

Consultancy Services for Carrying out Feasibility Study, Preparation of Detailed Project Report and providing pre-construction services in respect of 2 laning with paved shoulder of *Imphal-Jiribam section of NH-37 (NH-53) (length- 220 Km)* in the State of Manipur (PKG NO. NHIDCL/DPR/CT-IJ-TP/Manipur/2017)

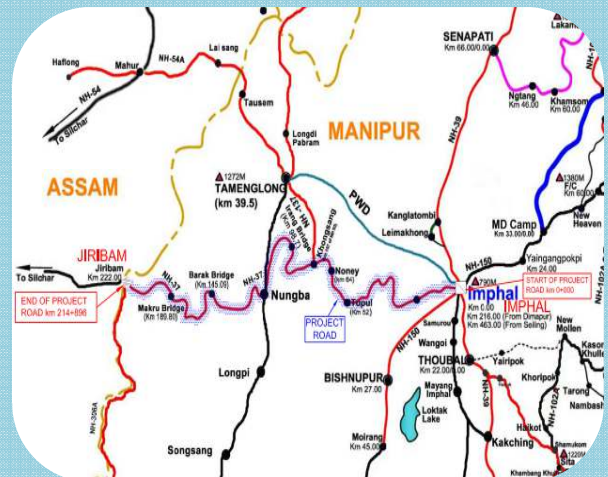
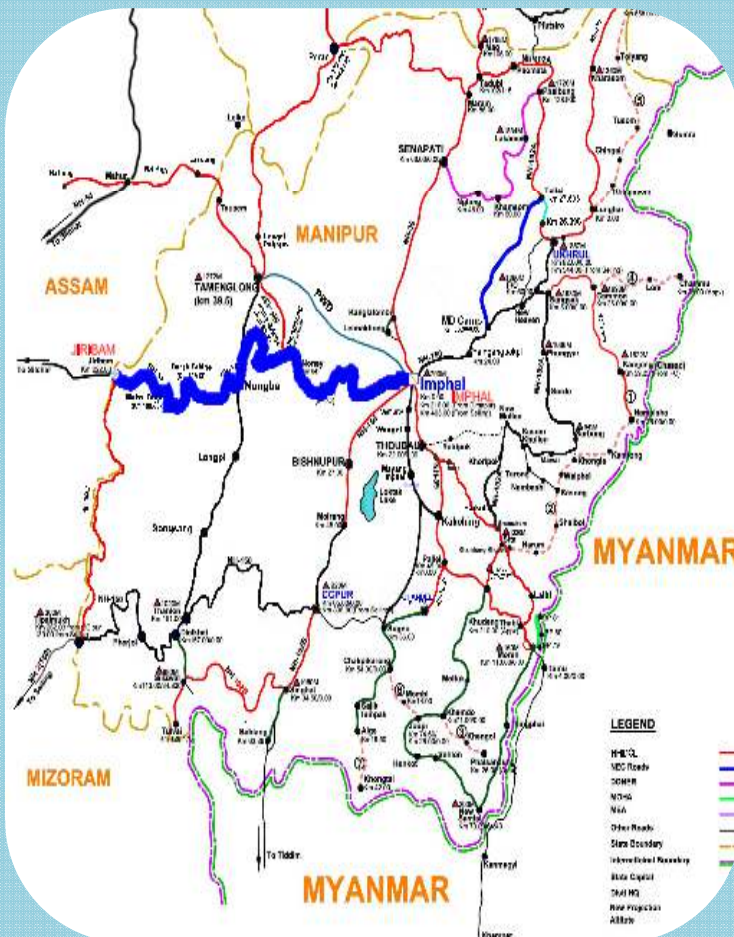
PACKAGE – III
DESIGN CH:
33+000 KM TO
49+250 KM

DRAFT DETAILED PROJECT REPORT
VOLUME – V: TECHNICAL SPECIFICATION
VOLUME – VI: RATE ANALYSIS
VOLUME – VII: COST ESTIMATE
VOLUME – VIII: BILL OF QUANTITY



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CET/4047/NHIDCL/NH-37/DDPR

Rev: R2

Feb, 2021

Road name- IMPHAL-JIRIBAM ROAD SECTION OF NH-53 (OLD NH-37)
PKG-III
(FROM DESIGN CH KM 33+000 TO KM 49+250)
GENERAL ABSTRACT OF COST

Length of Road (KM)

:

16.250

| DESCRIPTION OF WORKS | | TOTAL COST (IN Cr.) | COST PER KM. OF TOTAL ROAD LENGTH (IN Cr.) | % of Cost of Civil Works (% of C) |
|----------------------|---|------------------------|---|--|
| A. | ROAD WORKS | | | |
| 1 | Site Clearance and Dismantling | 1.80 | 0.11 | 1.10% |
| 2 | Earth work ,Subgrade and Erosion control | 37.37 | 2.30 | 22.87% |
| 3 | Sub-Base & Base | 31.11 | 1.91 | 19.04% |
| 4 | Bituminous Courses | 25.36 | 1.56 | 15.52% |
| 5 | Junction Improvement | 0.03 | 0.00 | 0.02% |
| 6 | Traffic signs, Road marking & other road appurtenances | 3.10 | 0.19 | 1.90% |
| 7 | Passenger Shelter | 0.08 | 0.00 | 0.05% |
| 8 | Busbay | 0.55 | 0.03 | 0.34% |
| | Drainage and Protective Works | | | |
| 9 | Longitudinal Drains | 8.82 | 0.54 | 5.40% |
| 10 | Protection Works | 20.55 | 1.26 | 12.57% |
| 11 | Retaining wall | 1.86 | 0.11 | 1.14% |
| 12 | Breast wall | 8.32 | 0.51 | 5.09% |
| B. | BRIDGES & CULVERTS | | | |
| 13 | Culvert | 15.59 | 0.96 | 9.54% |
| 14 | Minor Bridge | 4.13 | 0.25 | 2.53% |
| C. | COST OF CIVIL WORKS IN LAKHS (AS PER SOR 2018) | 158.67 | 9.76 | |
| D. | Escalation @ 3% WPI | 4.76 | | |
| E. | Total Civil Cost including Escalation@3% | 163.43 | 10.06 | |
| F. | Maintenance for 5 years, i.e 2.5% on civil cost (E) | 4.09 | | |
| G. | GST @ 12% of (E) | 19.61 | | |
| H. | Contingencies @ 2.8% over Civil Cost (E) | 4.58 | | |
| I. | Supervision Charges @ 3% of (E) | 4.90 | | |
| J. | Agency Charges @3% of (E) | 4.90 | | |
| K | Escalation Cost @ 2.5% during Construction Period(For 1.5 Yrs of construction period, No escalation in 1st Year and 2.5% for 0.5 Years) | 4.09 | | |
| L. | TOTAL CONSTRUCTION COST (C+D+E+F+G+H+I)=J | 205.60 | 12.65 | |
| M. | DEPARTMENTAL COST | | | |
| a. | LA Cost | 14.53 | | |
| b. | Encroachment Demolition Cost | 3.27 | | |
| c. | Utility Shifting(Electrical+PHE) | 2.45 | | |
| d. | Environmental Budget | 3.00 | | |
| N | Sub Total (L) | 23.25 | | |
| O | TOTAL PROJECT COST (N+M)=O | 228.85 | 14.08 | |

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VOLUME - V

TECHNICAL SPECIFICATION



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Technical Specification

1.1 General

The Technical specifications covering the materials and the workmanship aspects as well as method of measurements and payments 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. 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.

1.1.1. Inclusive Documents

The provisions of special conditions of contract, those specified elsewhere in the tender document, as well as execution drawings and notes, or other specifications issued in writing by the Engineer shall form part of the technical specifications of this project.

The attention of the contractor is drawn to those clauses of codes which require supporting specification either by the 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 Engineer before taking up the supply/construction. In absence of such prior clarification, the Engineer's choice/design will be final and binding on the contractor without involving separately any additional payment.

1.1.2. 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 Engineer the cost of repairs will be borne by the contractor.

1.2 Site Information

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.

1.2.1 Location

The area in which the works are located is in Plain and Mountainous terrain.

Package -IA (Km 0+000 to Km 13+747) of Churachandpur - Tuivai (NH-102B) road is situated in the district of Churachandpur, Manipur.

1.2.2 General Climatic Conditions

Churachandpur District is one of the 16 districts of Manipur state in north-eastern India. The district is bounded by Senapati district in the north, Bishnupur and Chandel districts in the east, Assam and Mizoram in the west and Myanmar on the south. The total population of the district as per 2011 census is 2,71,274. This district with its headquarters at Churachandpur has been divided into five blocks, i.e. Churachandpur, Thanlon, Henglep, Singhat and Parbung.



1.2.3 Seismic Zone

The works are located in Seismic Zone V as defined in IRC: 6-2000.

2. 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)", issued by the Ministry of Road Transport & Highways, Government of India and published by the Indian Roads Congress (IRC), with a cross reference to relevant Bureau of Indian Standards (BIS) for materials or other aspects not covered by the IRC.

2.2 PART-II: Supplementary Technical Specifications

The Supplementary Technical Specifications shall comprise of various Amendments/ Modifications/ Additions to the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS" referred to in PART - I above and Additional Specifications for particular item of works not already covered in PART-I.

- 2.2.1. A particular clause or a part thereof in "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (FIFTH REVISION, April 2013)" as corrected in the original referred in PART-I above, where Amended/ Modified/Added upon, and incorporated in PART-II, referred to above, such Amendment/Modification /Addition supersedes the relevant Clause or part of the Clause.
- 2.2.2. When an Amended/Modified/Added Clause supersedes a Clause or part thereof in the said Specifications, then any reference to the superseded Clause shall be deemed to refer to the Amended/Modified/Added Clause or part thereof.
- 2.2.3. In so far as Amended/Modified/Added Clause may come in conflict or be inconsistent with any of the provisions of the said Specifications under reference, the Amended/Modified/ Added Clause shall always prevail.
- 2.2.4. The following Clauses in the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (FIFTH REVISION, April 2013) have been Amended/ Modified/ Added upon;

| Sr. No. | Section No. | Section Title | Clause No. |
|---------|-------------|---|--|
| 1. | 100 | General | 100,105,106,107,108,109,110,111, 112,114 and 120 |
| 2. | 200 | Site Clearance | 200,201 and 202 |
| 3. | 300 | Earthwork, Erosion Control and Drainage | 300,301,304,305,307 and 309 |
| 4. | 400 | Sub-base, Bases (Non-Bituminous) and Shoulder | 400,401,404 and 406 |
| 5. | 500 | Bases and Surface Courses | 500, 501, 502, 503, 505, 507, 509, |

| Sr. No. | Section No. | Section Title | Clause No. |
|---------|-------------|--|---|
| | | (Bituminous) | and 516 |
| 6. | 800 | Traffic signs, Markings and other Road Appurtenances | 801, 802, 803, 804, 805, 807 and 811 |
| 7. | 900 | Quality Control for Road works | 901 and 903 |
| 8. | 1000 | Materials for Structures | 1007, 1008, 1010, 1012, 1014 and 1015 |
| 9. | 1500 | Form Work | 1501,1502,1503,1504,1506, 1507 1508,1509, 1510 and 1513 |
| 10. | 1600 | Steel Reinforcement (Untensioned) | 1602,1604,1605, and 1606 |
| 11. | 1700 | Structural Concrete | 1705, 1707, 1711, 1716 and 1718 |
| 12. | 2100 | Open Foundations | 2106 |
| 13. | 2200 | Substructures | 2204 and 2210 |
| 14. | 2500 | River Training Work and Protection Work | 2504, 2507 and 2509 |
| 15. | 2600 | Expansion Joints | 2602, 2607, 2608, 2609, 2013, 2014, and 2615 |
| 16. | 2700 | Wearing Coat and Appurtenances | 2702, 2703, 2704, 2705, 2706, 2708 and 2709 |

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 Engineer.

2.3 The latest edition till 28 days before the final date of submission of the bid of all specifications / standard shall be applicable.




PART II

SUPPLEMENTARY TECHNICAL SPECIFICATION

AMENDMENTS/MODIFICATIONS/ADDITIONS TO EXISTING CLAUSES OF GENERAL TECHNICAL SPECIFICATIONS

SECTION 100 GENERAL

CLAUSE 102 DEFINITIONS

The following abbreviations shall be added in this Clause:

| | | |
|----------|---|---|
| "MORT&H" | : | Ministry of Road Transport & Highways (Previously known as 'MOST', Ministry of Surface Transport) |
| "NHIDCL" | : | National Highway Infrastructure Development Corporation Limited. |
| "BIS" | : | Bureau of Indian Standards |
| "WBM" | : | Water Bound Macadam |
| "WMM" | : | Wet Mix Macadam |
| "BOQ" | : | Bill of Quantities |

CLAUSE 105 SCOPE OF WORK

Sub-Clause 105.3 Delete the text of Clause 105.3 and substitute the following:

"The Contractor shall institute and operate a quality management system complying with SP-47 (Quality systems for road bridges) and SP-57 (Quality system for roads). The quality management system shall be described in a Quality Assurance Plan that shall be submitted to the Engineer for acceptance not later than 28 days after the Letter of Acceptance. The costs associated with preparing, implementing and monitoring the quality management system shall be deemed to be covered in the scope of the work. The Quality Assurance Plan shall cover the following items:

- i) The Contractor's organization and management including:
 - The organization of the Contract, including the line of command and communication links between parties involved in the Contract;
 - Names, roles, responsibilities and authority of principles and key personnel;
 - Control of liaison and meetings with third parties;
 - Identification of the Contractor's staff responsible for overseeing each major activity;
 - Contractor's control of sub-contracts;



- Document control;
 - provide a safe, clear and informative system of road signs
 - Program for submission of method statements;
 - Procedures for the preparation, review and adjustment of programmes for the effective progression of the Works;
 - Procedures for the regular review and recording by the Contractor of the quality of the Works;
 - Control of personal selection based on skill and experience;
 - Management review and audit to monitor and exercise adequate control over the implementation of the quality plan.
- ii) The Contractor's detailed method statements and construction procedures for each major activity whether directly controlled or subcontracted including:
- Plant and materials to be used, safety measures, the requirement for skilled labour and/or special supervision and working space;
 - Delivering, handling and storage of materials;
 - Environmental control in respect of pollution, noise, dust, temperature, working hours, traffic control etc.
 - Hold points i.e. the stages at which checks are necessary before continuing;
 - Enable standards of reliability, durability, accessibility, maintainability, quality control and assurance, and fitness for purpose appropriate to a highway of the character of the Project Highway to be achieved throughout the Contract Period
 - Achieve a high standard in the appearance and aesthetic quality of the Project Highway and achieve integration of the Project Highway with the character of the surrounding landscape through both sensitive design and sensitive management of all visible elements including those on the existing road
 - Ensure adequate safety of the Project Workers on the work site.
 - Work instructions, quality control procedures, compliance testing, inspection procedures and work acceptance procedures.
- iii) The Contractor's construction quality control including;
- A statement of the Contractor's organization for quality control;
 - Control of test laboratories;
 - Control of test, measuring and inspection equipment;
 - Document control;



- Procedure for monitoring and recording the inspection, test and approval status of the Works;
- Procedures for the collation of quality records and provision of copies to the Engineer;
- Procedures for the receipt, examination and verification of certificates of conformity and test results for purchased products.”

Sub-Clause 105.5 Contractor shall take steps to minimize the negative impact of construction operations on environment.

