2.5 kg wt.	48
(e)	Spacer disc 148-mm dia, 47.7-mm ht. With handle	3
(f)	Perforated plate (Brass)	24
(g)	Soaking tank for accommodating 24 CBR moulds	
(h)	Proving rings of 1000 kg, 2500 kg and 5000 kg capacity	1 each

(i)	Dial gauges, 25 mm travel- 0.01 mm/division	10
(j)	Aluminium Tins	
	50x30mm	36 nos
	55x35mm	36 nos
	70x45mm	36 nos
	70x50mm	36 nos
	80x50mm	36 nos
10)	Standard Penetration test equipment	1
11)	Nuclear moisture Density meter or equivalent	2
12)	Speedy moisture meter complete with chemicals	2
13)	Unconfined compression test apparatus	1 set
14)	Aggregate Impact Test Apparatus	1
15)	Aggregate Impact Test Apparatus as per IS 2386(Part 4) 1963	1
16)	Los Angeles abrasion Test Apparatus as per IS 2386 (Part 4) 1963	1
17)	Riffle Box of Slot size of 50mm as per ASTM C-136	1
18)	Dynamic Cone Penetrometer	1
19)	Hydrometer with high speed stirrer and jars	2 sets
20)	Post-hole augur (to BS-812)	3
<b>C: For Bitumen and Bituminous Mixes</b>		
1)	Constant temperature bath for accommodating bitumen test specimen, electrically operated and thermostatically controlled (to accommodate minimum six Specimens)	2
2)	Penetrometer automatic type, adjustable weight arrangement and needles as per IS. 1203 – 1978	2
3)	Soxhlet extraction or centrifuge type apparatus complete with extraction thimbles with stocks of solvent and filter paper	1
4)	Bitumen laboratory mixer including required accessories (20 ltrs.)	1
5)	Marshall compaction apparatus automatically operated as per ASTM 1559-62 T complete accessories (with 180 N Marshall Moulds	1 set
6)	Distant Reading Digital Thermometer for Measuring Temperatures in Asphaltic Mixes	As required
7)	Riffle Box	1
8)	Automatic Asphalt Content Gauge [Nuclear or equivalent]	1

9)	Thin film Oven test apparatus for modified binder either with PMB or CRMB	1
10)	Ring Ball Apparatus as per IS 1205- 1978	1
11)	Asphalt Institute Vacuum Viscometer as per IS 1206 (part II) – 1978	1
12)	BS U- Tube Modified Reverse Flow Viscometer IS 1206 (Part III) – 1978	1
13)	Apparatus for Determination of Ductility Test as per IS 1208 – 1978	1
14)	Pen Sky – Martin closed Tester for testing flash and fire point as per IS 1209 – 1978.	1
15)	Apparatus for Float Test – IS – 1210 – 1978	1
16)	Apparatus for Determination of water content (Dean and Stark Method) IS – 1211 – 1978	1
17)	Apparatus for Determination of Loss on Heating IS – 1212-1978.	1
18)	Apparatus of Determination of specified Gravity IS- 1202-1978	1
19)	Core cutting machine suitable for upto 150mm dia. Core	1
20)	Apparatus for Elastic Recovery test for Modified Bitumen	1
21)	Apparatus for Storage Stability test for Modified Bitumen	1
22)	Apparatus for Separation test for Modified Bitumen	1
23)	Sand Equivalent test apparatus	1
24)	Mastic Asphalt Hardness testing equipment	1
25)	Automatic Asphalt content Meter	1
<b>D: For Cement, Cement Concrete and Materials</b>		
1)	Water still	1
2)	Vicat needle apparatus for setting time with plungers, as per IS. 269-1967	1
3)	Moulds	
(a)	150 mm x 300 mm ht cylinder with capping component along with the capping set and compound as per IS	As required
(b)	Cube 150mm, and 100mm (each size)	As required

(c)	150mmx100 mm x600mm beam for flexural strength	As required
4)	Concrete permeability apparatus	1
5)	High frequency mortar cube vibrator for cement testing	1
6)	Concrete mixer power driven, 1 cu ft capacity	1
7)	Variable frequency and amplitude vibrating table size 1 metre x 1 metre as per the relevant British Standard	1
8)	Flakiness & Elongation test apparatus	2each

- Note:** 1) The laboratory set-up shall be complete including a set of all IRC and IS reference standards, adequately staffed and operational to the satisfaction of the Authority's Engineer not later than 2 months from the date of receipt of Notice to commence the works. The Contractor shall be responsible for the provision of adequately experienced and qualified laboratory staff, in sufficient numbers to be able to meet all testing requirements to the approval of the Authority's Engineer, and for the supply of all transportation of staff, testing equipment and samples necessary to allow the testing to be performed in a time scale compatible with the needs of the Site. The Employer and the Authority's Engineer shall have free access to the laboratory.
- 2) The laboratory setup may be reduced after issue of Taking over Certificate with the approval of Authority's Engineer."

#### **Replace Sub-Clause 120.4 with the**

**following: "Sub Clause 120.4**

#### **Maintenance**

The Contractor shall arrange to maintain the laboratory in satisfactory manner and will carry stocks of spare equipment and laboratory consumables until the issue of Performance Certificate. Maintenance include the day to day upkeep of the laboratory building and the surroundings, attending to repairs to various parts of the building, furniture, fittings, office/laboratory equipment's and the concerned services as and when necessary, including the periodic white/colour washing of building and painting of wood, steel work, replacing the broken window/door/ventilator, glasses, furniture and other hardware and maintaining necessary watch and ward during the day and night.

The Contractor shall arrange to provide uninterrupted supply of electricity and water for the laboratory building. In case of failure of main power/water supply, alternate source

shall be available for providing uninterrupted supply. Upon Completion of the works, the field laboratory shall revert to the Employer's possession but all the equipment shall remain the property of the Contractor."

## **SECTION 200 SITE CLEARANCE**

### **CLAUSE 201 CLEARING AND GRUBBING**

#### **Sub Clause 201.1 Scope**

**Add the following Paragraph at the end of this Sub-Clause.**

"Diversion and filling of existing water courses along the road alignment shall be as per Additional Technical Specification A-1."

**Sub Clause 201.5 Delete 1st sentence in the 1st Paragraph in Sub-Clause 201.5 and add the following sentence.**

"Clearing and grubbing for road embankment, drains and cross drainage structures shall be measured on area in plan basis in units of hectares."

### **CLAUSE 202 DISMANTLING CULVERTS, BRIDGES AND OTHER STRUCTURES/PAVEMENTS**

#### **Sub-Clause 202.6 Measurements for Payment**

This Clause shall read as:

"The work of dismantling shall be paid for in units indicated below by taking measurements before and after, as applicable:

(i)	Dismantling brick/stone masonry / plain cement concrete / reinforced cement concrete including reinforcement.	Cu.m
(ii)	Dismantling pavement structures such as Granular Course, Bituminous course, Concrete pavement	Cu.m
(iii)	Dismantling pipes, guard rails, road kerbs, gutters and fencing	Linear Meter
(iv)	Dismantling Guard Stones/KM stones/Sign post/Hect. Stones/5 <sup>th</sup> KM stones	Nos.

(v)	Dismantling RCC railing	Linear Meter
(vi)	Dismantling angle type expansion joints of bridges	Linear Meter
(vii)	Dismantling of railing kerb	Linear meter
(viii)	Dismantling of Concrete Edge strip without damaging existing structure	Linear Meter
(ix)	Dismantling of Drainage spout including cleaning entire area, enclosure of metallic bearing	Nos.
(x)	Dismantling of Stone pitching/ boulder apron/ brick soling/ stone soling	Cu.m

## **SECTION 300 EARTHWORK, EROSION CONTROL AND DRAINAGE**

### **CLAUSE 301 EXCAVATION FOR ROADWAY AND DRAINS**

#### **Sub-clause 301.3.7 Excavation of road shoulders/verge/medians for widening of pavement or providing treated shoulders:**

The 2<sup>nd</sup> sentence of this Clause shall read as under:

“The subgrade material within 500mm from the bottom of the pavement for the widened portion and paved shoulder shall be loosened and recompactd as per Clause 305 if it does not meet the compaction requirement of Table 300-2.”

#### **Sub Clause 301.8 Measurements for Payment**

In **first line of first paragraph** add “and drains” after the word “roadway”

### **CLAUSE 304 EXCAVATIONS FOR STRUCTURES**

#### **Sub Clause 304.3.2 Excavation**

At the end of 1st paragraph of Clause 304.3.2 insert the following additional sentences:

“The Contractor shall ensure the stability and structural integrity of adjacent existing foundations and structures and if necessary shall, at his own expense, install temporary or permanent sheet piles, coffer dams, shoring or similar support or protection to the satisfaction of the Authority’s Engineer.”

## CLAUSE 305 EMBANKMENT CONSTRUCTIONS

**Clause 305.2.1.6** the 1<sup>st</sup> sentence of this Clause shall read as under:

“The material to be used in subgrade shall conform to the requirements shown on the drawings.”