Hot Mix Plants should be located at least 1-2 Km from the nearest habitation unless otherwise required by statutory requirements. Vehicles and machinery used for road construction are to be regularly maintained to conform to SPCB (State Pollution Control Board) norms. Blasting as per Indian Explosive Act will be adopted. People living such blasting site should have prior information of operation hours. Workers at blasting site will be provided with ear plugs. Vehicle transporting earth materials will be covered. Water shall be spread to control the dust.

Degraded materials and waste water shall be disposed into the Septic Tank and soak pits etc. The contractor will make arrangement to clean up the spoil as soon as the work finishes in a stretch. If such sites are located outside the ROW, restoration of the site to a level acceptable to the land owner will be done with in time period agreed between land owner and the contractor. Spilling of oil and bituminous products during construction phase will be avoided to reduce the chances of contamination of surface as well as ground water. The construction camps shall be situated at places involving least risks of the nature considering the factors like ground slopes, underground water table and shall confirm to local building regulations, as applicable.

Construction camps shall be properly located to avoid contamination of water through waste water drainage into river and canals. Seasonal pollution issues may arise when flow of river is slow. To prevent such contamination, waste water generated at camp site will be discharged in soak pits. For human excreta, proper disposal through Septic Tanks or deep trenches will be done.

CLAUSE 106 CONSTRUCTION EQUIPMENT

Add the following sub Para (l) and (m) after sub Para (k)

- Adequate standby equipment including spare parts shall be available.
- 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. Accuracy and fitness of measuring devices shall be ensured by proper maintenance.

CLAUSE 107 CONTRACT DRAWINGS

Sub-Clause 107.1 Add the following after the end of Para

After careful study of the drawings issued by the employer, the contractor shall where details are not provided or where changes are required due to site conditions, prepare all supplementary and/or additional working drawings based on field/construction information and shall submit the same to the Engineer for approval prior to construction.

CLAUSE 108 SITE INFORMATION

Sub-Clause 108.4 Add this Sub-clause after the Sub-clause 108.3:

“Identification of quarry sites and borrow areas shall be the responsibility of the Contractor. Materials procured from quarry sites and borrow areas identified by Contractor and to be used in Works must comply with the requirements of quality as stipulated in the Technical Specification for particular items of work.”

Clause 109 SETTING OUT

Sub-Clause 109.9 Delete the 2nd and 3rd sentences in Clause 109.8 and substitute the following:

“Setting out of the road alignment and measurement of angles shall be done by using Total Station. Levels shall be taken by Automatic levels with precision micrometer staff having least count of 1mm.”

Clause 110 PUBLIC UTILITIES

Replace whole of this Clause 110 with the following:

Clause 110 ENCUMBRANCES IN CONSTRUCTION AREA, INCLUDING TREES AND UTILITIES

Sub- Clause 110.1 The contractor shall be responsible to coordinate with service provider/concerned authorities for cutting of trees, shifting of utilities and removal of encroachments, etc. and making the site unencumbered from the project construction area required for completion of work. This will include initial and frequent follow-up meetings/actions/ discussions, with each involved service provider/concerned authorities. Payment for cutting of trees and shifting of utilities as required by the concerned department shall be made by the Employer.

Sub-Clause 110.2 Drawings scheduling the affected encumbrance such as trees and services like water pipes, sewers, oil pipelines, cables, gas ducts, electricity lines, accessories, telephone poles and OFC cables, etc. including in the contract document shall be verified by the contractor for accuracy of scope.

Sub-Clause 110.3 The Employer will make payments to the respective service provider/authorities for cutting trees and shifting of utilities, wherever required. The contractor shall obtain necessary approval from such Authorities after payments by the Employer and also in cases where payments are not required to be made for such shifting. The Employer will also write to all concerned department/service provider organization for expedite and facilitating cutting of trees, shifting of utilities and removal of encroachments, etc.

Sub-Clause 110.4 Any services and properties affected by the works must be temporarily supported by the Contractor who must also take all measures reasonably required by the various authorities/ persons to protect their services and properties during the execution of the works. It shall be deemed to be part of the Contract and no extra payment shall be made for the same.

Sub-Clause 110.5 The Contractor may be required to carry out certain works for and on behalf of various bodies and he shall also provide, with the prior approval of the Engineer, such assistance to the various bodies as may be authorized by the Engineer.

Sub-Clause 110.6 Payment

For coordinating the work of cutting of trees, shifting of utilities and removal of encroachments, etc. no separate payment will be made and these will be incidental to the work.

Clause 111 PRECAUTIONS FOR SAFEGUARDING THE ENVIRONMENT

Sub-Clause 111.1 General

Delete the text of Clause 111.1 in its entirety and substitute the following:

“The Contractor shall take all necessary measures and precautions and otherwise ensure that the execution of the Works and all associated operations on site or off-site are carried out in conformity with statutory and regulatory requirements including those prescribed elsewhere in this document. The provisions specified in the Environment Management Plan Report shall be followed as guidelines.

The Contractor shall take all measures and precautions to avoid any nuisance or disturbance arising for the execution of the Works. This shall wherever possible be achieved by suppression of the nuisance at source rather than abatement of the nuisance once generated. All vehicles deployed for material haulage shall be spillage proof.

Haul roads shall be inspected at least once daily to clear any accidental spillage. In the event of any spoil, debris, wastes or any deleterious substance from the Site being deposited on any adjacent land, the Contractor shall immediately remove all such material at no cost to the Contract and restore the affected area to its original state to the satisfaction of the Engineer.”

The Contractor shall be required to carry out all Environmental mitigation measures and monitoring required during execution of works as directed by the Engineer in Charge. It is pointed out that all costs incurred on such measures/ monitoring shall be treated as incidental to the work and shall be deemed to have been included in the cost of item of works covered under the BOQ

Sub-Clause 111.2 Borrow Pits for Embankment Construction

Delete the text of Clause 111.2 and substitute the following:

“Prior approval shall be sought from the concerned State Authorities, and the Contractor shall comply with all local environmental regulations. For all borrow areas, the actual extent of area/zones to be excavated shall be demarcated with the signboards and the operational areas shall be access controlled.

In the case of borrow from tank beds, a regarded/improvement of the inlet channels (at least up to 100m stretch) shall be undertaken in consultation with the concerned state government departments (the Minor Irrigation department and the State RCD) and local bodies. The Contractor shall ensure that excavation of tank beds is uniform over the entire area and that the finished profile of the bed is smooth.

In the case of borrow from the dry highlands, all borrow areas shall be reinstated by the formation gentle side slopes, re-vegetated and connected to the nearest drainage channel to avoid the formation of pools during/after the rainy seasons.

Plant and machinery used in the borrow areas shall conform to State noise emission regulations. All operation areas shall be water sprinkled to contain dust levels to the National Ambient Air Quality Standards.”

Sub-Clause 111.3 Quarry Operations

Delete the text of Clause 111.3 and substitute the following:

“Aggregates shall be sourced only from quarry sites that comply with the local/state environmental and other applicable regulations. Occupational safety procedures/practices for the work force in all quarries shall be in accordance with applicable laws. Quarry and crushing units shall have adequate dust suppression measures, such as sprinklers, in work areas and along all approach roads to the quarry sites. These shall preferable be located on the upwind side.”

Sub-Clause 111.5 Pollution from Hot-Mix Plant and Batching Plants

Delete the 1st sentence of Clause 111.5 and substitute the following:

“Bituminous hot mix plant and concrete batching plants shall be located at least one 1 km away from the sensitive receptors (schools, hospitals, etc.) and at least 500m from urban settlements, unless otherwise required by the statutory requirements.”

Sub-Clause 111.8.2 Air Quality

Add the following text after the end of 1st Para

Construction camps shall have facilities for LPG fuel. The use of firewood shall not be permitted.

Add the following text after the end of last Para

The Contractor shall monitor air-quality once weekly in all operational areas under the project and take the necessary steps to comply with the specified requirements.



Air quality parameters will include SPM, RPM, SO₂, NO_x, HC and CO. operational areas include work sites, haulage roads, hot mix plants, quarries, crushing plants, stockpiles, borrow sites and spoil disposal sites.

Sub-Clause 111.8.3 Water Sources and Water Quality

Add the following text after the end of 1st Para

Bore wells installed and used for the project shall be left in good operating condition for the use local communities. The Contractor shall prevent any interference with the supply to or abstraction from, and prevent any pollution of water resources (including underground percolating water) as a result of the execution of the Works.

Add the following text after the end of last Para

Areas where water is regularly or repetitively used for dust suppression purposes shall be laid to fall to specially constructed settlement tanks to permit sedimentation of particulate matter. After settlement, the water may be re-used for dust suppression and rinsing. The Contractor shall protect all watercourses, waterways, ditches, canals, drains, lakes and the likes from pollution as a result of the execution of the Works. All water and other liquid waste products arising on the Site shall be collected and disposed of at a location on or off the Site and in a manner that shall not cause either nuisance or pollution.

The Contractor shall at all times ensure that all existing stream courses and drains within, and adjacent to, the Site are kept safe and free from any debris and any materials arising from the Works. The Contractor shall not discharge or deposit any matter arising from the execution of the Works into any water except with the permission of the Engineer and the regulatory authority concerned.

Work force camps shall have septic tank and soak away pits. Operational areas like POL storage areas/hot mix plant areas shall comply with local/state environmental regulations and safety procedures. Storage and handling areas shall be impervious and surrounded by an impervious lined drain to catch any accidental spills. Storm water shall be stored in lined holding tanks with oil, grease-tapping facility prior to disposal in to nearby watercourses. The trappings and sludge of holding tanks shall be disposed of in accordance with the procedures approved by the local regulatory authority.

Sub-Clause 111.10 Control and Disposal of Wastes

Add the following text after the end of last Para

Spilling of oil and bituminous products during construction and transport shall be avoided to reduce the chances of contamination of surface as well as ground water.

Degraded materials shall be disposed of in a manner as approved by the Engineer and wastewater shall be disposed into septic tanks and soak pits etc. The Contractor shall make arrangements to cleanup spoil as soon as the work finishes in a stretch. If such sites are located outside the ROW, restoration of the site to a level acceptable

to the land owner(s) will be carried out within a time period agreed between landowner(s) and the Contractor. Separators shall be used to separate POL materials from wastewater prior to discharging to the watercourses or as approved by the Engineer in conformance with directives and guidelines.

Disposal of solid waste materials shall be outlined in a plan for which environmental clearances shall be obtained from State environmental regulatory authorities. Potential locations for solid waste disposal are the natural depressions and borrow areas. The areas used for dumping of uncontaminated debris shall be covered with 300mm soil and shall be planted. Contaminated debris shall be dumped in depressions whose bed must be impervious e.g., stone quarry sites or depressions made impervious with 450mm thick impervious floor apron as per MORT&H Technical Specifications. Each successive 1.0m layers shall be covered with 500mm thick soil layer, and the area will be covered with 300mm thick layer and planted.

After Clause 111.13 Add the following new Clauses 111.14 to 111.17

Sub-Clause 111.14 Haulage Roads

Existing roads used for hauling shall be strengthened and/ or widened by the Contractor in accordance with the requirements for normal and construction traffic. Where such roads do not exist, the Contractor shall construct project specific single lane paved roads in settlement areas and gravel roads in open areas conforming to the Ministry of Road Transport and Highways (MORTH) specifications.

The alignment of the haulage roads shall be fixed to avoid agricultural land to the extent possible. In unavoidable circumstances, suitable compensation shall be paid to the people whose land will be temporarily acquired for the duration of the operations. The compensation shall cover for loss of income for the duration of temporary acquisition and land restoration. Prior to the construction of the haul roads, topsoil shall be stripped and stockpiled for re-use. Material dumping sites shall be access controlled to prevent the unauthorized entry of the people, grazing cattle and stray animals. Haulage roads shall be reinstated upon completion of hauling for the use of local communities.”

Sub-Clause 111.15 Equipment and Vehicles used for the Works

Equipments and vehicles deployed for the construction activities shall not be older than 5 years. Equipments used for road and bridge works shall be based on new technology and shall generate noise and pollutants not exceeding the limits specified by the relevant State Authorities. Vehicles and machineries used for road and bridge works are to be regularly maintained to conform to the National Air Quality Standards.

Sub-Clause 111.16 Noise Control

The Contractor shall consider noise as an environmental constrain in the planning and execution of the Works.

The Contractor shall take all necessary measures so that the operation of all mechanical equipment and construction processes on and off the site shall not cause any unnecessary or excessive noise, taking in to account applicable environmental

requirements. The Contractor shall use all necessary measures and shall maintain all plant and silencing equipment in good conditions so as to minimize the noise emission during construction works.

Any member of the work force likely to be exposed to beyond their threshold noise levels shall be provided with protective equipment, such as earplugs, and shall be rotated every four hours.

Construction operations shall be limited to daytime hours only, particularly in the settlement areas.

Sub-Clause 111.17 Vibration Control

The Contractor shall take measures during construction activities to control the movement of the work force and construction machinery/equipment, and to avoid/minimize activities, which produce vibrations.

CLAUSE 112 ARRANGEMENT FOR TRAFFIC DURING CONSTRUCTION

Sub-Clause 112.2 Passage of Traffic along a part of the Existing Carriageway under Improvement

This clause shall read as under:

For widening and strengthening of the existing carriageway where part width of the existing carriageway is proposed to be used for passage of traffic, paved shoulder in a width of at least 1.5m shall be provided on one side of the existing road with the following minimum requirements to be provided by the contractor:

- i) At least one 5.5m lane to remain open to traffic at all times
- ii) The surface used by the through traffic shall at all times be a firm all weather compacted surface free of pot holes and other defects
- iii) The maximum continuous length over which construction under traffic may take place shall be limited to 750m. However, for longer stretches, passing places shall be provided at every 0.75 km interval with at least 50m length.
- iv) The treatment to paved shoulders shall consist of providing 200 mm thick granular base course grading-I Table 400-1 as per Clause 401 covered by 225 mm thick wet mix macadam layer as per Clause 406 and treated with mix seal surfacing (MSS) type B as per Clause 512.
- v) Construction activity shall be restricted to only one side of the existing road.

Sub-Clause 112.3 Passage of Traffic along a Temporary Diversion

Add the following at the end of this Clause.

Where the new highway crosses or joins with an existing state highway, or an established road or cart track, the highway, road or cart track shall be kept open at

all times. In case the Engineer specifically orders to construct and maintain diversion as described below, the same will be paid for.

| Sr. No. | Type of Road | Carriageway Width | Unpaved Shoulders Width on each side (m) | Pavement Elements (Compacted) |
|---------|------------------------------------|-------------------|--|---|
| 1. | National Highways & State Highways | 7.0 m | 2.5 | <ul style="list-style-type: none"> • Earthwork • 200 mm granular sub base (Grading-I of Table 400-1) • 225 mm W.B.M. • Prime coat & Tack Coat • Mix seal surfacing Type B. |

Drainage should be provided as directed by the Engineer.

The alignment and longitudinal section of diversion including junctions and temporary cross drainage provision shall be as approved by the Engineer.

Sub-Clause 112.4 Traffic Safety and Control

Add the following Para in the end of Clause 112.4

The Contractor shall be fully responsible for the adequate safety of all site operations and methods of construction.

Persistent breaches of the safety provisions by the Contractor and his employees shall constitute a sufficient cause for action.

The Contractor shall also observe the following additional safety provisions. Before taking up, an agreed phased programmed for providing barricades of the approved design as per drawings and other safety measures shall be drawn in consultation with the Engineer.

- The barricading shall be erected on the side of the carriageway portion/ portion of the carriageway where any construction activity is taken up on or alongside of the existing carriageway.
- Flagmen in adequate numbers shall be provided to marshal the traffic on diversion wherever diversion of traffic is resorted to.
- Proper traffic signage in required numbers shall be provided for the information of road users.
- A safety officer shall be nominated to prepare safety programmed and oversee the safety arrangements at site.



Sub-Clause 112.6 Measurements for payment and rate

Replace this clause by following:

All arrangement for traffic during construction except temporary safety barricade as mentioned hereafter, dismantling and clearing debris, where necessary and providing traffic safety and control devices where necessary shall be considered incidental to the works and shall be contractor's responsibility.

Payment for construction of temporary diversion including temporary cross drainage structures, if required, construction of treated shoulder for traffic during construction shall be measured and paid separately as per relevant item in the BOQ. The temporary diversion shall be dismantled and credit for dismantled material shall be taken as per BOQ.

During construction activity for widening of road on hill side, the contractors shall provide rock fall fencing and deepen and widen the existing hill side drain to arrest the falling materials from coming to road surface. The fencing shall be of type as shown in the drawing or as decided by the engineer for safety of road users and workers. After the completion of the work the temporary fencing shall be shifted or removed according to necessity. All works towards providing fencing shifting of fencing clearing accumulated debris arrested by fencing regularly deepening and widening of existing drain etc. shall be considered incidental to the work.

Temporary safety barricade shall be measured in linear meter. All works in excess of quantitative provisions made in BOQ towards providing temporary safety barricade shall be considered as incidental to work and no extra payment shall be admissible for the excess quantity. The contract unit rate for the temporary safety barricade shall be payment in full for the cost all labour, materials, installation, maintenance or replacement, shifting of temporary units from one location to other and refilling the temporary holes made in the ground. Removing debris and all other incidentals to complete the work in all respect, The contractor shall take back these temporary barricades in full quantities after the completion of the project or earlier as per direction of the Engineer by paying at the rate of 50 % of his quoted rate or Rs. 1000 per meter whichever is more as salvage value to the Employer. Recovery for the salvage value shall be made in the third last interim payment certificate. These temporary units shall not be used in any permanent work in the project.

CLAUSE 114 SCOPE OF RATES FOR DIFFERENT ITEMS OF WORK

Sub-Clause 114.2 *Item (ii) of Clause 114.2 shall read as follows:*

A detailed resource based construction programme including resources planning using computerized critical path network method/PERT in a form, which facilitates control of the progress of the works and consequences of any changes in terms of time. The programme shall also include detailed network, activities for the submission and approval of materials, procurement of critical materials and equipment, fabrication of special products/ equipment and their installation and testing and for all activities of the Contractor that are likely to affect the progress of work etc. including updating all such activities on the basis of decisions taken at the periodic site review meetings or as directed by the Engineer. The Contractor shall submit data via electronic media to the Engineer in a form readily compatible with

Engineer's planning system.

Add the following as item (xix) to sub-clause 114.2:

The Contractor shall prepare detailed construction drawings for each culvert on the basis of the drawings given in Bid Documents and get them approved by the Engineer. The drawings shall be submitted to the Engineer at least 8 weeks before commencement of construction of culverts.

Add the following as item (xx) to sub-clause 114.2

Monthly progress report will be submitted in a format acceptable to the Engineer. The report shall state the progress which has been achieved compared with the planned progress, illustrate delays in proportion to the progress planned, analyses the consequences and state planned corrective measures. Intermediate progress reports may also be required.

The first issue of the detailed construction programme including the detailed description of the system and the procedures shall be submitted to the Engineer for acceptance not later than 28 days after the date of receipt of the letter of acceptance.

The contractor shall submit to the Engineer for approval & consent, the updated & revised programme at every three months interval or as such as directed by the Engineer. The updated & revised programme shall be submitted showing the actual progress achieved (physical & financial) and the effects of the progress achieved on the timing of the remaining work including any change to the sequence of the activities.

Sub-Clause 114.4 Add the following as Clause 114.4

If any 'work' executed by the Contractor does not meet the specifications, it shall be deemed as rejected. The Engineer, in his sole discretion, may consider a proposal by the Contractor to retain, the element or part of the 'work'. The Contractor's proposal shall be supported by calculations, drawings and other data to prove the soundness of the proposal and shall clearly describe the additional measures required to ensure the intended performance of the 'work'.

Such corrective measure shall be carried out at the contractor's cost and risk.

CLAUSE 120 FIELD LABORATORY

Sub-Clause 120.1 Scope

Add the following at the end of the clause.

This facility will be provided and maintained by the Contractor, as incidental to work and no separate payment shall be made for this item.

Sub-Clause 120.2 Description

Replace “electric supply etc.” to the second sentence of first paragraph by “including uninterrupted power supply etc.”

Add the following at the end of this Clause:

“There shall also be provided a concrete paved area, for storing samples adjacent to the laboratory, of about 300 sqm and another 200 sqm shall be suitably roofed with open sides giving protection against sun and rain.

Within 14 (fourteen) days of the commencement date, the Contractor shall prepare and submit a layout plan and details of the laboratory building and make/supplier of the equipment to the Engineer for his approval.

The field laboratory to be provided under the Contract shall be handed over to the Engineer in finished and fully equipped condition not later than 2 months after the receipt of Notice to Commence Work, and the field laboratory with all equipment/instrument shall be to the entire satisfaction of the Engineer. During the 2 months period starting from the Notice to Commence work, the laboratory tests shall be performed in another laboratory proposed by the Contractor and approved by the Engineer.

Sub-Clause 120.3 This clause stands deleted.

Sub-Clause 120.4 This clause stands deleted.

Table 100-2 Laboratory Equipment

| S. No. | Sub No. | Item, Specifications | Nos. required |
|-------------------|---------|--|---------------|
| A: General | | | |
| i) | | Balance | |
| | (a) | 5 kg to 20 kg capacity semi -self-indicating Electronic Type –Accuracy 1 gm. | 1 |
| | (b) | 500 gm. capacity semi self indicating Electronic Type – Accuracy 0.01 gm. | 1 |
| | (c) | Chemical balance 100gm capacity - Accuracy 0.0001gm | 1 |
| | (d) | Pan balance 5 kg capacity - Accuracy 0.5 gm. | 1 |
| | | | |
| | (e) | Platform Scale – 300 kg capacity | 1 |
| ii) | | Ovens – Electrically operated, thermostatically controlled | |
| | (a) | From 0°C to 220°C – Sensitivity | 1 |

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| S. No. | Sub No. | Item, Specifications | Nos. required |
|--------|---------|--|---------------|
| iii) | | 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 | 1 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 |
| iv) | | Sieve shaker capable of taking 200 mm and 450 mm dia. Sieves electrically operated with time switch assembly (As per BIS) | 1 |
| v) | | 200 tones compression testing machine | 1 |
| vi) | | Stop watches 1/5 sec. Accuracy | 2 |
| vii) | | Glassware comprising of Beakers, Pipettes, dishes, measuring cylinders (100 to 1000 cc capacity) glass rods and funnels, glass thermometers range 0oC to 100oC and metallic thermometers range 300oC | 2 Nos. each |
| viii) | | Hot plates 200 mm dia (1500 watt.) | 6 |
| ix) | | Enamel trays | |
| | (a) | 600 mm x 450 mm x 50 mm | 2 |
| | (b) | 450 mm x 300 mm x 40 mm | 2 |
| | (c) | 300 mm x 250 mm x 40 mm | 2 |
| | (d) | Circular plates of 250 mm dia. | 2 |
| x) | | Water Testing Kit | 1 |

Sub-Clause 121.3.2 for Soils and Aggregates

| B: For Soils and Aggregates | | | |
|------------------------------------|--|--|-------|
| i) | | Water still, 3 liter/hr. with fittings and accessories | - |
| ii) | | Liquid limit device with Casagrande and ASTM grooving tools as per IS: 2720 | 1 |
| iii) | | Sampling pipettes fitted with pressure and suction inlets, 10 ml Capacity | 1 set |
| iv) | | Compaction apparatus (Proctor) as per IS: 2720 (Part 8) complete with collar, base plate and hammer | 1 set |
| v) | | Modified AASHTO compaction apparatus as per IS. 2720 (Part 7) 1980 or Heavy Compaction Apparatus as per IS complete with collar, base plate and hammer | 1 set |

| B: For Soils and Aggregates | | | |
|------------------------------------|-----|--|--------|
| vi) | | Sand pouring cylinder with conical funnel and tap and complete as per IS 2720 (Part 28) 1980 including modified equipment | 2 |
| vii) | | 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. | 4 |
| viii) | | Lab CBR testing equipment for conducting CBR testing, load frame with 5 Ton 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. | 6 |
| | (b) | Tripod stands for holding dial gauge holder | 4 |
| | (c) | CBR plunger with settlement dial gauge holder | 1 |
| | (d) | Surcharge weight 147-mm dia 2.5 kg weight with central hole | 6 |
| | (e) | Spacer disc 148-mm dia, 47.7-mm ht. With handle | 2 |
| | (f) | Perforated plate (Brass) | 2 |
| | (g) | Soaking tank for accommodating 24 CBR moulds | 2 |
| | (h) | Proving rings of 1000 kg, 2500 kg and 5000 kg capacity | 1 each |
| | (i) | Dial gauges, 25 mm travel- 0.01 mm/division | 2 |
| ix) | | Standard Penetration test equipment | 1 |
| x) | | Nuclear Moisture Density Meter or equivalent | 1 |
| xi) | | Speedy moisture meter complete with chemicals | 1 |
| xii) | | Unconfined compression test apparatus | 1 set |
| xiii) | | Aggregate Impact Test Apparatus as per IS 2386 (Part 4) 1963 | 1 |
| xiv) | | Los Angeles abrasion Test Apparatus as per IS 2386 (Part 4) 1963 | 1 |
| xv) | | Riffle Box of Slot size of 50mm as per ASTM C-136 | 1 |
| xvi) | | Dynamic Cone Penetrometer | 1 |
| xvii) | | Hydrometer with high speed stirrer and jars | 2 sets |
| xviii) | | Post-hole augur (to BS-812) | 3 |



Sub-Clause 121.3.3 For Bitumen and Bitumen Mixes

| C: For Bitumen and Bituminous Mixes | | | |
|--|--|--|-------------|
| i) | | Constant temperature bath for accommodating bitumen test specimen, electrically operated and thermostatically controlled, 50 liter capacity temp. range ambient 80° C | 1 |
| ii) | | Penetrometer automatic type, adjustable weight arrangement and needles as per IS. 1203 – 1978 | 1 |
| iii) | | Solvent extraction or centrifuge type apparatus complete (AASHTO, T-164) with extraction thimbles with stocks of solvent and filter paper | 1 |
| iv) | | Laboratory mixer including required accessories about .02 cum capacity electrically operated fitted with heating jacket | 1 |
| v) | | Marshall compaction apparatus automatically operated as per ASTM 1559-62 T and complete with electrically operated loading unit, compaction pedestal heating head assembly, dial micrometer and bracket for flow measurement, load transfer bar, specimen mould 100 mm dia. (4 in) with base plate, collars, specimen extractor, compaction hammer 4.53 kg (10 lb.) x457 mm (18 in) fall | 1 set |
| vi) | | Distant Reading Digital Thermometer for Measuring Temperatures in Asphaltic Mixes | As required |
| vii) | | Riffle Box | 1 |
| viii) | | Automatic Asphalt Content Gauge [Nuclear or equivalent] | 1 |
| ix) | | Thin film Oven test apparatus to the requirement of AASHTO T 179, including accessories | 1 |
| x) | | Ring Ball Apparatus as per IS 1205- 1978 | 1 |
| xi) | | Asphalt Institute Vacuum Viscometer as per IS 1206(part II) – 1978 | 1 |
| xii) | | BS U- Tube Modified Reverse Floro Viscometer IS 1206(Part III) – 1978 | 1 |
| xiii) | | Apparatus for Determination of Ductility Test as per IS 1208 – 1978 | 1 |
| xiv) | | Pen Sky – Martars closed Tester for testing flash and fire point as per IS 1209 – 1978. | 1 |
| xv) | | Apparatus for Float Test – IS – 1210 – 1978 | 1 |
| xvi) | | Apparatus for Determination of water content (Dean and Stark Method) IS – 1211 – 1978 | 1 |

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| C: For Bitumen and Bituminous Mixes | | | |
|--|--|--|---|
| xvii) | | Apparatus for Determination of Loss on Heating IS – 1212-1978. | 1 |
| xviii) | | Apparatus of Determination of specified Gravity IS-1202-1978 | 1 |
| xix) | | Core cutting machine with 100mm dia. Diamond cutting Edge | 1 |
| xx) | | Apparatus for Elastic Recovery test for Modified Bitumen | 1 |
| xxi) | | Apparatus for Storage Stability test for Modified Bitumen | 1 |
| xxii) | | Apparatus for Separation test for modified bitumen | 1 |

Sub-Clause 121.3.4 for Cement, Cement Concrete and Materials

| D: For Cement, Cement Concrete and Materials | | | |
|---|-----|---|-------------|
| i) | | Water still | 1 |
| ii) | | Vicat needle apparatus for setting time with plungers, as per IS. 269-1967 | 1 |
| iii) | | Moulds | |
| | (a) | 150 mm x 300 mm ht cylinder with capping component | As required |
| | (b) | 150mmx150 mm x150mm cubical for compressive strength | As required |
| | (c) | 150mmx100 mm x600mm beam for flexural strength | As required |
| iv) | | Concrete permeability apparatus | 1 |
| v) | | High frequency mortar cube vibrator for cement testing | 1 |
| vi) | | Concrete mixer power driven, 1 cu ft capacity | 1 |
| vii) | | Variable frequency and amplitude vibrating table size 1 meter x 1 meter, as per the relevant British Standard | 1 |
| viii) | | Flakiness & Elongation test apparatus | 2each |
| ix) | | Aggregate impact test apparatus as per IS 2386 (Part 4) 1963 | 2 |
| x) | | Los Angeles abrasion apparatus as per IS. 2386 (Part 4) 1963 | 1 |
| xi) | | Flow table as per IS 712-1973 | 1 |
| xii) | (a) | Equipment for slump test | 2 |



| D: For Cement, Cement Concrete and Materials | | | |
|---|-----|---|----------|
| | (b) | Compaction factor test equipment | 1 |
| xiii) | | Equipment for determination of specific gravity for fine and coarse aggregate as per IS 2386 (Part 3) 1963 | 2 |
| xiv) | | Core cutting machine with 150 mm dia. Diamond cutting edge | 1 |
| xv) | | Needle vibrator | 1 |
| xvi) | | Vibrating hammer as per BS specification | 1 |
| xvii) | | Air entrainment meter ASTM C - 231 | 1 |
| xviii) | | 0.5 Cft, 1 Cft cylinder for checking bulk density of aggregate with tamping rod | 1 |
| ix) | | Soundness testing apparatus for cement | 1 |
| xx) | | Compression testing machine with the provision of flexural attachment and accessories for testing flexural beam | 1 |
| xxi) | | Chemicals solutions and consumable | As reqd. |
| xxii) | | Chloride Testing kit for chemical analysis of chloride content. | 1 |
| xxiii) | | ION Exchange kit for rapid determination of sulphate content. | 1 |
| xxiv) | | Electronic PH meter | 1 |

Sub-Clause 121.3.5 For Control of Profile and Surface Evenness

| E: For Control of Profile and Surface Evenness | | | |
|---|-----|--|---------|
| i) | | Total Station with all accessories | 1 No. |
| ii) | | Precision Automatic Level | 1 set. |
| iii) | | Distomat or equivalent | 1 set. |
| iv) | | Theodolite – Electronically operated with computerised output attachment | 1 set. |
| v) | | Precision Staff of 1mm least count | 2 Sets. |
| vi) | | 3 metre straight edge and measuring wedge | 1 set. |
| vii) | | Camber templates 2 lane | |
| | (a) | Crown type cross-section | 1 set. |

| E: For Control of Profile and Surface Evenness | | | |
|---|-----|-------------------------------|---------|
| | (b) | Straight run cross-section | 2 sets. |
| viii) | | Steel tape | |
| | (a) | 5 m long | 2 Nos. |
| | (b) | 10 m long | 2 Nos. |
| | (c) | 20 m long | 2 Nos. |
| | (d) | 30 m long | 2 Nos. |
| | (e) | 50 m long | 2 Nos. |
| ix) | | Roughometer (Bump Integrator) | 1 Set. |

Note: The laboratory set-up must be complete including a set of reference standards, adequately staffed and operational to the satisfaction of the 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 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.