### Clause 305.2.2.4 Compaction Requirements

In Clause 305.2.2.4 after the 1<sup>st</sup> paragraph delete Table 300-2 and substitute the following:

**Table 300-2: Compaction Requirements for Embankment and Sub-grade**

S. No.	Type of Work/Material	Relative Compaction as %age of maximum laboratory dry density as per IS 2720 (Part 8)
1	Subgrade and earthen shoulders	Not less than 97%
2	Embankment	Not less than 95%
3	High Embankment (Height >6m)	Not less than 97%
4	Expansive clays	Not allowed
5	Design CBR of Subgrade & Shoulder shall be as shown on the Drawings	

### Sub Clause 305.3.4 Compacting Ground Supporting Embankment/Sub-grade

**Add the following paragraph at the end of 2nd Paragraph in Sub Clause 305.3.4**

Backfilling layers in pits, trenches and below the original ground are to be compacted to the relative natural ground density. The natural ground density shall be determined by conducting field density tests at three widely spaced locations along the central line of the proposed carriageway at a depth in between 0.5m to 1.0m. Samples of natural ground are collected at each location, and are tested in accordance with IS: 2720 (Part 8). The relative density (i.e. the percentage of the field dry density to the laboratory maximum dry density) is assessed for each sample, and the greatest relative density obtained is selected as the “natural ground density”. If the natural ground density is less than 85% then these are to be compacted after necessary watering so as to achieve not less than 85% of relative compaction”.



**Sub-Clause 305.9.1**

Add new sub section as (xv) “slush removal”

**Sub Clause 306.4** Replace Sub-clause 306.4 with the following:

“The soil erosion, sedimentation and pollution control works shall be deemed as incidental to the earthwork and other items of work and, as such, no separate payment shall be made for the same.”

**Sub Clause 306.5 Rates**

This Clause shall be deleted.

**Sub-Clause 309.4 Measurements for Payment**

This Clause shall read as:

“Construction of drains shall be measured as finished work in position as below:

a)	Unlined ditch drain	.....	As per Clause 30
b)	Semi-Circular median drain as shown in the drawing with PCC M20, NP2 pipe, leveling concrete M15 and filter media.	.....	Linear metre
c)	Drainage Chute	.....	Linear metre
d)	Lined open/Covered drain		
	(i) Leveling concrete M15	.....	Cubic metre
	(ii) Coarse rubble masonry	.....	Cubic metre
	(iii) Stone pitching grouting with CM 1:3	.....	Cubic metre
	(iv) RCC grade M20	.....	Cubic metre
	(v) Steel Reinforcement	.....	Tonne
	(vi) Precast perforated slab	.....	Nos.
	(vii) Catchpits/inspection chambers	.....	Nos.
	(viii) RCC pipes	.....	Linear metre
f)	Sub-surface drains		Linear metre

**SECTION 400 SUB-BASES, BASES (NON-BITUMINOUS) AND SHOULDERS**

Sub clause (i) of clause 401.7 stands deleted and remaining sub paras (ii) to (v) are renumbered as (i) to (iv).

Sub clause (i) of clause 405.7 stands deleted and remaining sub paras (ii) to (v) are renumbered as (i) to (iv).

The provision of clause 401.7 (i) to (v) be read as “Clause 401.7 (i) to (iv)” in the sub clauses 402.8, 403.8, 404.7, 407.8 and 408.7.”

## **CLAUSE 401 GRANULAR SUB-BASE**

### **Sub Clause 401.2 Materials**

#### **Sub Clause 401.2.1 The Clause shall read as follows:**

“The material to be used for the work shall be crushed stone conforming to the physical requirements stipulated in Sub-Clause 401.2.2. The material shall be free from organic or other deleterious constituents and conform to Grading-V of Table 400-1.”

### **Sub Clause 401.3 Construction Operations**

#### **Sub-Clause 401.3.1: Preparation of Sub grade**

Add the following paragraphs at the end of the 1<sup>st</sup> paragraph of Sub-Clause 401.3.1: Preparation of Sub grade

“When granular sub base is to be placed on existing sub base or base for partial reconstruction the existing bituminous layers, if any, shall be scarified/ milled in accordance with Sub Clause 501.8.3.2. Scarification/milling shall be continued to the design foundation elevation within existing base/sub base layer on which the new sub base is to be placed. The Contractor will verify that all bituminous layers have been removed using appropriate methods approved by the Authority’s Engineer. The bituminous surfacing and base material removed from the existing pavement may be used in other parts of the works as directed by the Authority’s Engineer provided it complies with the relevant specification clauses.

After scarification/ milling and removal to the satisfaction of the Authority’s Engineer of the existing bituminous surfacing (full) and if required base/sub base (full or part), the surface shall be lightly sprinkled with water if necessary and rolled with three passes of vibratory rollers. The existing pavement shall then be proof rolled with minimum three passes of an 8 tonne single drum vibrating roller

in the presence of the Engineer who shall determine of the surface for placing the sub base layer.”

## **CLAUSE 406 WET MIX MACADAM SUB-BASE/BASE**

### **Sub Clause 406.2 Materials**

#### **Sub-Clause 406.2.1.1 Physical requirements**

**Delete 2nd Sentence in 1st Paragraph in the Sub Clause 406.2.1.1 and replace with the following Sentence:**

“The constituents of the aggregates shall be produced by an integrated crushing and screening plant of suitable capacity having appropriate primary crusher, secondary cone crusher, vertical shaft impactor and vibratory screen, unless otherwise instructed by the Authority’s Engineer. Crushing shall be carried out in at least two stages. The fraction of material passing through 4.75mm sieve shall also be crusher run screening only.”

### **Sub-Clause 406.3 Construction**

#### **Operations      Sub Clause 406.3.4**

##### **Spreading of Mix**

**Replace “may” with “shall” in the 1<sup>st</sup> sentence of 2<sup>nd</sup> paragraph of Sub-Clause 406.3.4.**

**Delete the last paragraph of Sub-Clause 406.3.4.**

### **Sub-Clause 406.3.5 Compaction**

**Delete second sentence of Paragraph 1 of Clause 406.3.5.**

## **CLAUSE 409 CEMENT CONCRETE KERB AND KERB WITH CHANNEL**

### **Sub Clause 409.5 Construction Operations**

**Sub Clause 409.5.1 Add at the end of the first sentence “as shown in the drawings”**

**CLAUSE 410 FOOTPATHS AND SEPARATORS**

**Replace the entire Clause 410 with the following:**

**“410.1 Scope**

The work shall consist of constructing footpaths and/or separators at locations as specified in the drawings or as directed by the Authority’s Engineer. The lines, levels and dimensions shall be as per the drawings. The scope of the work shall include provision of all drainage arrangements as shown in the drawings or as directed.

**410.2. Materials**

The footpaths and separators shall be constructed with the following type:

Precast cement concrete block/tiles of Grade M20 as per Sections 1700 of the Specifications. The minimum thickness of the cement concrete block/tile shall be 25 mm and minimum size shall be 300 mm x 300mm.

**410.3. Construction Operations**

**410.3.1** Drainage pipes below the footpath originating from the kerbs shall be first laid in the required slope and connected to the drains/sumps/storm water drain/drainage chutes as per provisions of the drawings, or as specified.

**410.3.2** Portion on back side of kerbs shall be filled and compacted with granular sub-base material as per Clause 401 of the Specifications in specified thickness.

**410.3.3** The base shall be prepared and finished to the required line, levels and dimensions as indicated in the drawings with the following: -

- (a) Minimum 150 mm thick, compacted granular sub-base material as per Clause 401 of the Specifications.
- (b) Minimum 25 mm thick cement concrete of Grade M15.

Over the prepared base, precast concrete tiles shall be set/laid as described in Clauses 410.3.4.

**410.3.4 Precast cement concrete tiles:**

The tiles shall be set on a layer of average 12 mm thick cement-sand mortar (1:3) laid on prepared base in such a way that there is no rocking. The gaps between the tiles shall not be more than 12 mm and shall be filled with cement-sand mortar (1:3).

#### **410.4 Measurements for Payment**

Footpaths and separators shall be measured in sq. meter between inside of kerbs.

#### **410.5 Rates**

Contract unit rates shall be inclusive of full compensation of all labour, materials, tools, equipment's and incidentals to construction of footpaths. Cost of providing pipes and arrangement for their discharge into appropriate drainage channels shall be incidental to the construction of footpaths."

### **SECTION 500 BASES AND SURFACE COURSES (BITUMINOUS)**

Sub para (i) of Clauses 501.8.8.2 stands deleted and remaining sub paras (ii) to (x) are renumbered as (i) to (ix).

The provision "Clause 501.8.8.2 (i) to (x)" to be read as "Clause 501.8.8.2 (i) to (ix)" in the Sub-Clauses 506.9 and 513.9

### **CLAUSE 501 GENERAL REQUIREMENTS FOR BITUMINOUS PAVEMENT LAYERS**

#### **Sub Clause 501.2**

##### **Materials Sub**

##### **Clause 501.2.1**

##### **Binder**

**Replace** "Tables 500-5 and 500-6" **with** "Table 500-1" in the last paragraph of

##### **Sub-Clause 501.2.1**

##### **Sub-Clause 501.2.2 Coarse Aggregates**

Delete “, crushed gravel or other hard material” from 1<sup>st</sup> Line of Para 1.”  
Para 2 is deleted.

### **Sub Clause 501.6 Compaction**

**Replace** the sentence “The intermediate rolling .....0.56 MPa.” **with** “The intermediate rolling shall be done with a smooth wheeled tandem vibratory roller of 8-10 tonne weight followed by a pneumatic tyre roller of 12-15 tonnes weight having nine wheels, with a tyre pressure of at least 0.56 MPa.” **in 2<sup>nd</sup> paragraph.**

## **CLAUSE 502 PRIME COAT OVER GRANULAR BASE**

### **Sub-Clause 502.2 Materials**

**Sub-Clause 502.2.1** This Clause shall be read as under:

**"502.2.1** The primer shall be cationic bitumen emulsion SS1 grade conforming to IS: 8887 and shall be refinery produced."