Contractor shall arrange to maintain the laboratory in satisfactory manner and will carry stocks of spare equipment and laboratory consumables until the issue of Taking over Certificate.

The contractor shall provide any other equipment required to check quality as per the requirement of specification in addition to the above.

Sub-Clause 120.5 Rate

"This Clause shall be read as under:"

The construction, supply, installation, maintenance, and operation including all consumables like chemicals & reagents etc., and all other expenses involved in connection thereto for the field laboratory shall be incidental to the work, and shall not be paid for separately.

SECTION 200 SITE CLEARANCE

CLAUSE 201 CLEARING AND GRUBBING

Sub-Clause 201.1 Scope

Replace with following Para:

This work shall consist of cutting, excavating, removing, and disposing of all materials such as trees of girth up to 300 mm, bushes, shrubs, stumps, roots, grass weeds, rubbish etc. and top soil up to 150 mm, which in the opinion of Engineer is unsuitable for incorporation in the work including draining out stagnant water if any from the area of road land, drain, cross drainage structure and other area as specified in the drawing or instructed by Engineer. It shall include necessary excavation by harrow discs or any other suitable equipment, back filling of the pits by suitable soil, resulting from uprooting of trees & stumps and making the surface in proper grade by suitable equipment and compacted by power roller to required compaction as per Clause 305.3.4. The work also includes handling, salvaging and disposal of cleared material. Clearing and grubbing shall be performed less than one month in advance of earthwork operation and in accordance with requirement of these specifications.

Sub-Clause 201.5 Measurements for Payment

Delete the 2nd sentences in first paragraph and replace as under:

Cutting of trees up to 300 mm in girth measured at 1 meter above ground including removal of stumps and roots and trimming of branches of trees extending above the roadway shall be considered incidental to the clearing and grubbing operations and no separate payment shall be made for the same.

Removal of stumps & roots of trees of girth above 300mm trees cut by other agencies and back filling to required compaction as specified in this clause shall be measured in terms of number separately on the basis of girth size of stumps of trees as given in Bill of Quantities and will be payable. For the purpose of stump removal, girth size shall be measured 150mm above ground.

CLAUSE 202 DISMANTLING CULVERTS, BRIDGES AND OTHER STRUCTURES/ PAVEMENTS

Sub-Clause 202.5 Disposal of Materials

The first paragraph of the sub clause shall read as below

All materials obtained of dismantling/milling shall be the property of the Employer and, the Contractor shall be free to use this material in work or he may sell/dispose of the material to as desired/deemed fit by him, for which he shall quote a rate for rebate against the respective items of BOQ.

Contractor may use dismantled / milled road crushed material on as is where is basis.

by suitably modifying the material, or by crushing the material, or by breaking the material, and screening the same, after effecting due rebate in the BOQ, provided it meets the specifications and is approved by the Engineer.

Sub-Clause 202.6 Measurements for Payment

This Clause shall read as:

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

- | | | |
|------|--|-----------------|
| i) | Dismantling brick / stone masonry / plain concrete / reinforced concrete including reinforcement. |cum |
| ii) | Dismantling pavement structures such as Sub base / Base Course, Bituminous wearing course, Concrete wearing course |cum |
| iii) | Dismantling pipes, guard rails, road kerbs, gutters and fencing | ..running metre |
| iv) | Dismantling Guard Stones/KM stones/Sign post/Hectometre Stones |Nos |
| v) | Dismantling RCC railing | ..running metre |
| vi) | Dismantling of railing kerb | ..running metre |
| vii) | Dismantling of Stone pitching/ boulder apron/ brick soling/ stone soling |cum |

Sub-Clause 202.7 Rates

Add at the end of this sub clause:

The contract unit rates for various items of rebate shall be on the full quantities obtained from dismantling.

SECTION 300 EARTHWORK, EROSION CONTROL AND DRAINAGE

CLAUSE 301 EXCAVATION FOR ROADWAY AND DRAINS

Sub-Clause 301.1 Scope

Add the following as second paragraph under this clause:

“The work shall also include excavation for channel training at culverts/bridges, excavation of existing shoulders and medians for purposes of widening the pavement and excavation of existing embankment for reconstruction to specification.”

Sub-Clause 301.2.1 Classification

The Para (a) under this clause shall read as under:

“(a) Soil

This shall comprise top soil, turf, sand, silt, loam, clay, mud, black soil, soft shale or loose moorum, a mixture of these and similar material which yields to the ordinary application of pick, spade and stroke/or shovel, rake or other ordinary digging implement, including excavation of unsuitable soil (as described in Clause 305.2). Removal of gravel or any other nodular material having dimension in any one direction not exceeding 75 mm occurring in such strata shall be deemed to be covered under this category. Conglomerates and boulders not requiring blasting having maximum dimension in any direction up to 300 mm and excavation of unsuitable soils (as described in clause 305.2) shall also be covered under this category”.

Delete “and Conglomerates” from first line of Para b (i)

Delete Para b (iv)

Sub-Clause 301.3.3 Excavation – General

The following paragraph is added to the sub-clause 301.3.3

“Temporary support to the sides of the excavation, necessary to support the foundation of adjoining structures and to prevent any ground movement shall be provided by the Contractor. Where temporary supports are provided these shall be designed & removed such that no ground movement occurs on removal. The Contractor shall submit his proposal in this respect to the Engineer for approval prior to commencement of the excavation”.

Sub-Clause 301.3.7 Excavation of road shoulders/verge/medians for widening of pavement or providing treated shoulders

The title of this Clause shall read as under:

“Excavation of road shoulders/verge & medians for widening of pavement or for providing treated/paved shoulders and medians”.

The first sentence of this Clause shall be replaced as under:

“In works involving widening of existing pavements or providing paved shoulders, the existing shoulders/verge/median shall be removed to its full width and upto top of subgrade. The subgrade material within 0.5m from the lowest part of the pavement crust for widened portion or paved shoulders shall be loosened and re-compacted as per Clause 305 to a density not less than 97% of maximum dry density determined according to IS:2720 (Part 8). Any unsuitable material encountered in this portion of sub-grade shall be removed and replaced with suitable material and compacted in accordance with Clause 305”.

Clause 301.3.11 Use & Disposal of excavated materials

Delete this sub-clause and replace with:

“All the excavated materials shall be the property of the Employer. Suitable material obtained from the excavation of the roadway, shoulders, verges, drain, cross drainage works, etc. shall be used for:

- i) Filling for roadway embankments with all lifts and leads
- ii) Filling existing pits in the right of way as directed by the Engineer, including levelling and spreading with all lifts and leads
- iii) For landscaping of the road as directed by the Engineer, including levelling and spreading with all lifts and leads

Excavated rock shall be available to the contractor for using in the manner as he desires (other than the above items of work) after affording the rebate against the respective items of BOQ.

The contractor shall remove unsuitable and surplus material, which, in the opinion of the Engineer cannot be used in the works, from site and disposed of at the approved location in accordance with all statutory requirements as approved by the Engineer with all lifts and leads and no extra payment shall be made for the same. Area of dumping shall be arranged by the contractor.

Sub-Clause 301.6 Preparation of Cut Formation

Second Para shall be read as under:

“In rock formation, the rock shall be cut 100mm below the specified elevation of base WMM and the surface irregularities shall be corrected. The gap between rock cut and base of WMM shall be filled with 100mm thick granular sub-base as per grading-I of Table 400-1 of Clause 401. The unsuitable material shall be disposed of in accordance with Clause 301.3.11.”

Sub-Clause 301.8 Measurements for Payment

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

Delete the last Para from “works involved.....” and substitute:

“Works involved in excavation for roadway and drains shall be measured in unit indicated below:

- Excavation in all classes of soil including marshy soil ...cum
- Excavation in ordinary rock ...cum
- Excavation in hard rock with or without blasting ...cum
- Preparing Rocky Subgrade ...sqm
- Loosening and re-compacting of sub-grade ...cum

Sub-Clause 301.9 Rates

Sub-Clause 301.9.1

Add extra item after item (vii)

“(viii) The removal from site and disposal of all surplus or unsuitable materials obtained from excavation operations, which, in the opinion of the Engineer cannot be used in the Works, shall also be included in the Contract unit rates.”

Sub-Clause 301.9.2 This Clause shall read as under:

“The contract unit rate for loosening and re-compacting at subgrade level shall include full compensation for loosening to the specified depth, removing the loosened soil outside the roadway excavation rolling the surface below, breaking the clods, spreading the excavated soil in layers, watering where necessary and compacting to the requirements.”

Sub-Clause 301.9.3

Insert “including marshy soil” after words “unsuitable material” in the second line of this sub-clause.

Sub-Clause 301.9.6

Add new Sub Clause after 301.9.5 as under;

The Contract unit rate for rebate of materials obtained from excavation/cutting shall take into account for full compensation to be made by the Contractor who shall be responsible for arranging approval, payment of royalty and complying the requirement of mining department and other authorities of Central / State Government for reuse of materials obtained for rock cutting”.

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 as support or protection to the satisfaction of the Engineer.”

CLAUSE 305 EMBANKMENT CONSTRUCTION

Sub-Clause 305.2 Material and General Requirements

Sub-Clause Physical Requirements:

305.2.1 Add at the end of the 1st paragraph of Sub Clause 305.2.1.1 insert the following additional sentence;

“Use of flyash available from Thermal Power Station located within 100 kms of work may be required. The embankment with flyash shall be executed as per IRC: SP: 58:2001.

Sub-Clause

305.2.1.2 Add the following at the end of Sub-Clause:

“Soils having medium and high swelling potential shall be defined on the basis of Liquid Limit, Plastic Limit, Shrinkage Limit, Gradation, Free swelling Index, Field dry Density and Field Moisture Content and types of Clay minerals present in the soil and as directed by the Engineer. The location and the extent of these soils with medium to high swelling potential should be defined as directed by the Engineer.”

Sub-Clause

305.2.1.4 Delete second sentence “However, the Engineer Requirements of these Specifications”.

Sub-Clause

305.2.2.4 Compaction Requirements

Delete Table 300-2 and substitute the following:

Table 300-2

Compaction Requirements of Embankment and Subgrade

| 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 per Drawing, but not less than 6% | |

Replace the last part of Sub-Clause 305.2.2.4 (after Table 300-2) with the following:

The contractor shall at least 7 working days before commencement of construction of embankment and the subgrade; submit the following to the Engineer for approval:

- i) The values of maximum dry density and optimum moisture content obtained in



accordance with, IS: 2720 (Part 8) for each fill material proposed to be used in the construction of embankment and subgrade.

- ii) The graphs of Density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture content were determined.
- iii) The dry density-moisture content-CBR relationships, heavy compactive efforts conforming to the IS 2720 (part 8) for each of the fill material proposed to be used in the sub grade.

The above information shall form the basis for compaction only upon its approval by the Engineer."

Sub-Clause Add the following new sub-clause:

"Construction of embankment with flyash / pond ash available from coal or lignite thermal plants as waste materials.

Construction of Embankment using Fly ash / Pond ash shall be carried out complete as per IRC: SP: 58 – 2001".

Sub-Clause 305.3 Construction Operations

Sub-Clause 305.3.1 Setting Out

Add the words "with minimum 300 mm wider" after the words "sufficiently wider" in the fourth line of the clause.

Sub-Clause Compacting Ground Supporting Embankment/Subgrade

305.3.4 Para 1 of this clause shall be read as

"Where necessary the original ground shall be leveled, scarified, mixed with water and then compacted by rolling to facilitate placement of first layer of embankment so as to achieve minimum dry density as given in Table 300-2".

Add at the end of Para 2

"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 additional carriageway at a depth 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 90% then these are to be compacted after necessary watering so as to achieve not less than 90% of relative compaction".

"Where necessary to facilitate compaction of the subgrade to 97% relative compaction as stated above, a further depth below the subgrade of maximum

thickness of 0.2m shall be loosened, watered and compacted in accordance with Sub Clause 305.3.5 and 305.3.6 to not less than 95% of dry density determined in accordance with IS: 2720(Part-8)".

Sub-Clause

305.3.6 Compaction

The second Para of this Clause shall read as under:

"Vibratory roller of not less than 80-100 KN static weight with plain or pad foot drum or pneumatic tyre roller of 300 KN weight having tyre pressure of at least 7 kg/sqcm shall be used for compaction."

Insert the following sentence before the last sentence of Paragraph 4.

"The co-relation between sand replacement densities and nuclear gauge densities shall be based on trials with minimum 30 coherent density measurements".

Sub-Clause 305.9 Rates

Sub-Clause 305.9.1

Add "including removal of topsoil after word "materials" appearing in first line of item (v).

Insert "including removal and replacement of marshy soil" after words "unsuitable material" appearing in the second line of item (iii).

Sub-Clause Add new Sub-Clause after Sub Clause 305.9.10 as under;

305.9.11 The contract unit rate for construction of embankment with suitable material obtained from roadway excavation within Right of Way (ROW) shall be payment in full for carrying out the required operation including full compensation for items under Clause 305.9.1 excluding Sub Clause (i) & (x) after the suitable material has been received as provided in Clause 301."

Clause 306 SOIL EROSION AND SEDIMENTATION CONTROL

Sub-Clause 306.4 Measurements for Payment

Substitute Clause 306.4 as follows:

"All temporary 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.

Clause 309 Surface/Sub-Surface Drains

Sub-Clause 309.2 Surface Drains

Add the following paragraphs after end of the fourth Para of this clause.

“Drains in super-elevations shall be constructed as per drawings. Geotextile membrane if specified for these drains shall conform to Sub-Clause 702 of Section 700”.

“The roadside land between toe of road embankment & drain shall be levelled & sloped towards the drain as per drawing.”

Sub-Clause 309.3 Sub-Surface Drains

Sub-Clause 309.3.1 Scope

The first sentence of this clause should read as:

“Sub-surface drains shall be close jointed perforated pipes, surrounded by granular material laid in a trench to drain the pavement courses.”

Sub-Clause 309.3.2 Materials

Grading requirements for filter material shall conform to Class I of Table 300-3.

Sub-Clause 309.3.2.1 Pipe

The first and second sentences of this clause shall read as:

“Perforated pipes for the drains are of PVC. The size and grade of the pipe to be used is as specified in the drawing.”

Sub-Clause 309.3.4 Laying of Pipe and Backfilling

Delete Para 4 of this clause.