### **Sub Clause 502.8 Rate**

This Clause shall be read as under:

#### **"502.8. Rate**

The contract unit rate for prime coat shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 401.7 sub para (i) to (iv) and as applicable to the work specified in these Specifications."

## **CLAUSE 503 TACK COAT**

### **Sub-Clause 503.2 Materials**

This Clause shall be read as under: **"503.2**

#### **Materials**

The binder used for tack coat shall be cationic bitumen emulsion (RS 1)

Complying with IS: 8887 and shall be refinery produced.”

#### **Sub Clause 503.8 Rate**

This Clause shall be read as under:

##### **“503.8. Rate**

The contract unit rate for tack coat shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 401.7 and as applicable to the work specified in these Specifications.”

### **CLAUSE 505 DENSE BITUMINOUS MACADAM**

#### **Sub-Clause 505.2.1 Bitumen**

This Clause shall be read as under:

“The bitumen shall be paving bitumen of viscosity grade VG-40 complying with Indian Standard Specifications for “Paving Bitumen”, IS: 73.”

#### **Sub-Clause 505.2.2 Coarse Aggregates**

**Delete** the words “, crushed gravel or other hard material’ from the first sentence of Clause 505.2.2.

**Delete** 2<sup>nd</sup> paragraph of Clause 505.2.2.

#### **Sub-Clause 505.2.3 Fine Aggregates**

**Replace** the words “or natural occurring mineral material, or a combination of the two” with “material” in the 1<sup>st</sup> sentence of the Clause 505.2.3.

**Delete** the 4<sup>th</sup> sentence of the Clause 505.2.3.

#### **Sub Clause 505.2.5 aggregate Grading and Binder**

**Content Add** the following at the bottom of **Table 500-10**:

“The grading of the aggregate mix as used in work shall be a smooth curve within and approximately parallel to the envelope in Table 500-10”.

#### **Sub-Clause 505.9 Rate**

Add the words “except for item of prime coat and tack coat” after the words “required operations” in 2nd line.

### **CLAUSE 507 BITUMINOUS CONCRETE**

#### **Sub-Clause 507.2.1 Bitumen**

This Clause shall be read as under:

“The bitumen shall be paving bitumen of viscosity grade VG-40 complying with Indian Standard Specifications for “Paving Bitumen”, IS: 73.”

#### **Sub-Clause 507.2.2 Coarse Aggregates**

**Delete** the words “and where crushed gravel is proposed ..... two fractured faces” from the first sentence of Clause 507.2.2.

#### **Sub Clause 507.2.5 aggregate Grading and Binder**

**Content Add** the following at the bottom of **Table 500-17**:

The grading of the aggregate mix as used in work shall be a smooth curve within and approximately parallel to the envelope in Table 500-17”.

#### **Sub-Clause 507.9 Rate**

Replace “504.9” with “505.9” in the Clause 507.9.

### **CLAUSE 508 CLOSE GRADED PREMIX SURFACING/MIXED SEAL SURFACING**

#### **Sub Clause 508.1**

#### **Scope Sub Clause**

#### **508.1.2**

This Clause shall read as under

“**508.1.2** Close graded Premix surfacing shall be “Type B”



**Sub Clause 508.2 Materials Sub-****Clause 508.2.1 Binder**

This Clause shall be read as under:

“The binder shall be paving bitumen of viscosity grade VG-40 complying with Indian Standard Specifications for “Paving Bitumen”, IS: 73.”

**Sub-Clause 508.2.2 Coarse Aggregates**

Replace “511.1.2.2” with “510.1.2.2” in the **Sub-Clause 508.2.2**.

**Sub-Clause 508.2.3 Fine Aggregates**

**Delete** the words “, or natural sand or a mixture of both” with “material” in the 1<sup>st</sup> sentence of the Clause 508.2.3.

**Sub-Clause 508.3 Constructions Operations**

**Replace** “ 510.1.3.1 through Clause 510.1.3.5” **with** “510.1.3.1 to Clause 510.1.3.5” in the **Sub-Clause 508.3**.

**Sub Clause 508.8 Rate**

Add the words “except for item of prime coat and tack coat” after the words “required operations” in 2nd line.

**CLAUSE 516 MASTIC ASPHALT****Sub-Clause 516.2 Materials****Sub-Clause 516.2.2 Coarse Aggregates**

**Delete** the words “, crushed gravel/shingle or other stones” from the first sentence of Clause 516.2.2.

**Fine Aggregates**

**Delete** the words “, natural sand or a mixture of both” in the 1<sup>st</sup> sentence of the Clause 516.2.2.

**Sub-Clause 516.4.5      Spreading**

**Replace** “Table 500-6” with “500-5” in sub-paragraph 2) of 4<sup>th</sup> paragraph of Sub-Clause 516.4.5.

**Sub-Clause 516.4.7      Surface Finish**

**Replace** “retained on the 6.7 mm sieve” **with** “retained on the 9.5 mm sieve” in 4<sup>th</sup> line of Sub-Clause 516.4.7.

**SECTION 800 TRAFFIC SIGNS, MARKINGS AND OTHER ROAD APPURTENANCES Clause 801 TRAFFIC SIGNS**

**Sub-Clause 801.2.6** This clause shall read as under:

“The signs shall be 2mm thick with Aluminium sheet.”

**Sub-clause 801.4 Installation**

**Sub-clause 801.4.1** The 1<sup>st</sup> sentence of Clause shall read as follows:

“Traffic Signs shall be mounted on support posts, which shall be of MS pipe 80mm dia. (NB-MW) or as shown in the drawing.”

**Sub-clause 801.4.2** Add following at the end of this clause:

“The sign back shall be painted with two coats of grey colour epoxy paint. The sign post shall be painted in black & white alternate bands with two coats of epoxy paint.”

**Sub-clause 801.5 Measurement for Payment**

This clause shall read as under:

“The measurement of cautionary, mandatory, information, route marker, chevron and direction & place identification sign shall be in numbers.”

## **Clause 802 OVERHEAD SIGNS**

### **Sub-Clause 802.4.2**

**Replace** the words “they shall .... IS Specifications.” **with** “they shall be thoroughly descaled, cleaned, primed along with all other components of signs, except reflective portion. They shall be painted with two coats of epoxy paint. The sign back side shall be painted with grey colour and post shall be painted in black & white alternate bands. The post below ground shall be painted with three coats of red lead paint.

**Sub-Clause 802.4.3** The last sentence of this Clause shall read as under: “The thickness of aluminium sheet shall be 2 mm.”

## **CLAUSE 803 ROAD MARKINGS**

### **Sub Clause 803.2 Materials**

This clause shall read as under:

“Road markings shall be of hot applied thermoplastic compound and the materials shall meet the requirements as specified in Clause 803.4.

### **Sub Clause 803.8.11 Measurement for Payment**

The 1<sup>st</sup> sentence of this Clause shall read as under:

“The Audible and Vibratory pavement markings shall be measured in square metre of area including the gaps.”

## **CLAUSE 805 DISTANCE INDICATOR POST**

**Sub Clause 805.3** The first sentence of this Clause shall read as under:

“The hectometre/kilometre/5<sup>th</sup> kilometre distance indicator posts shall be made of concrete of grade as shown in the drawing.”

### **Sub Clause 805.5 Rate**

This Clause shall read as under:

“The Contract unit rate for hectometre/kilometre/5th kilometre distance indicator posts shall be payment in full compensation for furnishing all labour, materials, tools, equipment including cost of excavation, foundation in M15 grade concrete, formwork, backfilling, etc and making the posts, painting and lettering and fixing at site and all other incidental costs necessary to complete the work to these Specifications.”

## **CLAUSE 807 BOUNDARY STONES**

### **Sub Clause 807.1 Scope**

Add at the end of Paragraph 1, “The boundary stones shall be of concrete as shown in drawing.” The words ‘NH-361’ should be engraved on each stone appropriately.

## **CLAUSE 809 TUBULAR STEEL RAILING**

**Sub Clause 809.3** Add the following to the end of this Sub-Clause:

“The railing shall be embedded in the concrete foundation of size and the grade of concrete along with the depth of the embedment of post as indicated in the drawing.”

### **Sub Clause 809.5 Rate**

After the words “test and final erection at site” in 3<sup>rd</sup> line of this Clause, add the words “including cost of excavation, concrete foundation etc.”

## **CLAUSE 811 CRASH BARRIER**

### **Sub Clause 811.2 Concrete Crash Barrier**

#### **Sub Clause 811.2.1 Materials**

**Sub Clause 811.2.1.2** This Clause shall read as under: “The grade of concrete shall be M-40.”

**Sub Clause 811.2.2 Construction Operations**

**Sub Clause 811.2.2.2 Replace** “Clause 810.2.2.3” **with** “Clause 811.2.2.3” in the 4<sup>th</sup> line of 1<sup>st</sup> paragraph of Clause 811.2.2.2.

**CLAUSE 811.3 Metal Beam Crash Barrier**

**Sub Clause 811.3.1.2 Replace** 1<sup>st</sup> paragraph of Sub-Clause 811.3.1.2 **with** the following:

Metal beam is a “W” profiled corrugated beam as specified in drawings made from cold rolled steel strip of 3.0 mm thick using high strength steel of IS:5986 Fe 510 grade and have properties as under:

Ultimate Tensile Strength (Min.): 483 Mpa. Yield stress (Min.): 345 Mpa.

Elongation (Min.) in 50mm: 12%

The beam after forming shall have formed width of 312 mm and depth of 83 mm and shall have punched holes for fixing as specified in drawings.

The steel post and the blocking out spacer shall both be channel section of 75 mm x 150 mm & size 5 mm thick conforming to IS: 5986 grade Fe.360 as specified in drawings. The rail shall be 71 cm above the ground level and posts shall be spaced 2.0 m centre-to centre. Double “W” beam barrier shall be as indicated in the drawing.

The Guardrail reflector shall be made of material and placed in position as shown in drawings. It shall be hot dip galvanized 0.55 kg per square meter.

Test specimens for mechanical properties and coating shall be prepared and tested as specified in relevant IS codes.

**Sub Clause 811.3.1.3** This Clause shall read as under:

“Concrete for bedding and anchor assembly shall conform to Section 1700 of these Specifications. The size of the concrete foundation block for embedding the posts and grade of concrete shall be as shown in the drawing.”

**Sub-Clause 811.3.3 Installation of Posts**

The sub-clause 811.3.3.1, 811.3.3.2, 811.3.3.3 and 811.3.3.4 are replaced as below:

“The steel posts shall be embedded in the concrete foundation of size and the grade of concrete along with the depth of the embedment of post as indicated in the drawing.”

**Sub Clause 811.3.3.5** This Clause shall read as under:

“Posts and end section for metal beam guardrails on bridges shall be bolted to the structure as detailed in the drawings. The anchor bolts shall be set to proper location and elevation with templates and carefully checked.”

**Clause 811.3.4.3** Add at the end of this Clause:

“The guard rail reflector shall be bolted replacing splice washer at every 10th posts interval.”

#### **Sub-Clause 811.3.7 Measurements for Payment**

**Sub-Clause 811.3.7.1** The 2nd sentence "Terminals/anchors of various types shall be paid by numbers" is **deleted**.

**Sub-Clause 811.3.7.2** This Clause shall read us under:

“No separate measurement for payment shall be made for Terminals/anchors of various types required for the work. The cost of these elements shall be deemed to be included in the rate quoted by the Contractor. Furnishing and placing anchor bolts and/or devices for guard rail posts on bridges shall be considered incidental to the construction and the costs thereof shall be included in the price for other items of construction.”

**Sub-Clause 811.3.7.3** The words “or backfilling” shall be **substituted** as “and concreting”.

#### **Sub Clause 811.3.8 Rate**

Add the words “and drawings” **at the end of the last sentence in Sub-Clause**

**811.3.8.**

**CLAUSE 813 TRAFFIC CONTROL AND SAFETY DEVICES IN  
CONSTRUCTION ZONE**

**Sub Clause 813.11: Measurement**

This Clause shall read as under:

The Provisions made in Bill of Quantities shall be the ceiling for the Contract during the Contract Period. The Additional claims due to damage and theft of the same shall be deemed incidental to works. No extra payment shall be made towards additional quantities for these bill items.

**Sub Clause 813.12: Measurement**

All arrangements for traffic control and safety device in construction zone during construction including their maintenance, dismantling and clearing debris, where necessary, shall be considered as incidental to the works and shall be the Contractor's responsibility, unless provided as a separate payable item in the BOQ.”

**SECTION 1000 MATERIALS FOR STRUCTURES**

**CLAUSE 1002 SOURCES OF MATERIALS**

**Add the words** “at his own expense” **at the end of 3<sup>rd</sup> paragraph of Clause 1002.**

**CLAUSE 1006 CEMENT**

The 1<sup>st</sup> paragraph of this Clause shall read as follows:

“Cement to be used in bridge structures shall conform to the following standard:

IS:12269 – Specification for 53 Grade Ordinary Portland cement.

For other works Ordinary Portland cement 43 grade, conforming to IS 8112 shall be used with the prior approval of the Authority's Engineer.”

**CLAUSE 1007 COARSE AGGREGATES**

Delete the following from 3<sup>rd</sup> and 4<sup>th</sup> lines of 1st paragraph “Crushed gravel  
.....inert material”

**CLAUSE 1008 SAND/FINE  
AGGREGATES**

Delete from the 1<sup>st</sup> line the word “or crushed gravel sand” and from the 2<sup>nd</sup> line “or gravel” in Paragraph 2.

**CLAUSE 1014 STORAGE OF MATERIALS**

**Sub Clause 1014.3:** Add the following to the Sub-clause 1014.3:

“Aggregates shall be stored or stockpiled in their respective size in such a manner that the various sizes will not become intermixed before proportioning. They shall be stored, stockpiled and handled in such a manner that will prevent contamination by foreign materials.”

**SECTION 1500 FORMWORK****CLAUSE 1501 DESCRIPTION**

Add the following paragraphs at the end of this Clause:

“The Contractor shall prepare a formwork mobilization and utilization plan and submit the plan for Authority’s Engineer’s approval at least 21 days before the commencement of construction of structures. The requirement of formwork shall be worked out considering the overall construction program of all the structures to be cast in one or more stages, as specified in the drawings. The plan shall take into account the time required for erection of formwork, retention in position, stripping, and removal and subsequent use in the next and subsequent structures.

Notwithstanding Authority’s Engineer’s approval of mobilisation plan, if due to any reason, Contractor has to arrange additional formwork, to meet the requirements of the construction program, it shall be done by the Contractor without any extra cost to the Employer.”

**CLAUSE 1502 MATERIALS**

Delete the last sentence in 1st paragraph.



Delete the word “or timber” in 1st line of 2nd paragraph.

#### **CLAUSE 1506 PRECAUTIONS**

Add the following as items (vii) and (viii) to this Clause:

- vii) Adequate support against sideway and lateral loads due to construction operations and wind shall be provided.
- viii) In case cantilevers are supported directly from the ground, the supports for cantilevers shall be removed simultaneously with main supports only after approval for the same from the Authority's Engineer.

#### **Clause 1513 Rate**

Add the following at the end of the first paragraph:

“The unit rate shall also include all costs for preparation of erection scheme, designs of false work and formwork.”

### **SECTION 1600 STEEL**

#### **REINFORCEMENT CLAUSE 1602**

##### **GENERAL**

Paragraph 2 of Clause 1602 shall read as follows:

“Reinforcements shall be High Strength Deformed Steel Bars (HSD) of grade Fe 500 conforming to IS: 1786.”

#### **CLAUSE 1603 PROTECTION OF REINFORCEMENT**

Replace “1010.3.2” with “1009.3.2” in 2<sup>nd</sup> line of 3<sup>rd</sup> paragraph of Clause 1603.

#### **CLAUSE 1605 PLACING OF REINFORCEMENT**

Add the following as sub Para (f) to this Clause:

##### **Tolerances:**

1. Tolerance of cover: Deviation shall not exceed + 10 mm No negative tolerance is allowed.
2. Tolerance in position: Tolerance for deviation from the positions shown in the drawings shall not exceed the following:

Structural depth d (mm)	Tolerance (mm)
$d < 1000$	$< 10$
$1000 < d < 2000$	$< 0.01d$
$2000 < d$	$< 20$

## SECTION 1700 STRUCTURAL

### CONCRETE CLAUSE 1705

#### ADMIXTURES

##### Sub Clause 1705.1: Chemical Admixtures

**Replace** “Clause 1007” with “Clause 1012” in the 3<sup>rd</sup> paragraph of Sub-Clause 1705.1.

## CLAUSE 1706 SIZE OF COURSE AGGREGATE

Table 1700-7 shall be modified as given below:

Components	Maximum nominal size of Coarse aggregate (mm)
------------	---

a. RCC Well Curb.	20
b. RCC / PCC well steining, PCC below foundations and approach slab, annular filling around foundations.	40
c. Well cap or pile cap; solid wall type abutments, piers, median walls, splayed wing walls and their foundations.	40
d. RCC works in T-beam and slab / solid slab / voided slab and box girder superstructure, wearing coat, kerb, crash barrier, approach slab, dirt walls, coping on masonry wing walls, hollow abutments and piers, pier / abutment caps, pedestals, dirt walls, piles, all components of counter fort type abutments, columns, cantilever return walls etc.	20
e. All PSC works	20

#### Clause 1707 EQUIPMENT

The Para “a (i) & (ii)” shall be replaced with the following:

For production of concrete, batching and mixing of the concrete shall be done in a concrete batching and mixing plant fully automatic of a minimum capacity of 15 cum/hour. The plant shall be approved by the Authority’s Engineer.”

The third para of para “(a)” shall be replaced with the following:

“The accuracy of measuring devices shall fall within the following limits:

Measurement of Cement  $\pm 1\%$  of the quantity of cement in each batch.

Measurement of Water  $\pm 1\%$  of the quantity of water in each batch.

Measurement of Aggregate  $\pm 2\%$  of the quantity of Aggregate in each batch

Measurement of Admixture  $\pm 1\%$  of the quantity of Admixture in each batch.

#### CLAUSE 1715 HIGH PERFORMANCE CONCRETE

##### Sub Clause 1715.9: Additional Tests for Concrete

Replace “Clause 1714.3” with 1714.4 in 2<sup>nd</sup> line of Sub-Clause 1715.9.

**CLAUSE 1800 PRESTRESSING****CLAUSE 1803 MATERIALS****Sub Clause 1803.2.2**

**Replace** “1804.6” **with** “1805.6” in 3<sup>rd</sup> line of 3<sup>rd</sup> paragraph of Clause 1803.2.2.

**SECTION 2000 BEARINGS****CLAUSE 2005 ELASTOMERIC BEARINGS****Sub Clause 2005.4: Acceptance Specifications**

In Paragraph 5, substitute the words "Engineer or his authorised representative" for the word "Inspector".