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 301 Cum |
| b) Semi-Circular median drain as shown in the drawing with PCC M20, NP2 pipe, levelling concrete M15 and filter media. | | running metre |
| c) Open cross-drain in paved median as per drawing with PCC grade M-20 & levelling concrete M-15. | | running metre |
| d) Paved open/Covered drain | | |

| | | |
|---|-------|------------------|
| (i) Levelling concrete M-15 | | cum |
| (ii) Course rubble masonry | | cum |
| (iii) Stone pitching grouting with CM 1:3 | | cum |
| (iv) PCC/ RCC grade M-20 | | cum |
| (v) Steel Reinforcement | | MT |
| (vi) Precast perforated slab | | Nos. |
| (vii) Catchpits/ inspection chambers | | Nos. |
| (viii) RCC pipes | | running metre |
| e) Sub-surface drains | | running metre |
| f) Iron grating | | Nos. |

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

General

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 401.8 (i) to (v) be read as "Clause 401.8 (i) to (iv)" in the sub clauses 402.8, 403.8, 404.7, 407.7 and 408.7

Clause 401 GRANULAR SUB BASE

Sub-Clause 401.2 Materials

Sub-Clause 401.2.1 Para 1 of this Clause shall be read as under:

"The material shall be free from organic or other deleterious constituents and conform to the Grading I given in Table 400-1 with the percentage passing 0.075mm size restricted to 5%. The portion of the total aggregate passing 4.75 mm sieve shall have a sand equivalent value of not less than 50 when tested in accordance with the requirement of IS: 2720 (Part – 37).

Delete the eighth sentence beginning with "where the sub-base is laid in two layers as upper sub-base and lower sub-base, the thickness of each layer shall not be less than 150mm".

Sub-Clause 401.2.2

Add at the end of this clause as under:




The Contractor shall, at least 21 working days before the commencement of the construction of the sub-base course, submit to the Engineer, the results for approval of the laboratory testing on the physical properties defined above. The construction of the sub-base course shall be taken up only upon the Engineer's approval of the material.

Sub-Clause Add new Sub-Clause after Sub Clause 401.3.3 Strength of Sub-base as under:

It shall be ensured prior to actual execution that the material to be used in the sub-base has a minimum CBR value of 30% and other physical requirements when compacted and finished.

When directed by the Engineer, this shall be verified either by performing CBR tests in the laboratory or by conducting DCP test. The CBR tests shall be conducted on specimen soaked for 4 days and compacted to 98% of the maximum dry density as per IS: 2720 (Part 8).

When decided by the Engineer – Dynamic Cone Penetration (DCP) tests shall be performed in-situ as per TRRL (UK) Road Note No. 31 and in situ CBR calculated by co-relation given by TRRL.

Clause 406 WET MIX MACADAM SUB BASE/BASE

Clause 406.2.1.1 Physical requirement

Delete the second sentence beginning with "If crushed gravel and ending with fractured faces" and add as under:

"If crushed boulders are used, not less than 90% by weight of crushed boulders retained on 4.75 mm sieve shall have at least two fractured faces.

The constituents of the aggregates shall be produced by integrated crushing and screening plant (Impact or Cone type of capacity 200T/hour) and, unless otherwise instructed by the 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."

Add the following at the end of the paragraph:

Soundness test shall be carried out in accordance with IS: 2386 (Part 5) 1963. The average loss of weight of coarse aggregate after "5 cycles shall not exceed 12% when tested with sodium sulphate and 18% when tested with magnesium sulphate as specified in IS: 383.

From Table 400 – 10 delete at the bottom of the table asterisk and modify as under:

"The aggregate should satisfy both the tests a) Los Angeles Abrasion Value
b) Aggregate Impact value"

Sub-Clause 406.3.4 Spreading of Mix

Substitute 1st sentence of Para 2 of clause 406.3.4.

“The mix shall be spread by a WMM paver”.

Sub-Clause 406.3.5 Compaction

Delete second sentence of Para 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 “or as shown in the drawings”

Sub-Clause 409.6 Substitute

“Cement concrete kerb/kerb with channel shall be measured in linear metre. Foundation of kerb, where separately provided, shall be measured in cubic metre.”

Clause 409.7 This Clause shall read as under:

The contract unit rates for cement concrete kerb / kerb with channel shall be payment in full compensation for furnishing all materials, labour, tools equipment for construction and other incidental cost necessary to complete the work. Foundation for kerb, wherever provided, shall be paid separately as per contract.

SECTION 500 BASE AND SURFACE COURSES (BITUMINOUS)

General

Sub Para (i) of clauses 501.8.8.2 stands deleted and remaining sub pares (ii) to (x) are renumbered as (i) to (ix).

The provision “clause 401.7 (i) to (v)” be read as “Clause 401.7 (i) to (iv) in the clauses 502.8 & “clause 401.8 (i) to (v)” be read as “Clause 401.8 (i) to (iv) in the clauses 503.8.

Sub-Clause 501.2 Materials

Sub-Clause 501.2.2 Delete “Crushed gravel or other hard material” from First line of Para 1 and replace with “crushed boulders”

Replace word “crushed gravel” in Para 2 with “crushed boulders”

Sub-Clause 501.6 Compaction

Para 2, Line 11; sentence starting with “the intermediate rolling” is replaced by “Intermediate rolling shall be done with a Pneumatic roller of 150-250kN weight having a tyre pressure of at least 0.7Mpa.

Add new Para,

“Rolling shall be continued till the density achieved, satisfied the requirement of Clause 903.4.2.”

Sub-Clause

501.8.8.2 Add the following at the end of Para (viii)

Payment of extra bitumen shall be made on the basis of the prevailing rate of

bitumen.

CLAUSE 502 PRIME COAT OVER GRANULAR BASE

Sub-Clause

Add the Sub-Clause 502.2.5 Choice of Primer after 502.2.4

This clause shall be read as under:

The primer shall be medium setting bitumen emulsion and shall be refinery produced. The particular grade to be used for the work shall be got approved by the Engineer."

CLAUSE 503 TACK COAT

Sub-Clause

503.2 Materials

This clause shall be read as under:

"Binder: The binder used for tack coat shall be medium setting bitumen emulsion and shall be refinery produced. The particular grade to be used for the work shall be got approved by the Engineer."

CLAUSE 505 DENSE GRADED BITUMINOUS MACADAM

Sub-Clause 505.2.1 Bitumen

This Clause shall be read as under:

The binder shall be viscosity grade VG-30 bitumen conforming to IS:73-2006.

Sub-Clause 505.2.2 Coarse Aggregates

Delete "Crushed Gravel or other hard material" from 1nd line of 1st para and replace with "crushed boulders".

Replace word "crushed gravel" in para 2 with "crushed boulders"

Add the following at the end of this clause:

"The constituents of the aggregates shall be produced by integrated crushing and screening plant (Impact or Cone type of capacity 200T/hour) and, unless otherwise instructed by the 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 505.2.3 Delete the words “or Naturally Occurring Mineral or a Combination of the two” appearing in the first sentence of the clause.

Sub-Clause 505.2.4 the first sentence of this clause shall read as “Filler shall consist of finely divided hydrated lime or cement as approved by the Engineer”

Sub-Clause 505.2.5 Aggregate Grading and Binder Content

From the Table 500 – 8, replace at bottom of the table against Asterisk (*) with the following:

“Aggregate should satisfy both the tests Los Angeles abrasion value and aggregate impact value”

In Table 500-10, the following may be substituted:

| Grading | 1 | 2 |
|-----------------|----------------|---------|
| Layer Thickness | >75mm to 100mm | 50-75mm |

Sub Clause 505.3 Mix Design

Sub-Clause 505.3.1 Requirement for the Mixture

Add the following requirements to the list of Table 500-11:

Water sensitivity (ASTM D1075): Retained stability (Ratio of Marshal Stability for 24 h Immersion and 30min Immersion in water at 60 degree centigrade temperature) = not less than 75 %

Filler- Bitumen ratio = 0.6 to 1.2 (Filler: passing 75 micron sieve)

Sub-Clause 505.3.3 Insert the following paragraph between the existing paragraphs 3 & 4:

“Mixed design shall be carried out in accordance with the modified Marshal method described in Asphalt Institute Manual MS-2.”

Sub-Clause 505.4.9 Rolling

Add at the end of Para 1

“The rolling shall be continued till the density achieved is at least 98% of that of laboratory Marshall Specimen compacted as detailed in Table 500-11.”

Add the following Sub-clause after Sub-clause 505.4.9

Clause 507 BITUMINOUS CONCRETE

Sub-Clause 507.1 Scope

Add the Following at the end of this clause:

“A site trial shall be performed in accordance with the direction of the Engineer”

Sub-Clause 507.2.1 Bitumen

This Clause shall be read as under:

The bitumen use for the work shall be VG-30 grade conforming to IS:73:-2006.

Sub-Clause 507.2.2 Coarse Aggregates

Add the following as second para:

“The constituents of the aggregates shall be produced by integrated crushing and screening plant (Impact or Cone type of capacity 200T/hour) and, unless otherwise instructed by the 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.”

From the Table 500 – 16, replace at bottom of the table against Asterisk (*) with the following:

“Aggregate should satisfy both the tests Los Angeles abrasion value and aggregate impact value”

Sub-Clause 507.2.4 Filler

This clause shall read as under:

“Filler shall consist of finely divided hydrated lime or cement as approved by the Engineer.”

Sub-Clause 507.3 Mixture Design

Sub-Clause 507.3.1 Requirement for the mixture

Add the following requirements to the list of Table 500-11:

Water sensitivity (ASTM D1075): Retained stability (Ratio of Marshal Stability for 24 h Immersion and 30min Immersion in water at 60 degree centigrade temperature) = not less than 75 %

Swell Test (Asphalt Institute, MS-2, No.2), maximum = 1.5%

Sub-Clause 507.4.9 Add the following additional sub-clause 507.4.9

The bitumen concrete layer shall be laid with sensor paver capable of paving in width 8 to 10 m in single operation.

Sub-Clause 507.9 Rate

Delete the existing Para and replace it with the following:

The contract unit rate shall be for all operations as specified in clause 505.9, except that the rate shall include the provision of modified bitumen at 5.40 percent by weight of total mixture. The variance in actual percentage of modified bitumen used will be assessed and payment adjusted up or down, accordingly. The modified

binder, the cost of modifier and its mixing with the bitumen for the preparation of modified bitumen shall not be paid separately and is inclusive of all costs

CLAUSE 516 MASTIC ASPHALT

Sub-Clause 516.2.2 Coarse Aggregate

Delete "Crushed gravel/Shingle or other stones" from the 1st sentence

SECTION 800 TRAFFIC SIGNS, MARKINGS & OTHER ROAD APPURTENANCES

CLAUSE 801 TRAFFIC SIGNS

Sub-Clause 801.2.5 Substrate

2nd sentence of this clause shall read as under:

"The aluminum sheet used for signs shall be 2mm thick."

Sub- Clause 801.3 Traffic Signs Having Retro-reflective Sheeting

Sub-Clause 801.3.1 General Requirements

The fifth sentence of this clause should read as under:

"The reflective sheeting shall be of High Intensity grade with encapsulated lens."

Sub-clause Add following in the clause

801.3.8.3 "All the facility information and place identification signs shall have blue (Indian standard colour No. 166: French Blue) background and white letters."

Sub-Clause Warranty and Durability

801.3.11 the first and second sentences of this clause shall read as under:

"The Contractor shall obtain from the manufacturer a seven-year warranty for satisfactory field performance including stipulated retro-reflectance of the retro-reflective sheeting of high intensity grade and submit the same to the Engineer. In addition, a seven year warranty for satisfactory in-field performance of the finished sign with retro-reflective sheeting of high intensity grade, inclusive of the screen printed or cut-out letters/legends and their bonding to the retro-reflective sheeting shall be obtained from the Contractor/Supplier and passed on to the Engineer."

Sub-clause 801.4.1 the last sentence of clause shall read as follows

Posts shall be embedded in concrete (M-15) for safeguard against theft. The cost of concrete shall be deemed to be included in the rate of signboard.

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."

CLAUSE 802 OVERHEAD SIGNS

Sub-Clause 802.4 Materials for Overhead Sign and Support Structures

Sub-Clause 802.4.2

The last line of this clause “they shall _____ IS specifications” shall read as

“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 Replace “1.5mm” with 2.0mm” in the fifth line.

Sub-Clause 802.8.1 this clause shall read as under:

“The Structural steel part of the overhead signs shall be measured in tones while the sign board shall be measured in square meters. The excavation for foundation, concrete and reinforcement in foundation shall be paid separately under the respective BOQ items. All other items like painting of structural steel and sign back etc. shall be considered incidental and no separate payment shall be made. The contract unit rate for overhead sign structures shall be payment in full compensation for finishing, all labour, materials, tools, Equipment, fabrication, installation and all other incidental works necessary to complete the work to the specifications”

CLAUSE 803 ROAD MARKINGS

Sub-Clause 803.2 Materials

This clause shall read as under:

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

The road markings shall be laid in one layer with appropriate road marking machine approved by the Engineer. Before the road-marking machine is used on the permanent works, the satisfactory working of the machine shall be demonstrated on a suitable site, which is not part of the permanent works. The rate of application shall be checked and adjusted as necessary before application on a large scale is commenced, and thereafter daily.”

Sub-Clause 803.3 Ordinary Road Marking Paint

This Clause shall be deleted.

Sub-Clause 803.5 Reflectorised Paint

This Clause shall be deleted.

803.6.6 Add the following para at the end of Sub-Clause 803.6.6

Line and curves, whether broken or unbroken, shall not consist of chords but shall follow the correct radius.

ii) Faulty Workmanship or Materials

If any materials not complying with the requirements is delivered at the Site or used in the Works, or if any sub-standard work is carried out, such material or work shall be removed, replaced or repaired as required by the Engineer, at the Contractor's own cost. Rejected traffic markings and paint that has been splashed or has dripped onto the surfacing, kerbs, structures or other such surfaces shall be removed by the Contractor at his own cost, in such a way that the markings of spilt paint will not show up again later."

CLAUSE 805 DISTANCE INDICATOR POSTS

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

"The hectometre/kilometre stones shall be made of concrete of grade as shown in the drawing."

Sub-Clause 804.3.1 New Clause 804.3 shall be added as follows:

Marker post shall be provided as shown in drawing. The posts shall be embedded in the ground as shown in drawing.

Sub-Clause 804.4 Measurement of Payment

The measurement will be in numbers of 200 meters, kilometers, 5th kilometer stone and marker posts fixed at site.

Sub-Clause 804.5 Rate

The words '/marker posts' shall be inserted after the words '5th kilometer stone' appearing in the clause.

CLAUSE 806 ROAD DELINATORS

Sub-Clause 806.2 This clause shall read as follows:

- a) Triangular Object Marker shall be 300mm side with four red reflector, made out of 2mm thick aluminum sheet, face to be fully covered by high intensity grade white retro reflective sheeting of encapsulated lens type as per clause 801. The background/ border/ symbols shall be made by screen-printing of desired colour as per sign details. The sign plate shall be fixed with 6mm dia. aluminium rivets on MS angle iron frame. The angle iron frame shall be made with angle of size 40mmx40mmx5mm. The sign shall be fixed with nut-bolts & welding on MS pipe 50mm dia (NB-MW) and 500mm high or as shown in the drawings.
- b) Rectangular hazard marker 600mm x 300mm made out of 2mm thick aluminum sheet, face to be fully covered by high intensity grade white retro reflective sheeting of encapsulated lens type. The background/ border/ symbols shall be

made by screen-printing of desired colour as per sign details. The sign plate shall be fixed with 6mm dia aluminium rivets on MS angle iron frame. The angle iron frame shall be made with angle of size 40mmx40mmx5mm. The sign shall be fixed to 80mm dia (NB-MW) MS pipe or as shown in the drawings.

- c) Roadway Indicators shall be 1000mm high made with 100 mm dia. NB medium weight MS pipe. One reflector of high intensity grade retro reflective sheeting with encapsulated lens shall be provided on top of the reflector. The white & red reflector shall be provided alternatively of 40mm width, so that total width of reflector shall be 120mm. A wire mesh cover of 150mm height shall be provided on top or as shown in the drawings.
- d) All components of signs & supports shall be thoroughly descaled, cleaned, primed and painted with two coats of epoxy paint. The sign backside shall be with grey colour and post shall be white colour/ alternate white & black bands. The post below ground shall be painted with three coats of red lead.