**Sub-Clause 2005.4.5 Inspection Certificate**

Substitute the words "Engineer or his authorised representative" for the word "Inspector".

**Sub-Clause 2005.4.6 Quality Control Certificate**

**Delete** the words “/Inspector” in sub-paragraph b) of 1st paragraph.

**CLAUSE 2009 MEASUREMENTS FOR PAYMENT**

**Add** the following after Paragraph 2:

"Tar Paper bearings shall be measured in square meters."

**CLAUSE 2011 TAR PAPER BEARING**

**Add the new Clause 2011 at the end of the Section 2000. “2011**

**TAR PAPER BEARING**

Tar Paper bearing shall be reinforced bitumen laminated Kraft paper conforming to the requirements of IS- 1398.”

**CLAUSE 2100 OPEN FOUNDATIONS****CLAUSE 2104 WORKMANSHIP****Sub Clause 2104.1 Preparations of Foundations**

**Replace “M10” with “M15” in 5<sup>th</sup> line of 1<sup>st</sup> paragraph of Clause 2104.1.**

**Sub Clause 2104.3 Construction**

**Replace “M10” with “M15” in 1<sup>st</sup> & 7<sup>th</sup> line of sub-paragraph ii) of Clause 2104.3.**

**SECTION 2200 SUB-STRUCTURE****CLAUSE 2204 PIERS AND ABUTMENTS**

**Add the following paragraph at the end of Clause 2204**

“Wherever necessary, suitable cofferdams or other means shall be provided to exclude water from the construction area. The Contractor shall provide necessary pumping equipment for dewatering in working areas.”

**CLAUSE 2210 RATE**

This Clause shall read as under:

“The contract rate for masonry, concrete reinforcement and weep hole in substructure shall include all works as given in respective sections of these Specifications and cover the cost of all incidental items like providing cofferdams, dewatering, providing special formwork, where necessary, and all other items for furnishing and providing substructure as mentioned in this Specifications and shown on the drawings.

The necessary material (asphaltic/bituminous board or equivalent material) and labour, tools etc. required for maintaining 20 / 40 mm gap between faces of various structures (old / new) wherever required / as shown in drawing shall be incidental to work and shall not be measured / paid separately.”

**SECTION 2500 RIVER TRAINING AND PROTECTION****WORK CLAUSE 2504 PITCHING/REVTMENT ON SLOPES****Sub Clause 2504.3 Construction Operations**

**Replace** “Clause 1405.3” **with** “Clause 1405.1.3” in 3<sup>rd</sup> line of 3<sup>rd</sup> paragraph of Clause 2504.3.

**CLAUSE 2507 CURTAIN WALL AND FLEXIBLE APRON****Sub Clause 2507.1 Curtain Wall**

The last sentence of this Clause shall read as:

“The curtain wall shall be in cement concrete grade as shown in the drawing.”

**SECTION 2700 WEARING COAT AND APPURTENANCES**

**Add the following additional clauses:**

**Sub-Clause 2703.5 Concrete crash barrier for bridges****Sub-Clause 2703.5.1 General**

This work shall consist of construction, provision and installation of concrete crash barrier on the bridge deck / approach slab / approaches at locations and of dimensions as shown on the drawings or as directed by the Authority’s Engineer.

**Sub-Clause 2703.5.2 Materials**

All materials shall conform to Section 1000-Materials for Structures as applicable, and relevant Clauses in Section 1600 shall govern the steel reinforcement. The concrete barriers shall be constructed either by the “cast-in- place with fixed forms” method or the “extrusion or slip form” method or a combination thereof at the Contractor’s option with the approval of the Authority’s Engineer. Where “extrusion or slip form” method is adopted, full details of the method and literature shall be furnished.

Grade of concrete for crash barriers on deck slab, approach slab etc. shall be M40.

An expansion joint with Polysulphide Joint sealants and bituminous fiber board shall be provided in the crash barriers at the location of expansion joints/ gaps on the bridge, approaches etc.

#### **Sub-Clause 2703.5.3 Construction Operations**

The location of crash barrier shall be strictly adhered to as shown on the drawing and as directed by the Authority's Engineer. Concrete crash barriers shall present a smooth, uniform appearance in their final position, conforming to the horizontal and vertical lines shown on the plans or as ordered by the Authority's Engineer and shall be free of lumps, sags or other irregularities. The top and exposed faces of the barriers shall conform to the specified tolerances, as defined in Clause 2703.5.4, when tested with 3 m straight edge, laid on the surface.

The concrete crash barrier or precast shall be given two coats of cement paint or aqua based paint as directed by the Authority's Engineer of approved brand and shade.

#### **Sub-Clause 2703.5.4 Tolerance**

The overall horizontal alignment of crash barrier and rails shall not depart from the road alignment by more than + 30 mm, nor deviate in any two successive lengths from straight by more than 6 mm and the faces shall not vary more than 12 mm from the edge of a 3 m straight edge. Barriers shall be at the specified height as shown in the plans above the edge of the nearest adjacent carriageway or shoulder, within a tolerance of + 30 mm.

#### **Sub-Clause 2703.5.5 Measurements for Payment**

All barriers will be measured in linear metres of concrete in place, including approach and departure ends. The steel rails on the top of crash barrier shall be measured and paid separately. The sealing of opening in crash barrier at expansion joints with polysulphide rubber joint sealant and bituminous fibre board as per sub-clause 2703.6 shall be incidental to work. The painting shall be measured in square meter.

#### **Sub-Clause 2703.5.6 Rate**

The Contract unit rate shall include full compensation for furnishing all labour, materials including steel reinforcement as per drawings, tools, equipment and

incidental costs necessary for doing all the work involved in constructing the concrete barrier complete in place in all respects as per these Specifications.

### **Sub-Clause 2703.6 POLYSULPHIDE RUBBER JOINT SEALANT**

Polysulphide Joint sealants with bituminous fibre board shall be provided in the Expansion Joints/ gaps in Crash Barriers.

Before application it shall be ensured that the top of the bituminous fibre board and the concrete faces are dry, sound, and free from dirt, grease and other loose foreign matter. A thin coat of primer shall be applied on concrete faces with a brush to air dry before applying sealant. The components of the sealant i.e. base and hardener shall be mixed in a slow speed mixed sealant till uniform colour is obtained. Placement of the mechanical mixer shall be done with either cartridge or fully enclosed gun barrels within 30 minute of mixing. Manufacturer's recommendation shall be followed.

The sealing compound shall be two packs, low modulus of elasticity Polysulphide elastomer having bituminous ingredients such as Cico T-680 or equivalent with following properties of the cured compound.

Tensile strength	-	0.4 MPa $\pm$ 10%
Modulus of elasticity	-	At 100% elongation:
0.15 MPa Elongation	-	Elongation at break
550%		
Hardness	-	Shore 'A' hardness 22 $\pm$ 3 @ 25°C
Operating temperature	-	-20°C to
+ 80°C Shrinkage	-	Less
than 1%		
Permanent dynamic	-	$\pm$ 25%
Movement capability		

Polysulphide material shall be approved by the Authority's Engineer prior to procurement.

### **Measurements for Payments:**



Cost for providing polysulphide joint sealants and bituminous fibre board in the expansion joints in crash barriers shall be deemed to be included in the unit rate of crash barrier and shall not be measured separately.

#### **CLAUSE 2706 WEEP HOLES**

This Clause shall read as under:

“Weep holes shall be provided in solid plain concrete / reinforced concrete/ brick or stone masonry abutments, wing walls, return walls as shown in the drawing or as directed by the Authority’s Engineer to drive moisture from the back filling. Weep holes shall be provided with 100mm dia PVC (6 Kg/cm<sup>2</sup>) pipe and shall extend through the full width of concrete/masonry with slope of about 1 vertical: 20 horizontal towards the draining face.

The spacing of weep holes shall generally be 1 m in either direction or as shown in the drawing with the lowest at about 150 mm above the low water level or ground level whichever is higher or as directed by the Authority’s Engineer.”

#### **CLAUSE 2708 MEASUREMENT FOR PAYMENT**

Sub-paragraph i) of this Clause shall read under:

“i) Cement wearing coat shall be measured in cubic metres. Bituminous wearing coat be measured in square metres. Steel reinforcements in concrete wearing coat shall be measured in tonnes.”

Sub-paragraph iii) of this Clause shall read under:

“iii) Concrete crash barriers shall be measured in linear metres of concrete in place, including approach and departure ends. The steel rails on the top of crash barrier shall be measured and paid separately. The sealing of opening in crash barrier at expansion joints with polysulphide rubber joint sealant and bituminous fibre board as per sub-clause 2703.6 shall be incidental to work. The painting shall be measured in square meter. .”

### **SECTION 2900 PIPE CULVERTS**

#### **CLAUSE 2910 MEASUREMENT FOR PAYMENT**

This Clause shall read as under:

“RCC pipe culverts including selected granular material and cement concrete for pipe bedding shall be measured along their centre between the inlet and the outlet ends in linear metres.

Ancillary works like headwalls, Aprons etc., shall be measured as provided for under the respective Sections.”

### **CLAUSE 2911 RATE**

This Clause shall read as under:

“The Contract unit rate for the pipes shall include the cost of pipes including loading, unloading, hauling, handling, storing, laying in position and jointing complete and all incidental costs to complete the work as per these Specifications. Cost of selected granular material and cement concrete for pipe bedding shall be included in the Contract unit rate for pipes.

Ancillary works such as excavations including backfilling, concrete and masonry shall be paid for separately, as provided under the respective Clauses.”

## **SECTION 3000 MAINTENANCE OF ROAD**

### **CLAUSE 3001: GENERAL**

Add the following at the end of Clause 3001:

“The maintenance work carried out during the period from the Commencement Date to the issue of Taking over Certificate shall be incidental to the works. The same shall not be measured and paid.”

## **ADDITIONAL TECHNICAL SPECIFICATIONS**

### **CLAUSE A-1 DIVERSION AND FILLING OF EXISTING WATER COURSES ALONG THE ROAD ALIGNMENT**

Where watercourses have to be diverted from the sites of embankments, the original channels shall be cleared of all vegetation and soft deposits as directed by the Authority’s Engineer and carefully filled in with suitable materials and compacted as specified. The new channel/ side drain shall be formed as shown in the drawings or as directed by the Authority’s Engineer.

## **1. Measurement for Payment**

The work involved in filling existing watercourses shall be measured as follows:

- (i) The work involved in filling existing watercourses shall be measured under clearing and grubbing item on area basis.
- (ii) Excavation and removal of soft deposits shall be measured in cubic metre.
- (iii) Filling with suitable material shall be measured in cubic metre.
- (iv) The works involved in forming the new channel/side drain shall be measured under the relevant items of work.

## **CLAUSE A-2 CHUTE DRAIN FOR HIGH EMBANKMENT SECTIONS**

### **Clause A-2.1 Scope**

This work shall consist of construction of chute drain on the slope of the road embankment including erosion protection works at the locations and to dimensions shown on the Drawings or as directed by the Authority's Engineer. Schedule of works shall be so arranged that the drains are completed in proper sequence with roadway to ensure that no damage is caused due to lack of drainage.

### **Clause A-2.2 Materials**

The drains shall be rectangular 300mm wide and 200 mm depth in cement concrete M-20 grade with foundation in M-15 grade concrete as shown in the drawings. The RCC work shall conform to the relevant clauses of these specifications.

Energy dissipation structures in M-20 grade shall be provided at the foot of the chute as shown in the drawings.

Dumped riprap for erosion protection at ground level shall be hard, unweather and durable rubble stone of size 150 to 250mm.

### **Clause A-2.3 Construction Operations**

Excavation for fixing drain sections: At the locations where the chute drains are to be installed, a rectangular cut on the side slope of the embankment along the line of the chute drain shall be made in such a way that the RCC drain sections could be fixed snugly with their edges flush with the adjoining embankment slope. The sloping bed of the drain shall be to a regular line and suitably compacted to provide a firm bed.

Fixing RCC Drains sections: The ends of the RCC drain sections shall be specially shaped to form a self-canting joint. Fixing of the drain sections shall start from top of toe wall at the lower end and proceed towards the upper. The jointing space shall be filled with cement mortar (1 cement to 2 sand) mixed sufficiently dry to remain in position when fixed with a trowel or wooden rammer. Care shall be taken to fill all voids, and excess mortar shall be removed. All joints shall be made with care with interior surface of RCC sections. After finishing, the joints shall be kept covered and damp for at least 4 days.

Dumped Rip Rap: Dumped rip rap for erosion protection shall be placed above ground level at the lower end of the chute drain in such a way that the rip rap stones are not easily moved by water flowing down the chute drain.

#### **Clause A-2.4 Measurements for Payment**

Chute drain shall be measured as length of drain sections placed in position in linear metre. Excavation and preparation of bed for the drain shall not be measured separately. Energy dissipation structures shall be measured in cum. Dumped riprap shall be measured as volume of the material placed in position in cum.

#### **Clause A-2.5 Rate**

Rate for the different items of work shall be payment in full for completing the respective work including all materials, labour, equipment and incidentals.

### **CLAUSE A-3 SPECIFICATIONS FOR PAINTING OF STRUCTURES WITH SYNTHETIC ENAMEL PAINT/ WATER PROOFING CEMENT PAINT**

#### **Clause A-3.1 Materials**

Synthetic enamel paint conforming to IS: 2932 of approved brand and manufacture and of the required colour shall be used for the top coat and an undercoat of ordinary paint of shade to match the top coat as recommended by the same manufacturer as far as top coat shall be used.

#### **Clause A-3.2 Painting on New Surface Clause A-**

##### **3.2.1 Preparation of surface**

The surface shall be thoroughly cleaned and dusted off. All dirt, mortar droppings and grease shall be thoroughly removed before painting is started. The prepared

surface shall have received the approval of the Authority's Engineer after inspection, before painting is commenced.

#### **Clause A-3.2.2 Application**

The number of coats including the undercoat shall be as stipulated in the item.

(a) **Under coat:** One coat of the specified ordinary paint of shade suited to the shade of the top coat shall be applied and allowed to dry overnight. It shall be rubbed next day with the finest grade of wet abrasive paper to ensure a smooth and even surface, free from brush marks and all loose particles dusted off.

(b) **Top Coat:** Two top coats of synthetic enamel paint of desired shade shall be applied after the undercoat is thoroughly dry. Additional finishing coats shall be applied if found necessary to ensure properly uniform glossy surface.

#### **Clause A-3.3 Lettering and Numbering on New Surface**

The letters and numbers for bridges/culverts span and number shall be as per IRC-71971. The size of area for painting shall be varied depends upon the numbers and letters. The background area and letters/numbers shall be painted with one prime coat (under coat) and two coats (top coat) of synthetic enamel paint.

#### **Clause A-3.4 Measurement for payment**

The painting of culverts /Bridges numbering and span arrangement shall be measured in number of each side facing traffic.

The Painting of edge stones, breast walls, parapet walls and road side trees at curves shall be measured in Square metres.

#### **Clause A-3.5 Rate**

Rate for the painting of culverts / bridges numbering and span arrangement shall include the cost of materials, labour and other operation described above to complete set of letters and numbers required in each side facing traffic.

Rate for Painting of edge stones, breast walls, parapet walls and road side trees at curves shall include the cost of materials, labour, including all other incidental costs to complete the work.

**CLAUSE A-4 CONTROLLED****BLASTING Clause A-4.1 GENERAL**

The specifications for excavation in rock are covered by MoRT&H “Specifications for Road & Bridge Works” (5<sup>th</sup> revision April, 2013), vide Section 300. The following specifications are additional and supplementary to the same.

**Clause A-4.2 CONTROLLED BLASTING**

Whenever required by the Authority’s Engineer, the rock blasting shall be controlled so that vibration generated during the blasting does not cause damage to the building and installation around built up areas. Similarly, the rock pieces should not fly off the pits and thus damage the buildings and installation and life and limb of people around. Apart from the general precautions mentioned in the MORT&H Specifications, following protective measures and limits for use of explosives are suggested as guidelines.

**Clause A-4.3 PROTECTIVE MEASURES**

- a) Short delay blasting with light charges shall be used.
- b) The blast hole shall be covered with 0.6 to 1.0 sq.m. Mild steel plate of minimum 6 mm thickness.
- c) Reinforcement rod mesh not less than 20 mm dia. at 150 mm centres in both directions shall be placed over the steel plates.
- d) Steel plate and reinforcements shall be inspected after every blasting operation and all twists shall be removed before reuse to the satisfaction of the Authority’s Engineer.
- e) The thickness of the covering plate and the kind of dead weight is to be duly approved by the Authority’s Engineer.

When blasting is necessary adjacent in partially or completely built structures the contractor shall take all precautions necessary to prevent flying rock from causing damage to the structures.

**Clause A-4.4 BLASTING WITHIN CERTAIN LIMITS**

No blasting shall be allowed for any of the excavation until freshly placed concrete of nearby structures has reached a minimum strength of 7 MPa.

Normally, blasting shall be resorted to only after 7 days of concreting work in case of OPC (10 days in case of PPC) in adjacent structures.

In no case shall blasting be allowed closer than 15m to any structure after concrete placing has started. When minor blasting is necessary after concrete placing has started in any structure, the maximum size of charge for distance from 100m and above shall be limited to the following:

Distance in m	Safe particle velocity 10 mm/sec. Charge in kgs per delay	Safe particle velocity 3 mm/sec. Charge in kgs per delay.
100	10.7	2.6
150	24.2	5.8
200	43.0	10.3
250	67.3	16.7
300	96.9	23.2
350	131.9	31.6
400	172.3	41.2
450	218.2	52.2
500	269.3	64.5

Any deviation in the above-recommended limits will be adopted only after the specific approval of the Authority's Engineer. The contractor shall submit the scheme with charges and delays he proposed to use for blasting, for approval of the Authority's Engineer.

It is generally recommended that where the blasting is to be done, within 20 m of the nearest point of permanent building, the area shall be line drilled on periphery before blasting.

The Contractor shall be responsible for all damage caused by blasting whether to permanent or temporary structures and shall replace or repair the structures at his own cost.

#### **Clause A-4.5 PRECAUTIONS AFTER BLASTING**

After the blast, the supervisor must carefully inspect the work and satisfy himself that all the charges have exploded. After the blast takes place in underground works, the workmen shall not be allowed to go to the face till toxic gases have disappeared from the face. If it is suspected that part of the blast has failed to fire or is delayed, sufficient time shall be allowed to elapse before entering the danger

zone. When fuse and blasting caps are used, a safe time should be allowed and then the supervisor alone shall leave the shelter to inspect the blasting zone.