CLAUSE 807 BOUNDARY STONES

Sub-Clause 807.1 Scope

Add at the end of Para 1, "The boundary stones shall be of concrete as shown in drawing." The words 'RCD' should be engraved on each stones appropriately.

CLAUSE 811.2 CONCRETE CRASH BARRIER

Sub-Clause 811.2.1.2 The Clause will be read as below

"The concrete barriers shall be constructed with grade & concrete as indicated in the drawing and with high yield strength deformed reinforcement conforming to IRC-21"

Sub-Clause 809.6 Rate:

Add at the end of the clause:

"And paid as per respective BOQ items."

CLAUSE 811.3 METAL BEAM CRASH BARRIER

Sub-Clause 811.3.1 Materials

Sub-Clause 811.3.1.1 this clause shall be read as:

Metal beam is a "W" profiled corrugated beam in single or double row and single or double faced as specified in the drawing made out of cold roll forming from steel strip of 3 mm thick using steel of grade ST 42 grade conforming to IS:5986 with hot dip galvanised 550 gm per square meter.

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 metal crash barrier posts & spacer shall consist 'C' channel section made out of 5 mm thick sheet by cold roll forming process of steel conforming to IS: 2062-1992 Grade 'A' with hot dip galvanised 550 gm per square meter. All bolt, nuts and washers as specified in drawings shall conform to IS: 1367 & IS: 1364 unless otherwise specified and are hot dip galvanized 550 gm per square meter.



The Guard rail reflector shall be made of material and placed in position as shown in drawings. It shall be hot dip galvanized 550 gm per square meter.

Beams to be erected on a radius of 50 m or less shall be shop curved to the appropriate curvature of the installation.

Sub-Clause Add at the end of this Clause

811.3.1.4 The size of the concrete foundation block for embeddings the guard 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 guard posts shall be embedded in the concrete footing of size and the grade of concrete along with the depth of the embedment of post as indicated in the drawing.

Clause 811.3.3.5 Add "and end section" in first line after "posts".

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 the first sentence will be substituted as below:

"No separate measurement for payment shall be made for Terminals/Anchors of various types required for the work. The cost of these elements will be deemed to be included in the rate quoted by the contractor."

Sub-Clause 811.3.7.3 the words "or backfilling" shall be substituted as "and concreting"

Sub-Clause 811.3.8 Rate

Add "and drawings" at the end of last sentence of Clause.

SECTION 900 QUALITY CONTROL FOR ROAD WORKS

Clause 901 GENERAL

Sub-Clause 901.1 This clause shall read as under:

"All materials to be used, all methods adopted and all works performed shall be strictly in accordance with the requirements of these Specifications. The Contractor shall set up a field laboratory at locations approved by the Engineer and equip the same with adequate equipment and personnel in order to carry out all required tests and Quality Control work as per Specifications and/or as per Clause 121 and/or as directed by the Engineer. The list of laboratory equipment and the facilities to be provided shall be as per Clause 121 and shall be got approved from the Engineer in advance."

Sub-Clause 901.5 This Clause shall read as under:

"The Contractor shall provide necessary cooperation and assistance in obtaining the samples for tests and carrying out the field tests as required by the 'Engineer' from

time to time. This shall include provision of laboratory, equipment, transport, consumables, personnel, including labour, attendants, assistance in packing and dispatching and any other assistance considered necessary in connection with the tests."

Clause 903 QUALITY CONTROL TESTS DURING CONSTRUCTION

Sub-Clause 903.4 Tests on Bituminous Constructions

Sub-Clause 903.4.1 Add at the end of this Clause:

"The density test shall be carried out by 100 mm diameter core cutter machine on Dense Bituminous Macadam and Bituminous Concrete as per the frequency specified".

In Table 900-4, Serial No. 5 for Dense Graded Bituminous Macadam /Bituminous Concrete, modify the 'Frequency (Minimum)' values for Item No. (vi), (viii) and (xvi) as under:

| S. No. | Type of Construction | Test | Frequency (Minimum) |
|---------------|---|-----------------------------------|---|
| 5 | Dense Bituminous Macadam/ Bituminous Concrete | (vi) Sand Equivalent Test | Three tests on aggregates for each 400 t of mix subject to two tests per plant per day. |
| | Dense Bituminous Macadam/ Bituminous Concrete | (viii) Polished Stone Value (PSV) | Initially one set of three representative specimens for each source of supply. Subsequently when warranted by changes in the quality of aggregates. |
| | Dense Bituminous Macadam/ Bituminous Concrete | (xvi) Density of Compacted Layer | One tests per 250 m ² area subject to the condition that 10% of density tests shall be done on the edges. |

Note:

Add the following note at the end

- The laboratory and field tests shall be performed on materials and works at the frequency values indicated against each. The Supervision Personnel shall ensure that there are no deviations in this regard.
- The Contractor shall prepare a detailed manual for Quality Assurance including



the methodology for the respective tests, the data formats and the methodology for the analysis and interpretation of test results based on the reference Standards and Practices indicated in the Technical Specifications and obtain the approval of the Engineer.

Add the following Sub-Clause 903.4.4 & 903.4.5

Sub-Clause 903.4.4 Characteristics to be tested on completed Bituminous Layers

The characteristics to be tested on completed bituminous layers are:

Relative compaction

Layer thickness

For testing the above characteristics, the following sampling criteria shall apply:

a) Random Sampling

When testing any lot, or an isolated section, which is obviously defective or exhibits abnormal variation of the characteristics under consideration, all samples shall be taken in a random pattern.

b) Lot Size

The lot size shall normally be a section laid and compacted in one process and for which essentially the same materials had been used. Where production is on a continuous basis, a lot shall normally mean one-day production and shall not exceed two full days production. However, the Engineer for investigating compliance with the specifications may order a lot of any smaller size, if:

- The factors affecting the characteristics under investigation exhibit abnormal variation within the normal lot size
- The area is obviously defective or of poorer quality than that of the rest;
- The rate of production is very high.

Sub-Clause 903.4.5 Add new clause

"Bituminous mix shall be spread with paver fitted with electronic sensing device and string line arrangement (supported by steel pegs @ 5m apart) on either side of paving width for automatic levelling, surface evenness and profile control. Use of string line is compulsory to provide signal to the electronic sensing device fitted with a Paver Finisher".

Bituminous works shall be tested immediately after laying/finishing for:

- a) Thickness (compacted) measured by extracting cores and shall be dealt in accordance with Specifications Section 900.
- b) Density (compaction) test as performed on the extracted cores
- c) Workmanship test by measuring roughness of the finished layer by duly

calibrated Towed Fifth Wheel Bump Integrator

d) **Workmanship Test: Roughness measured longitudinally**

The finished bituminous layers (DBM and BC) shall be tested for workmanship (immediately before allowing traffic) by measuring roughness, longitudinally, separately for each lane with the Calibrated Towed Fifth Wheel Bump Integrator. Calibration of Bump Integrator device shall be carried out using the procedure recommended in the World Bank Technical Publication No. 46. The measured roughness shall **not** exceed a value of 2000 mm/km for finished DBM and BC layers.

Note: Contractor shall arrange the core extraction machine at his cost and shall take cores of the executed bituminous works jointly with Engineer without any extra cost.

Sub-Clause 903.5 Quality Control Tests for Road Constructions

Sub-Clause 903.5.2 Pavement Concrete

Sub-Clause 903.5.2.1 Sampling and testing of beam and cube specimens

Replace first para ("At leastfor compliance.") with:

"One each day's work, at least six pairs of beams for flexural strength and six pairs of cubes for compressive strength shall be cast of concrete delivered to the paving plant as long as the total daily production is less than 300m³. For daily productions over 300m³, two additional beams and two additional cubes shall be cast of each 100m³, (or part thereof). Each pair of beams and cubes shall be from different deliveries of concrete. All specimens shall be transported in an approved manner to prevent any damage to the specimen. From each pair of beams and cubes one specimen shall be tested at 7 days and one at 28 days. The groups of beams specimens from each day's production tested at 28 days shall be used for assessing the strength for compliance with the strength requirements. The groups of beam specimens from each day's production tested at 7 days shall be used for early indication of the 28 days strength as described in Clause 603.3.3.2. The flexural strength test results shall prevail over compressive strength tests results for compliance."

Sub-Clause 903.5.2.2 Replace 1st para with following:

"Where the 28 days strength requirements are not met; or where in the opinion of the Engineer the quality of the concrete or its compaction is suspect, the actual strength of the concrete in the slab shall be ascertained by carrying out tests on six cores cut from the concrete at such locations. The cores shall be 150 mm diameter, shall be saw cut in both ends to provide a specimen height of 300 mm \pm 5mm and shall be tested for compressive strength. The concrete will be acceptable if:

- The average compressive strength of the six cores when corrected to 28 days strength using the factors given in Table 900-5 or an age-strength relationship for the actual mix determined by the Contractor and approved by the Engineer

– is at least the average compressive strength of the cores tested from the trial length, refer Clause 602.10.5.5;

- None of the cores show considerable honeycombing”.

Delete fourth para (“In order..... test beams.”).

Delete fifth para (“The standard deviation.....the requirements.”)

Delete sixth para (“An individual.....is substandard.”)

Add at the end of seventh paragraph (“Beams shall..... and cubes required.”)

“The Engineer may permit a reduction in the number of beams and cubes required when previous test results have shown satisfactory strength and when he is satisfied with the variation in quality of the mix.”

Delete ninth para (“The flexural.....they were taken.”).

Delete eleventh para (“Should the concrete.....flexural strength.”)

Delete twelfth para (“The equivalent ----- obtained from Table 900-5.”)

Sub-Clause

903.5.2.2 In-situ density

Add as Para 5 of this clause:

“This Clause is not applicable for cement concrete kerb and kerb with channel”.

Sub-Clause

903.5.2.5 Summary of Control Tests.

In Table 900-6, item 5 (i) “Strength of concrete”, change test frequency to:

“On each day’s work, at least six pairs of beams and six pairs of cubes for total daily production less than 300 m³. Two additional beams and two additional cubes for each 100 m³ (or part thereof) in excess of 300m³.”

Sub-Clause

903.5.2.5 Summary of Control Tests in Table 900-6, item 5(ii) “(core strength on hardened concrete”, change test frequency to:

“As per Clause 903.5.2.1”.

Sub-Clause 903.5.2.6 Add the following new Clause:

Temperature Measurements

“The temperature development in the concrete slab during hardening shall be recorded for each day’s production. The temperature shall be measured in the middle (vertically) of the slab at a horizontal distance of at least 1000 mm from any free edge. The temperature shall be measured using a thermometer that shows maximum temperatures. From each day’s production three thermometers

shall be installed, at commencement, in the middle of production and at completion of placing concrete. Measurements shall be recorded for 3 days after placing of the concrete."

SECTION 1000 MATERIALS FOR STRUCTURES

CLAUSE 1007 COARSE AGGREGATES

Delete "crushed gravel, natural gravel or a suitable combination thereof or other approved inert material" in the third and fourth line of first para and replace with "or crushed boulders. For this purpose, boulder greater than average dimension of 300 mm shall only be used"

Add the following at the end of Para 2.

"Costs of all tests shall be borne by the Contractor."

Add the following at the end of the Clause:

"Integrated stone crusher with Primary and Secondary (Cone or Impact Type) crushers shall be employed for getting proper size and grading of coarse aggregates."

The alkali aggregate reactivity should be measured and reported for getting approval for the source aggregates at the beginning of the work using methods given in IS: 2386. The tests may be repeated if the source or the type of rock being exploited for winning aggregates, changes.

CLAUSE 1008 SAND/FINE AGGREGATES

Delete from the 2nd line the word "crushed gravel" and from the 3th line "gravel" in Para 2.

Add the following at the end of the clause:

"The alkali aggregate reactivity shall be measured and reported for getting approval for the source."

Clause 1010 WATER

In Para (C) the permissible limit for Chlorides (Cl) shall be read as "250 mg/lit for structures having length more than or equal to 30 m."

In case of structures of lengths 30m and below, the permissible limits of chlorides may be increased up to 500mg/ltr.

Clause 1012 CONCRETE ADMIXTURES

Sub-Clause 1012.1 General

Add the following at the end

Admixtures shall not impair the durability of concrete; they shall not combine with the ingredients to form harmful compounds or endanger the protection of

reinforcement against corrosion. Only chloride free admixtures shall be used.

2. Storing

- A. Shelf life
- B. Max. & Min. allowable temperature
- C. Other instructions (e.g. requirements of stirring)

3. Dosage

Maximum and minimum to be specified as a percentage of weight of cement.

Clause 1012.3.1 Information Required From the Manufacturer

Paragraph 1 shall read as follows:

For all admixtures being used the packing shall be marked with the name of the supplier/manufacturer, brand name (name of product) and main effect. A certificate for the admixture in question shall be submitted. The certificate shall include the following information:

Add the following at the end of the para h

- i. pH value and colour.
- j. If two or more admixtures have to be used in one mix, their compatibility.
- k. Latest date of test and name of test laboratory.

Add the following at the end of the clause:

After selecting a few acceptable brands and types of admixture based on the manufacturer's data/technical literature, independent acceptance tests should be carried out for the same using the approved combination of cement/sand/aggregates intended for use in the project. After establishing the basic acceptability using strength criteria (compression and tensile strengths) a number of trial mixes be designed using different proportions of admixtures/cement/water etc. to establish the data bank on the behavior of the admixture for the project site conditions. A spectroscopic signature of accepted product should be obtained and preserved for comparison for acceptance of the production lots.

Retrial should be conducted with change in source/type of cement.

Workmanship

The dosage should be finalized on the basis of field trial and special mechanical devices should be used for dispensing the admixture in the batching/mixing plant. No addition of admixture after dosage is permitted (including addition in transit mixers).

Manufacturer's experts should be available for consultation/trouble-shooting of problems associated with their product. The conditions of storage, shelf life etc., as

specified by the manufacturer should be strictly observed. The manufacturer's Quality Assurance Plan during process of production should be obtained and filed for reference/record.

Clause 1014 STORAGE OF MATERIALS

Sub-Clause 1014.3 Aggregates

The following shall be added to this Clause:

"Aggregates shall be stored or stockpiled in such a manner that segregation of fine and coarse sizes will be avoided and also 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."

CLAUSE 1015 TESTS AND STANDARDS OF ACCEPTANCE

Add the following as Para 3:

"Independent testing of pre-stressing steel shall be carried out by the Contractor for each consignment from each source at site in the laboratory approved by the Engineer before use. The tests shall be carried out for the properties as listed in clause 7.2.1 of BS- 5896:1980. These tests are in addition to the tests carried out by the Manufacturer."

CLAUSE 1104 MATERIALS

Sub-Clause 1104.2 The first sentence of this clause is amended as follows:

Concrete to be used in Cast-in-situ piles shall be of grade as per BOQ or as directed by the Engineer.

SECTION 1500 FORMWORK

CLAUSE 1501 DESCRIPTION

The Clause shall read as below.

The Contractor shall prepare a formwork mobilization and utilization plan and submit the plan for Engineer's approval at least 28 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 Engineer's approval of mobilization 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

This Clause shall read as under:

"All materials shall comply with the requirements of IRC-87.

Material and components used for formwork shall be examined for damage or excessive deterioration before use/reuse and shall be used only if found suitable after necessary repairs.

Only steel formwork shall be used. The steel used for forms shall be of such thickness that the forms remain true to shape. All bolts should be countersunk. The use of approved internal steel ties or plastic spacers shall be permitted. Structural steel tubes used as support for forms shall have a minimum wall thickness of 4 mm."