None of the drillers are to work near the misfired hole until one of the two following operations has been carried out by the Supervisor: Either (i) the Supervisor should very carefully (when the tamping is of damp clay) extract the tamping with a wooden scraper or jet of water or compressed air (using a pipe of soft material) and withdraw the fuse with the primer and a fresh detonator with fuse should be placed in these holes and fired out, or (ii) the hole may be cleared of 30 cm of tamping and its direction then be ascertained by placing a stick in the hole. Another hole may then be drilled at least 60 centimetres away and parallel to it and about 30 cm less in depth, this hole shall then be charged and fired. The balance of the cartridges and detonators found in the muck shall be removed. Before leaving his work, the Supervisor of the concluding shift shall inform the Supervisor of the relieving shift of any case of misfires and should point out the position with a red cross denoting the same and also stating what action, if any, he has taken in the matter.

The Supervisor should also at once report at the office of the Contractor and the Authority's Engineer all cases of misfire, the cause of the same and what steps were taken in connection with these.

The names of the day and night shift Supervisors must be noted daily in the Contractor's office.

If a misfire has been found to be due to a defective detonator of dynamite the whole quantity or box from which the defective article was taken, must be thoroughly inspected by the Contractor.

Drilling in holes not completely exploded by blasting shall not be permitted.

#### **Clause A-4.6 PERSONNEL**

Excavation by blasting will be permitted only under the personal supervision of competent and licensed blasters and trained workmen. All supervisors and workmen in-charge of preparation, handling, storage and blasting work shall be adequately insured by the Contractor.

Storage shall be in charge of a very reliable person approved by the Authority's Engineer, who may, if necessary conduct police enquiries as to his reliability, antecedents etc. The contractor shall have to produce a security for the person in-



charge of the explosives, if and when required by the Authority's Engineer, of the civil authorities of the district.

The Contractor shall make sure that his supervisors and workmen are fully conversant with all the rules to be observed in storing, handling and use of the explosives. It shall be ensured that the supervisors in charge are thoroughly acquainted with the details of the handling of explosives and blasting operations.

## **CLAUSE A-5 INTER LOCKING CONCRETE BLOCKS**

### **Clause A-5.1 Scope**

The scope of work involves laying of Precast M-30 grade interlocking concrete blocks of 75mm thick laid on 25 mm thick prepared sand bed conforming to IRC: SP: 63 and as directed by the Authority's Engineer. The shape of blocks, the source of supply, the methodology for laying of blocks shall be got approved from the Authority's Engineer.

### **Clause A-5.2 Unit of measurement**

The unit of measurement shall be the area of the finished item of work of interlocking blocks measured in plan in sq m.

### **Clause A-5.3 Rate**

The unit cost includes full compensation for laying the sand bed and laying the interlocking tiles including the cost of sand and tiles.

## **CLAUSE A-5A INTER LOCKING CONCRETE BLOCKS FOR RAISED PEDESTRIAN CROSSING**

### **Clause A-5A.1 Scope**

The scope of work involves laying of interlocking Paver blocks of 75mm thick conforming to IRC: SP: 63 laid on 50 mm thick prepared sand bed. M-30 grade Precast Concrete blocks of size (400x100X150) mm for lateral support and Bituminous Concrete ramp as per drawing on either side and as directed by the Authority's Engineer. The shape of paver blocks, the source of supply, the methodology for laying of blocks shall be got approved from the Authority's Engineer.

**Clause A-5A.2 Unit of measurement**

The unit of measurement shall be the area of the finished item of work of Bituminous Concrete ramp on either side measured in plan in sq m.

**Clause A-5A.3 Rate**

The unit cost includes full compensation for laying the sand bed, laying the interlocking Paver blocks, M-30 grade Precast Concrete blocks and Bituminous Concrete ramp including the cost of sand, interlocking Paver blocks, M-30 grade Precast Concrete blocks and forming Bituminous Concrete ramp on either side complete.

**CLAUSE A-6 UTILITY DUCTS****Clause A-6.1 Scope**

The work shall consist of laying and jointing of R.C.C. Utility Ducts in accordance with the requirements of these specifications.

**Clause A-6.2 Materials**

Reinforced concrete pipes shall be of NP 4 type conforming to IS: 458 as shown in the drawings.

**Clause A-6.3 Laying of Pipes**

Laying of Pipes shall be carried out in accordance with clause 2905; the Pipes shall be fitted and matched so that when laid in work they shall have a smooth uniform invert.

**Clause A-6.4 Jointing**

The Pipes shall be jointed either by collar joint or flush joint. Caulking shall be carried out as directed by the Authority's Engineer. The provisions of clause 2906 of the specifications shall be followed to the extent applicable. The Authority's Engineer's decision shall be final and binding.

**Clause A-6.5 Back Filling**

Where directed by the Authority's Engineer shall be carried out in accordance with clause 2907 of the specifications.

**Clause A-6.6 Closing of Ends**

The ends of Pipes shall be closed with plastic covers to prevent ingress of foreign materials

**Clause A-6.7 Measurement of Payments**

The utility ducts shall be measured from end to end in linear meter.

**Clause A-6.8 Rate**

The contract rate for ducts shall include the cost of pipes including collars and covers, handling and storing of Pipes, laying in positions and jointing, construction of head wall and inspection chamber, complete and all incidental works necessary for completion. Excavation including back filling where necessary shall not be measured and paid separately and the same shall be included in the rate for Utility Ducts.

**CLAUSE A-8 Specific Provisions for Protection of the Environment**

An Environmental Management Plan has been prepared for the Project road and is included as Volume VII of the Detail Project Report. The Contractor shall review the Project EMP and submit the Contractor's EMP which will set out the measures he proposes to implement to meet the requirements of the Project EMP.

**CLAUSE A 9-1 SIGNBOARDS**

The Contractor shall supply, erect, maintain and remove on completion of the Works, project signboards at each of the offices, shown in the list below at the location determined by the Authority's Engineer;

(a) The Authority's Engineer's Main Site Office(s), as directed by the Authority's Engineer

(b) Start and End of the Contract Roads

(c) Each of the Contractor's corresponding prime facilities

Each sign board shall be 4.8 m high x 2.4 m wide and shall display brief details of the Project, in English and Tamil languages, as shown below:

(a) Project Name

(b) Executing Agency

- (c) Source of Financing
- (d) Contractor
- (e) Supervising Consultant
- (f) Date for Completion

The specific wording, fonts, sizes of lettering, colours and the like shall be as directed by the Authority's Engineer.

At the end of construction, when directed by the Authority's Engineer, the Contractor shall remove the signboards and make good the area to the satisfaction of the Authority's Engineer. Payment shall be as per MORTH Clause 801.5.

## **CLAUSE A 9-2 PROVISION OF AUTHORITY'S ENGINEER'S FACILITIES AND SERVICES**

### **Clause A 9-2.1 Offices**

In order to properly monitor the construction activities, the Contractor shall provide and maintain the following facilities for the Authority's Engineer.

- One Authority's Engineer's Main Office Facility for the exclusive use of the Authority's Engineer - floor area not less than 150 m<sup>2</sup> carpet area each, with at least 15 office rooms, plus toilet and kitchen facilities (the carpet area shall not include the area of toilets, kitchens and entrances); and
- One Resident's Engineer's office for the exclusive use of the Authority's Engineer - floor area not less than 90 m<sup>2</sup> each with at least 9 office rooms, plus toilet and kitchen facilities;

A general layout of the offices is shown on the Drawings. The siting and orientation of the offices shall be agreed with the Authority's Engineer and confirmed in writing.

The land for the offices shall be provided by the Employer and the Contractor shall build the offices to the layout and details as provided by the Contractor and as approved by the Engineer.

The offices shall be of permanent concrete frame and brick infill with concrete roof construction. The Contractor shall be responsible for the design and construction of the offices including all permits and approvals as required by the concerned authorities. All materials shall be approved by the Authority's Engineer before commencement of construction.

The floor slab and roof slab shall be waterproofed and provided a bituminous water proofing membrane overlain by a bituminous coating. The roof slab shall be provided with adequate profile and galvanised steel gutters to all sides leading to PVC downpipes connecting to the surface drainage network system. All floors to wet areas including kitchen and toilets shall be waterproofed.

All external walls shall be in first class brickwork - 1 brick thick with 1:4 cement mortar - rendered with cement plaster and painted with approved 3 coats of paint of a color to be agreed with the Authority's Engineer. All internal walls shall be in first class brickwork - 1/2 brick thick with 1:4 cement mortar - rendered with cement plaster and painted with approved 3 coats of paint of a color to be agreed with the Authority's Engineer. All external walls shall be waterproofed with an approved system.

The front sliding entrance door shall be fully glazed in a mild steel frame and shall be provided with an approved lock. All external doors and doors to toilets and/or wet areas shall be waterproofed timber doors in a timber frame and shall be lockable.

False ceilings shall be provided to all offices. The clear height between floor slab and false ceiling shall be 2.4m minimum.

All windows shall be of the aluminium sliding windows that can open over the full window area and shall be provided with insect screens and shall be lockable.

All floors except in store area, shall be provided with approved ceramic tiles with skirting tiles. Drainage shall be provided to all wet areas leading to the foul water drainage system.

All toilets shall be provided with the following minimum equipment:

- a) white vitreous china pedestal type water closets (European type W.C. pan)
- b) wash basins;
- c) Mirrors of superior glass
- d) Chromium plated fittings
- e) Showers (hot and cold water) as shown on drawings;
- f) Electric geyser in each shower;
- g) Toilet paper holders;

All internal walls in toilets and showers shall be provided with ceramic tiles to full height of wall.

The kitchen shall be provided with a 200 litre capacity refrigerator with separate freezer compartment, microwave 1500cc capacity, hot water electric geyser of 10 litre capacity, double sink with suitable built in cupboards. Built in cupboards shall comprise timber construction faced with an approved laminate in a color and style to be approved by the Authority's Engineer.

All rooms in the offices shall be provided with suitable built-in cupboards and shelving to the approval of the Authority's Engineer.

The works shall include the provision of 220kV electricity supply dual single and three phase, all electrical items including light fixtures, wiring and cabling. Every wall in each room shall have a minimum of two double electrical sockets at floor height. Light fixtures and level of illumination shall be such that a minimum of 500 lux is obtained at any point in any room. The works shall include a back-up diesel generator in each office capable of supplying the office needs.

All toilets and kitchens shall be connected to a sewerage system including septic tanks, if necessary.

All wiring and cabling required for computer networking and wiring and cabling shall be included in the scope of works.

Each office shall be provided with:

- a) External hard and soft landscaping;
- b) Irrigation system to garden areas;
- c) Heavy duty paving to driveways and car parking areas;
- d) Reinforced concrete footpath 1m wide all round the building
- e) Covered parking as shown in the Drawings

During the period of construction of the offices, the Contractor shall provide suitable rented accommodation for the Engineer of similar size and facilities as specified herein.

The Contractor shall propose at least 3 alternative facilities for the temporary rented Offices and the Authority's Engineer shall select the facility which best suits his needs and make initial discussions with the owner(s). The Contractor will enter negotiations with the owner(s) and subject to the Authority's Engineer's approval, shall enter into a lease agreement with the owner(s) for a period of at least 6 months.

The Contractor shall arrange and supply all local support staff such as watch men, motor vehicle drivers, cooks, peons, gardeners, laborers, janitorial services,

maintenance and repair to mechanical, air-conditioning, heating, telecommunications, electrical and plumbing systems, providing potable drinking water and all toilet supplies, disposal of all waste, maintenance of interior and exterior of buildings, grounds and paved areas including any repairs thereto and maintenance and provision of water, gas, electricity, local telephone services, etc., needed for the Authority's Engineers office facilities, all to the approval of the Authority's Engineer.

### Clause A 9-2.2 Equipment and Consumables for the Authority's Engineer's Offices

**Table A9.1: Equipment for Authority's Engineer's Offices**

S. No.	Description of Equipment	Nos.
1	Mobile telephones of good quality but basic functionality acceptable to the Authority's Engineer together with SIM card and battery charger, operating under the local Indian system The Contractor shall provide 1 piece of INR 1,000 phone cards for each mobile telephone at the beginning of each month.	10 in Main office and 5 in RE office
2	High Speed Broadband internet service on a dedicated basis to be linked to the office LAN to provide internet services to all computers on the network.	1 in each office
3	Desktop PC, Pentium 4 with 3GHz processor, 4GB of RAM, 500GB Hard Drive, DVD-DVD/RW, LAN Card, 101 Key English Key Board, 17" LCD monitor, mouse, current licensed version MS Windows and MS Office Professional	15 in main office and 9 in each RE's office
4	AutoCAD work station	5 in main office and 2 in RE's office
5	Notebook Computer, 2GHz processor, 15.2" non-reflective LCD display, 8GB of RAM, 500 GB HDD, DVD-DVD/RW Drive, Network slot, USB port, with current licensed version of MS Windows and MS Office Professional, Bluetooth, Wi-Fi, modem,	3 in main office
6	Uninterrupted Power Supply, in-line Unit, 1 kVA with sealed maintenance free battery and 60 minutes backup time	1 in each office

7	LAN (at least 20 nodes at each office), wiring loops for all computers and printers	1 in each office
8	WiFi modem	1 in each office
9	Combined photocopier/printer/scanner of an internationally reputed brand, A3 capability, 35 ppm, enlarging/reduction facilities, automatic feeder and sorter	1 in each office
10	A4 LaserJet Printer of an internationally reputed brand, 1200 x 1200 dpi resolution, 10 ppm including USB/parallel/WiFi connectivity (equal or better)	2 in each office
11	A3 Laserjet Printer of an internationally reputed brand, 1200 x 1200 dpi resolution, 10 ppm including USB/parallel/WiFi connectivity (equal or better)	1 in each office
12	Computer software licensed MS Project	2 in each office
13	Computer Projector	2 in main office
14	Digital Camera of an internationally reputed brand; 8.2 MP, 3x optical minimum (equal or better)	5 in main office and 2 in each RE office
15	Weather Station to record temperature, humidity and wind speed in electronic format and facility for measuring rainfall	1 in main office
16	Office safe, 0.125 cu m nominal size, fire resistant with dual combination / mortice lock system	2 in main office
17	Binding Machine (Sipco or similar)	2 in main office
18	Laminating Machine (A4 and A3 size)	2 in main office
19	Office Desks, L shaped, 120 x 70 cm and 90 x 70 cm with connection piece	5 in Main office and 2 in RE Office
20	Office Desks 1.8 m x 0.75 m	10 in main office and 7 in RE office



21	Executive Chairs, gas lift height adjustment, back tilt lockable, adjustable lumbar support, arm rests	5 in Main office and 2 in RE Office
22	Office Chairs, cloth upholstery	10 in Main office and 7 in RE Office
23	Office chairs, polypropylene, stackable	40 in main office
24	Conference Table 4 m x 1.2 m with 10 No. Chairs	1 in main office
25	4 drawer steel Filing Cabinets	4 in main office
26	Storage Cabinets (full size)	4 in main office
27	Room Heater, 2 kW radiating type	0
28	Room fans, standing type	5 in main office
29	Waste paper basket	25
30	Book cases (four door)	10 in main office
31	Set of kitchen equipment including: High power microwave oven grill, refrigerator (325 litre) with separate deepfreeze, electric kettle, cups mugs, and saucers, dinner plates, bread plates, cutlery, 4 ring gas stove, miscellaneous pots, pans and kitchen utensils, kitchen	1 in each office
32	Set of cleaning equipment: vacuum cleaner, brushes (soft), window cleaning equipment, pails etc.	1 in each office
33	40 inch LCD Television Sony Bravia or equivalent in each Main office with Tata Sky (or equivalent) Cable Connection – wall mounted – location to be agreed with the Authority's Engineer	1 in each main office
34	Split system air conditioners in each room suitable to cool the room in 20 minutes	In Each office
35	200 litre capacity refrigerator with separate freezer compartment,	1 in each kitchen
36	microwave 1500cc capacity,	1 in each kitchen

37	Hot water electric geyser of 10 litre capacity in every kitchen and toilet	Item
----	--	------

**Note:** Quantities indicated in above table show total requirements. Distribution is indicative only and may be varied according to usage requirements.

All electronic equipment shall have extended warranty including site service / replacement for 5 years.

The Contractor shall provide replacement services or facilities whenever any item, service or utility becomes unavailable or unusable for any cause.

**Table A9.2: Consumables for Authority's Engineer's Main Office & Site Office (if any)**

Sl. No.	Consumables	Qty.
1	High speed broadband internet service on a dedicated basis	As Reqd.
2	Photo copy paper: A4 : 80 gsm	
3	Photo copy paper: A3 : 80 gsm	
4	Toner cartridges for laser printer / copier	
5	Licenses for MS Windows, MS Office, MS Project or Primavera	
6	DVD R/W Discs	
7	Spiral binders for binding machine	
8	Laminate sheets	
9	File cabinet inserts	
10	Office 'desk sets' including stapler, pencils, pen etc	
11	Cleaning materials and tools	
12	Consumables to be supplied include but not necessarily limited to; bottled potable water of an approved type, superior quality mosquito coils and or spray, slippers/sandals, 6 ashtrays, soap, soap powder, tea, coffee, biscuits, toilet cleaning tools and materials, window cleaning tools and materials, floor cleaning tools and materials, toilet paper, serviettes, kitchen towels, garbage bags, any other cleaning tools and materials	

**Note:** Items indicated in above table show overall requirement for consumable items by description only. Quantities will be according to usage requirements as determined by the Authority's Engineer.

**Table A9.3: Safety Equipment for Authority's Engineer's Main Office & Site Office  
(if any)**

Sl.	Safety Equipment	Qty.
1	Safety helmets	As Req'd.
2	Water/wind proof jacket and over trousers	
3	Safety footwear	
4	Safety spectacles	
5	Safety gloves	
6	Hearing protection	
7	Face masks	
8	Safety Harness	
9	Shock absorbing lanyard	
10	Self-retracting safety line	
11	High visibility reflective jackets	

**Note:** Items indicated in above table show overall requirement for items of PPE by description only. Quantities will be according to usage requirements as determined by the Authority's Engineer.

On issue of the Taking-Over Certificate, the office building(s) and all items listed above shall be the property of Employer and the Contractor shall make necessary arrangements for the same.

### **Clause A 9.2.3 Measurement and Payment**

Payment for provision of office buildings including provision and installation of all equipment and furniture together with consumables as described above shall be as below.

Measurement for construction of permanent Main / Site office building as described in Clause A- 9 2.1 & A-9 2.2 shall be on square metres of plinth area of completed building. The payment shall be made upon completion and handing over of the

completed building furnished to the requirements of Table A9.1, A9.2 and satisfaction of the Authority's Engineer.

Measurement for Maintenance of temporary or permanent Main / Site offices including maintenance of all equipment and furniture previously provided provision of office boy and all consumables specified in Table A9.1 & A9.2 shall be in maintenance months. Payment shall be made on completion of satisfactory maintenance every month.

There shall be no separate payment for the provision of Safety Equipment which deemed included in rates for other items.