Clause 1503 DESIGN OF FORMWORK

Sub-Clause 1503.1 *Add at the end of this Sub-clause*

"For distribution of load and load transfer to the ground through staging, an appropriately designed base plate must be provided which shall rest on firm sub-strata".

Sub-Clause 1503.2 The following shall be added at the end of this Clause:

"The work of formwork shall not commence without approval of the Engineer"

CLAUSE 1504 WORKMANSHIP

Sub-Clause 1504.1 *Add the following at the end of Clause 1504.1*

"The loading from the formwork shall be distributed to the soil or the permanent works below (e.g. pile cap) in such a manner that any total or differential settlement is within acceptable limits. Subsoil characteristics shall be taken into account while designing the staging to avoid untoward failures. All the pipes etc. used for staging shall be free from kinks, bends etc."

CLAUSE 1506 PRECAUTIONS

Add the following as items of this clause:

Adequate support against sideways and lateral loads due to construction operations and wind shall be provided.

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 Engineer.

Forms shall be rigid and of adequate section to reduce deflections. Forms shall have sufficient rigidity to resist horizontal pressures caused by flowing concrete resulting from use of superplasticisers. The formwork shall resist the lateral pressure caused due to fast rate of placement by concrete pumps.

CLAUSE 1507 PREPARATION OF FORMWORK BEFORE CONCRETING

Add at the end of last para :



“Concreting shall not commence without approval of the Engineer”

CLAUSE 1508 REMOVAL OF FORMWORK

Add the following as para 7 Clause. 1508.

For prestressed units, the side forms shall be released, as early as possible and the soffit forms shall permit without restraint deformation of the member, when prestress is applied. Form supports and forms for cast in situ members shall not be removed until sufficient prestress has been applied to carry the dead load and any formwork supported by the member and anticipated construction loads.

Clause 1509RE-USE OF FORMWORK

This Clause shall read as under:

"After forms are stripped, all materials shall be examined for any damage and damaged pieces, if any, shall be removed either as rejected or for rectification if possible. The materials found fit to be reused shall be thoroughly cleaned. Holes bored through sheathing for form ties shall be plugged by driving in common corks or foamed plastics. Patching plaster may also be used to fill small holes. After cleaning and before re-fixing, each formwork shall be got approved from the Engineer.

Formwork and staging shall be so used as to ensure quality of the exposed surface. However, if in the opinion of the Engineer, any particular panel/member has become unsatisfactory for use at any stage, the same will be rejected and removed from site.

All bent steel props shall be straightened before reuse. The maximum deviation from straightness shall not exceed 1/600 of length. However the maximum number of users shall be limited to 20 times since only steel formwork is to be used .The maximum permissible axial loads in used props shall be suitably reduced depending upon their condition.”

CLAUSE 1510 SPECIALISED FORMWORK

Replace the words ‘slip-form work’ by ‘climbing formwork’ in the first sentence of this clause.

The first sentence of Para 2 of this clause shall read as follows:

Slip forming is not permitted.

Replace the word “plywood” by “marine plywood” in the fifth paragraph of this clause.

Clause 1513 RATE

Add the following at the end of the first para:

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

SECTION 1600 STEEL REINFORCEMENT (UN-TENSIONED)

CLAUSE 1602 GENERAL

Paragraph 2 of Clause 1602 shall read as follows:

“Reinforcements shall be thermo mechanically treated (TMT) deformed bars of grade Fe 415/ Fe 500 conforming to IS: 1786 as Specified in the drawings. Only uncoated steel shall be used as reinforcement unless specified.”

CLAUSE 1604 BENDING OF REINFORCEMENT

Para 1 shall be read as follows:

The reinforcement shown on the drawings shall be considered merely symbolic representations of the shape and position and shall not be used by the Contractors to justify any deviation from the stipulated requirements. Bar bending schedules and any supplementary drawings as may be required shall be furnished by the Contractor and got approved by the Engineer before start of work. The bending schedules shall state the number, shape and length of bar and weight in respect of each type. System of bar referencing should be coherent and systematic. A separate bar bending schedule shall be prepared for auxiliary bars like spacers, chairs etc.

CLAUSE 1605 PLACING OF REINFORCEMENT

Paragraph (c) (i) of Clause 1605 shall be read as follows:

Cover blocks shall be made of concrete or cement mortar with the same durability properties as the surrounding concrete and with the same type of constituents. In visible surfaces, the cover blocks shall be of the same colour and texture as the surrounding concrete. The Contractor's proposal for cover blocks shall be submitted to the Engineer for acceptance.

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 |

CLAUSE 1606 BAR SPLICES

Sub-Clause 1606.1 First sentence of Clause 1606.1 shall read as follows:

To the extent possible, all reinforcement shall be furnished in full lengths as indicated in drawings.

Add the following as paragraph 2 of Clause 1606.1:

The location of joints in continuous reinforcing bars, not shown in drawings, shall be submitted to the Engineer for acceptance. If nothing contrary has been specified, the number of bars to be joined in any cross-section shall not exceed one-third of the total.

Sub-Clause 1606.2 Welding

Sub-Clause Add the following at the end of the paragraph:

1606.2.1 "In prestressed concrete members, when welding of untensioned reinforcement is permitted by the Engineer, it shall be carried out before insertion of the prestressing tendons/sheathing."

SECTION 1700 STRUCTURAL CONCRETE

CLAUSE 1703 GRADES OF CONCRETE

Sub-Clause 1703.2 This Sub-Clause shall be replaced with the following:

"The lowest grades of concrete in bridges and corresponding minimum cement contents and water-cement ratios shall be maintained as indicated in Table 1700-2 and 1700-3."

TABLE 1700-2 for all major bridges (bridges with total length 60m and above, ROBs, Flyovers, Grade Separators) and minor bridges (bridges with total length less than 60 m & Underpasses)

A) Minimum cement content and maximum water cement ratio

| Structural Member | Min. cement content (kg/cum) | | Max. water cement ratio | |
|-------------------|------------------------------|---------------|-------------------------|---------------|
| | Major Bridges | Minor Bridges | Major Bridges | Minor Bridges |
| PCC Members | 360 | 310 | 0.45 | 0.45 |
| RCC Members | 400 | 400 | 0.40 | 0.40 |
| PSC Members | 400 | 400 | 0.40 | 0.40 |

B) Minimum strength of concrete

| Member | Major Bridges | Minor Bridges |
|-------------|---------------|---------------|
| PCC Members | M30 | M20 |

| | | |
|-------------|-----|-----|
| RCC Members | M35 | M25 |
| PSC Members | M40 | - |

TABLE 1700-3 For culverts and other incidental structures:

A) Minimum cement content and maximum water cement ratio

| Structural Member | Min. cement content (kg/cum) | Max. water cement ratio |
|-------------------|------------------------------|-------------------------|
| PCC Members | 310 | 0.45 |
| RCC Members | 400 | 0.40 |

B) Minimum strength of concrete

| Member | Grade |
|-------------|-------|
| PCC Members | M20 |
| RCC Members | M25 |

Notes:

1. The minimum cement content is based on 20mm aggregate (nominal max. size). For 40mm and larger size aggregates, it may be reduced suitably but the reduction shall not be more than 10 per cent.
2. For under water concreting, the cement shall be increased by 10 per cent.

The cement content shall be as low as possible but not less than the quantities specified above. In no case shall it exceed 540 kg /cum.

Clause 1704 PROPORTIONING OF CONCRETE

Add the following at the end of this Clause:

"In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the manufacturer's weight per bag, a reasonable number of bags shall be weighed separately to check the net weight. Where cement is weighed from bulk stock at site and not by bag, it shall be weighed separately from the aggregates. Water shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be periodically checked.

It is most important to keep the specified water-cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined as frequently as possible; frequency for a given job being determined by the Engineer according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. The determination of moisture content in the aggregates shall be done as per IS: 2386 (Part III). Suitable adjustments shall also be made in the weight of aggregates to allow for the variation in weight of aggregates due to variation in their moisture content."

Sub-Clause 1704.4 Additional Requirements

In Para (a) substitute "0.06%" for "0.1%"; "0.06%" for "0.2%"; and "0.1%" for "0.3% for the three items respectively.




Clause 1705 ADMIXTURES

This Clause shall read as under:

"Duly tested admixtures/additives conforming to IS: 6925 and IS: 9103 (without replacement of cement) may be used subject to satisfactory proven use, with the approval of the Engineer. Admixtures generating Hydrogen or Nitrogen and containing chlorides, nitrates, sulphides, sulphates and any other material liable to affect the steel or concrete shall not be permitted.

The general requirements, physical and chemical requirements shall be as per Clause 1012."

Clause 1706 SIZE OF COARSE 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 | As specified by the Engineer |
| f) Any other item | |

Clause 1707 EQUIPMENT

Para 1 of this Clause shall read as under:

"Unless specified otherwise, equipment for production, transportation and

compaction of concrete shall be as under:

- a) 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 30 cum/hour. The plant shall be approved by the Engineer.
- b) In special cases for culverts, the Engineer may allow mixing of concrete by a diesel or electrically operated mechanical mixer with integrated weigh batching facility having a capacity of 500 litres and automatic water measuring system.

Paragraph 3 of this clause shall read as follows:

“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.

Paragraph 3(b) & 3(c) shall remain unchanged.

CLAUSE 1711 CONCRETING IN EXTREME WEATHER

Sub-Clause 1711.2 Hot Weather Conditions

Add the following at the end of paragraph 1 of the above clause:

Where the Contractor proposes to use ice to cool the concrete or mixing water or any of the ingredients, the Contractor shall provide a refrigeration plant to avoid use of contaminated ice.

Placement of concrete shall not be permitted when day temperature exceeds 40°C.

Clause 1712 PROTECTION AND CURING

Sub-Clause 1712.2 Water Curing

Add the following at the end of Para 1:

Water sprinklers or perforated pipes shall be used for curing of concrete for all major bridges, ROB's and grade separators. Such arrangement must be in place & tested before concreting for its proper functioning and shall be maintained for a minimum period of 14 days after concreting.

Approved concrete curing compounds should be preferred where water curing cannot be done reliably.

CLAUSE 1716 TOLERANCES

Add the following at the end of Clause:



"In the absence of any information in drawings or specifications, for particular cases, the following limitations shall apply.

| Dimension (mm) 'a' | Tolerances (mm) ' $\delta_a = (a_{\text{nominal}} - a_{\text{actual}})$ ' |
|---------------------|---|
| $a \leq 200$ | $ \delta_a < 5$ |
| $200 < a \leq 2000$ | $ \delta_a < 3.5 + 0.0075a$ |
| $2000 < a$ | $ \delta_a < 16.5 + 0.001a$ |

CLAUSE 1718 MEASUREMENT FOR PAYMENT

The clause may be read as under :

Structural concrete shall be measured in cubic metres. In reinforced or prestressed concrete, the volume occupied by reinforcement or prestressing cables and sheathing shall not be deducted. The slab shall be measured as running continuously through and the beam as the portion below the slab. In the case of RCC/PSC voided slab the deduction shall be made for the volume of void.

SECTION 1800 PRE-STRESSING

CLAUSE 1801 GENERAL

Add the following as the last paragraph of this clause:

Prestressing system shall conform to FIP Recommendation "Recommendations of acceptance of post-tensioning systems", June 1993.

CLAUSE 1802 MATERIALS

Sub-Clause 1802.2 Sheathing

Sub-Clause 1802.2.1 The second and third sentences of Para 6 shall be read as follows:

"The joint between the end of coupler and the duct shall be sealed with heat shrink tape to prevent penetration of slurry during concreting. The couplers of adjacent ducts should be staggered at least 300mm apart."

Add the following at the end of Para 6:

Couplers and splices shall be larger in diameter than ducts joined.

Sub-Clause 1802.2.3 This clause may be read as under:

Pull-in or push-in of prestressing stands shall be mechanized.

Strands shall not be placed in the ducts before concreting. The ducts shall be sealed at the ends by plastic caps to prevent water from entering.

Cables shall be threaded after concreting. In such cases a temporary tendon shall be inserted in the sheathing, or the sheathing shall be stiff ended by other suitable method during concreting. The sheathing supports shall be such as to prevent

floatation of empty cable duct during concreting.

Add the following as additional Sub-clause

Sub-Clause 1802.2.4 Corrugated HDPE sheathing ducts

When high-density polyethylene (HDPE) sheathing ducts are specified, the material for the ducts shall be with more than 2 percent carbon black to provide resistance to ultraviolet degradation and shall have the following properties:

Specific Density : 0.954 g/cm³ at 23 °C

Yield Stress : 18.0 N/mm²

Tensile Strength : 21.0 N/mm²

Shore Hardness D-3 sec. Value : 60

-15 sec. Value : 58

Notch impact strength at 23 °C : 10 KJ/m²

- 40 °C : 4 KJ/m²

Coefficient of Thermal Expansion for

20 °C - 80 °C : 1.50 x 10⁻⁴ KJ/m²

The thickness of the wall shall be 2.3 ± 0.3 mm as manufactured and 1.5 mm after loss in the compression test, for duct size upto 160 mm OD.

The ducts shall be corrugated on both sides. The ducts shall transmit full tendon strength from the tendon to the surrounding concrete over a length not greater than 40 duct diameters.

These ducts shall be joined by adopting any one or more of the following methods, as convenient to suit the individual requirements of the location, subject to the satisfactory pressure tests, before adoption.

Screwed together with male and female threads.

Joining with thick walled HDPE shrink couplers with glue. This can also be used for connection with trumpet, etc.

Welding with electro fusion couplers. The joints shall be able to withstand an internal pressure of 0.5 bar for 5 minutes as per test procedure given in Appendix-1A of IRC: 18 - 2000.

Sub-Clause 1802.3 Anchorages

Heading of the clause shall be "Anchorages and Tendon couplers"

Sub-Clause 1802.3.1 The word “Anchorages” shall be replaced by the words “Anchorages and couplers” in sentence 1 of the paragraph.

Add the following after the words “furnished to the Engineer” in sentence 3 of paragraph 1 of this clause:

“Couplers which connect two tendons to form a continuous tendon, should be tested in the same way as anchorages formed by mechanical means.”

CLAUSE 1803 TESTING OF PRESTRESSING STEEL AND ANCHORAGE

Add following Paragraphs to the section.

All samples shall be representative of the lot and in the case of wire or strand shall be taken from the same master roll. At least 5.0m length shall be selected from each lot for testing. Also two anchorage assemblies, complete with distribution plates of each size or types to be used, shall be tested. Testing of anchorage - cable assemblies shall be carried out in accordance with procedures in FIP document "Recommendations for the acceptance of Post Tensioning systems", June 1993.

The frequency of such tests should be as follows:

- 1) For acceptance of the tendon at the stage of submission of tendons, the manufacturers certificate together with the data of previously conducted and most recent test results of "Acceptance Testing" is acceptable subject to further testing as given below.
- 2) Acceptance Testing for the works
 - a) Static load test for tendon-anchorage assembly

A series of three tests using the proposed combination of anchorage systems and the prestressing strand/wire/bars. All the tests should meet the following requirements.

Residual deformations of anchorage components after the test should confirm the reliability of the anchorage.

The increase in the displacements between the anchorage components as well as between the prestressing steel and anchorage components should not be disproportionate to the increase in tendon force.

The above relative displacements during the 0.8Fpk load stage should stabilize within the first thirty minutes of the load duration of 1 hour.

The mode of failure of tendon should be by the fracture of the prestressing steel. Failure of the tendon should not be induced by the failure of anchorage components.

The measured anchorage efficiency should be:

(Refer CEB/FIP Guidelines for details).

The total elongation ϵ_u in free length of the tendon under the load F_{tu} should be $\epsilon_u \geq 2\%$

b) Dynamic load test with tendon/ anchorage assembly

This test is to be carried out for every new combination of type of anchorage and tendons. A series of three successful tests shall be carried out for acceptance of the systems. This test is considered as essential for both unbonded and bonded cables as per FIP document.

Requirements:

Each test result should meet the following requirements

- Fatigue failure of anchorage components should not occur.
- The minimum fatigue strength of post-tensioning system should be $\Delta\sigma_p \text{ min} = 80 \text{ MPa}$
- The fatigue strength is defined as the stress range ($\Delta\sigma_p$), which is endured for 2 million cycles without failure of more than 5% of the initial cross-section of the tested tendon at beginning of the test.

Clause 1804 WORKMAN SHIP

Sub-Clause 1804.3.1 Post-tensioning

The following para shall be inserted between the 5th and 6th para.

“The steel sheaths or duct formers shall be suitably tied to secondary reinforcement or to properly locate withdrawable through-shutter bolts, precast concrete blocks or similar effective means, in such a manner that they do not give rise to excessive friction when the steel is being tensioned.”

Sub-Clause 1804.5 Insert following Para after Para 1

Mixture of water-soluble oil such as Dromas - B and Water is to be flushed through empty metallic ducts before threading of cables, and after threading of cable at frequency of at least once in a month. The layer of oil formed on sheathing / prestressing steel shall be fully flushed out by using clean water before final grouting by cement grout.

CLAUSE 1806 TENSIONING EQUIPMENT

Add the following at the end of Para 2:

“Jack and Pump shall be calibrated by an approved laboratory prior to use and then at intervals not exceeding three months.

A standby set of jack, pumps and pressure gauges shall always be available at site where prestressing is in progress.”

Add the following at the end:



"Before initial use & subsequently at suitable intervals the pre-stressing equipment shall be checked to determine any variation from the normal values during use.

SO far as these variations depend upon external influence (e.g. temperature in the case of oil jacks) they shall be taken into account"

CLAUSE 1807 POST TENSIONING

Add the following at the end of Para 5 of this clause:

"Parallel measurement by load cell in combination with direct reading of Pressure gauge shall be preferred. In any case such parallel measurements by load cell shall be made for at least 10% of the cables stressed during any tensioning operation."

Add the following at the end of this Clause:

"The Contractor shall submit fabrication drawings, detailing prestressing cables, anchorages, couplers, chairs and supports, templates or forms holding anchorage assemblies etc. for Engineer's approval at least one month before commencement of work in superstructure. Stressing schedules shall be prepared by the Contractor and submitted to Engineer for approval."

CLAUSE 1808 GROUTING OF PRE-STRESSED TENDONS

Add new Para at the end of Clause as under:

"Where directed by the Engineer the Contractor shall perform full-scale site test to determine the adequacy of grout mix, equipment and grouting method. The Contractor shall submit a method statement detailing the test procedure.

Special Attention is directed to Appendix 1800 / III of the Standard Specifications. Contractor shall arrange for testing of all grout components and of the mix, prior to the start of grouting and whenever the source of any component is changed, to ensure that the grout is free of anything that could promote shrinkage or cracking of the grout or corrosion in the tendons. Further samples of grout and its components shall be obtained for each day of grouting at each site where grouting is carried out and a full chemical analysis shall be performed on the samples."

CLAUSE 1815 RATE

Add at end of Para 4:

Cost of fixing anchorages / sheathing for dummy cables and future prestressing cables shall be incidental to work and shall not be measured / paid extra. No additional cost shall be payable for stressing of cables for compensation of short fall of prestress or for any other reason.

CLAUSE 1816 JOINTS IN CONSTRUCTION WITH PRE-CAST-UNIT

Add new clause:



"Joints between a series of precast concrete units which are to be prestressed together by post-tensioning shall be such as to ensure even transfer of compression from one unit to another.

Whatever be the method of jointing, the holes of the prestressing steel shall be accurately made and shall meet one another in true alignment at ends. Jigs shall always be used. Care shall be taken to ensure that the jointing material does not enter the duct or press the sheath against the prestressing steel.

Jointing by application of mortar on the face of a unit and then placing another unit against it shall not be permitted.

Suitability and effectiveness of the method should be got confirmed from a suitably designed mock-up."

SECTION 2000 BEARINGS

CLAUSE 2001 DESCRIPTION

Add the following as paragraph 2 of this clause:

"Within 90 days of award, the Contractor shall submit detailed specifications, designs and drawings including installation drawings and maintenance manual, for the approval of the Engineer. Designs shall also include review and modifications of designs and drawings of bearing pedestals and other elements required for installation. The installation of bearings shall be carried out under the supervision of the manufacturer of the bearings. The Contractor shall provide the bearings only from the manufacturers approved and enlisted by the Department. In addition to routine testing of the materials and bearings at manufactures premises, the Contractor shall arrange at his own cost testing of random samples of 1 % (Minimum 1 no. of each type) of bearings from independent agencies, other than manufactures' own facilities, duly approved by the Engineer. The bearings shall be selected by the Engineer / his authorised representative and duly sealed in his presence for dispatch to the independent agency."

CLAUSE 2004 SPECIAL BEARINGS

The clause shall read as follows:

Sub-Clause 2004.1 Spherical Bearings: Spherical Bearings shall conform to the requirements of sections 9.1 and 9.2 of BS 5400. However materials of bearing elements may conform to Indian Standards nearest to the specifications stated in the above sections of BS: 5400.

Clause 2005 ELASTOMERIC BEARINGS

Sub-Clause 2005.4 Acceptance Specifications

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

Sub-Clause 2005.3.5 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 the third paragraph.

CLAUSE 2006 POT BEARINGS

The clause shall read follows:

"Pot Bearings shall conform to the requirements of IRC: 83 (Part III)-2002. Mild steel to be used for components of the bearings shall comply with Grade B of IS: 2062."

Sub-Clause 2006.1 General

Sub-Clause 2006.1.2 Add after 2nd sentence "Provisions of IRC83 (Part III) shall be applicable for POT, POT cum PTFE, PIN and Metallic Guide Bearings"

ADD new Clause 2009 as under and the existing Clauses 2009 and 2010 are renumbered as 2010 and 2011 respectively :

CLAUSE 2009 "Tar Paper bearing shall be reinforced bitumen laminated Kraft paper conforming to IS-1398".

Clause 2010 MEASUREMENTS FOR PAYMENT

Add the following after Para 2:

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

SECTION 2100 OPEN FOUNDATIONS

CLAUSE 2106 TOLERANCES

Reference to Tolerance shall be made to Clause 1716.

SECTION 2200 SUB-STRUCTURE

CLAUSE 2204 PIERS AND ABUTMENTS

Sub-Clause 2204.2 replaced as follows:

"Slip forming will not be allowed."

Add new Sub-Clause 2204.7 at the end of clause:

"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 areas. No payment will be made for these

operations as per Clause 304.5.1.”

Sub-Clause 2210 Rate

This Clause shall read as follows:

“The contract unit rate for masonry, concrete and reinforcement in substructure shall include all works as given in respective sections and cover the cost of incidental items like providing cofferdams, dewatering, providing special formwork, where necessary, and all other items for furnishing and providing substructure as mentioned in this section.”

The necessary material (thermocole, bituminous fibrous 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 2300 CONCRETE SUPER-STRUCTURE

Clause 2305 PRESTRESSED CONCRETE CONSTRUCTION

Sub-Clause 2305.2 Box Girder

Add the following at the end of paragraph 1:

“Contractor shall, in his methods statement, indicate the location of construction joints for Engineer’s approval.”

Add new sub clause 2305.5 as under:

Sub-Clause 2305.5 PSC Solid Slab

Casting of the slab shall be done in a single stage without construction joints.

The portions of deck near expansion joints shall be cast along with Reinforcements and embedments for expansion joints.

The deck slab shall be finished rough, but true to lines and levels as shown in drawings. Bearings shall be set as shown in drawings.

Sub-Clause 2504.2.2 Filter Media

Add after 1st Para:

“The material for filter media behind abutment shall conform to general guide lines given in Appendix 6 of IRC-78 (Standard Specification and Code of Practice for Road Bridges – Section-II).”

Clause 2507 CURTAIN WALL AND FLEXIBLE APRON

Replace Sub-clause 2507.1 and modify sub-clause 2507.2 as under:

Sub-Clause 2507.1 Curtain Wall

The rigid flooring shall be enclosed by curtain walls (tied to the wing walls) with a minimum depth below floor level on up-stream side and downstream side as indicated in the drawings. The curtain wall shall be in cement concrete M-20

grade. The rigid flooring shall be continued over the top width of the curtain wall.

Sub-Clause 2507.2 Flexible Apron

First sentence under this sub-clause shall read as under:

“Flexible apron of thickness indicated in the drawing, comprising loose stone boulder (weighing not less than 40 kg) shall be provided beyond curtain wall for a minimum distance of 3.0 m on upstream side and 6.0 m on downstream side”

Sub-Clause 2509 Add new Para in the end of the Clause;

“Filter media and cement concrete bedding, wherever required, shall be measured in cubic metre and paid separately as per contract.”

SECTION 2600 EXPANSION JOINTS

Clause 2602 GENERAL

Add the following at the end of the clause.

“The expansion joints shall be procured only from those manufacturers/ suppliers of expansion joints who are empanelled with MOSRT&H. The MOSRT&H (formerly, Ministry of Surface Transport) had issued modified interim specifications for expansion joints vide letter dated 31/03/97 and revised vide letter No. RW/NH-34059/1/96 - S&R dated 30th Nov, 2000 and corrigendum of same circular dated 15th Jan., 2001 which shall be adopted. These specifications are reproduced below.”

TABLE R-1 SUITABILITY CRITERIA FOR ADOPTION OF DIFFERENT TYPES OF EXPANSION JOINTS

| Sl. No. | Type of Expansion | Suitability of Adoption Joint | for Expected Service Life | Special Consideration |
|---------|-------------------|--|---------------------------|---|
| 1. | Buried Joint | Simply supported spans upto 10 metres | 10 Years | Only for deck with bituminous/ asphaltic wearing coat. Steel plate may need replacement, if found corroded or distorted at the time of relaying/ renewal of wearing coat. |
| 2. | Filler Joint | Fixed end of simply supported spans with insignificant movement or simply supported spans not exceeding 10 metres. | 10 Years | The sealant and joint filler would need replacement if found damaged. |

| | | | | |
|----|---|--|----------|--|
| 3. | Asphaltic Plug Joint | Simply supported spans for right or skew (upto 20 degree), moderately curved or wide deck with maximum horizontal movement not exceeding 25 mm. Ambient temperature should be in the range of 5 degree to 50 degree Celsius. | 10 Years | Only for decks with bituminous/ asphaltic wearing coat. Not suitable for bridge with longitudinal gradient more than 2 % and cross camber/ super-elevation exceeding 3%. Not suitable for curved spans and spans resting on yielding supports. |
| 4. | Compression Seal Joint* (Chloroprene Seal & Cell Foam Seal) | Simply supported or continuous spans right or skew (upto 30 degree), moderately curved with maximum horizontal movement not exceeding 40 mm. | 10 Years | Chloroprene/ Closed Foam Seal may need replacement during service. |
| 5. | Elastomeric Slab Seal Joint* | Simply supported or continuous spans, Right or skew (less than 20 degree), moderately curved with maximum horizontal movement upto 50 mm | 10 Years | Liable to excessive wear and tear under high traffic intensity. Not suitable for bridges located in heavy rainfall area and spans resting on yielding support. |
| 6. | Single strip seal joint* | Moderate to large simply supported, cantilever/ continuous construction having right, skew or curved deck with maximum horizontal movement up to 70 mm | 25 Years | Electrometric seal may need replacement during service. |
| 7. | Modular Strip/ Box Seal Joint | Large to very large continuous/ cantilever construction with right, skew or curved deck having maximum horizontal movement in excess of 70 mm | 25 Years | Electrometric seal may need replacement during service. |
| 8. | Special Joints for | For bridges having wide decks and large | 25 Years | Electrometric seal may need replacement |

special conditions span length involving complex movements/ rotations in different directions/ planes, provision of special type of modular expansion joints such as Swivel joists joints may be made. during service. Provision of these joints may be made with prior approval of the Ministry.

* These are proprietary items for which 10 years warranty shall be insisted upon from the suppliers. The contractor shall submit all relevant information as per clause 115.1

Clause 2608 Add the following Sub-Clause after the end of This Clause

Sub-Clause 2608.3

Installation

- (a) The Expansion joint shall be installed by the manufacturer/ Supplier.
- (b) The block out for the joint shall be marked and constructed to the dimensions as indicated in the drawing or recommended by the manufacturer/ supplier.
- (c) The recess for the block out shall thoroughly cleaned of any loose or foreign material wire brushing and air blowing and dried with hot compressed air.
- (d) The recess in the deck slab, if required, shall be repaired with epoxy mortar and cleaned and dried again.
- (e) The foam caulking/backing rod shall be placed about 25 mm down in the joint opening.
- (f) The aggregate shall be washed, cleaned and heated to a temperature between 170°-180°C prior to placement.
- (g) The binder shall be preheated to temperature of 170 – 190° C before application.
- (h) While sealing the joint opening with preheated binder, care shall be taken that the binder does not spill on to the joint surface of the deck.
- (i) The joint shall not be installed when the ambient temperature goes below + 5 deg. C or above + 35 deg.C. or while it is raining/ snowing. (Planning for installation must taken into account the weather condition).
- (j) When clement weather resumes, the joint installation may be continued after the upper layer and/or exposed surface of the partially completed joint has been re-prepared by heating and/ or coating with binder as

necessary.

Sub-Clause 2608.4 Handling and Storage

All the aggregates and binder shall be pre-bagged and clearly marked. All the material shall; be stored on concrete platform at 150 mm above the ground in covered enclosures to avoid contamination.

Clause 2608.5 Tests and Standard of Acceptance

The material shall be tested in accordance with these specifications and shall meet prescribed criteria. The manufacture/ supplier shall furnish the requisite certificates from the recognized testing laboratory of India or abroad.

The work shall conform to these specifications and shall meet the prescribed standards of acceptance.

The clause 2609 be replaced fully as below:

Clause 2609 COMPRESSION SEAL JOINT

Clause 2609.1 Compression seal joint seal joint shall consist of steel armoured nosing at two edges of the joint gap suitably anchored to the deck concrete and a performed chloprene elastomer or closed cell foam joint sealer compressed and fixed in to the joint gap with special adhesive binder.

Clause 2609.2 Material

(a) Steel nosing

The steel nosing shall be of angle section ISA 100 x 100 conforming to weldable structural steel as per IS:2062. The thickness of legs shall not be less than 12 mm. The top face of the angle shall be provided with Bleeder holes of 12 mm diameter spaced at a maximum 100 mm centers so as to ensure that there are no voids in the concrete beneath the angle.

(b) Anchorage

The anchorage steel shall conform to IS:2062 or equivalent. The steel nosing shall be anchored to the deck by reinforcing bars, headed studs or bolts or anchor plates cast in concrete or a combination of anchor plate and reinforcing bars, headed studs or bolts. Anchor bars, studs or bolts shall engage the main structural reinforcement of the deck and in case of anchor plates o anchor loops this shall be achieved by passing transverse bars through the loops or plates.

The minimum thickness of anchor plate shall be 12 mm. Total cross sectional area of bars, studs or bolts on each side of the joint shall not be less than 1600 mm sq. per metre length of the joint and the center

to center spacing shall not exceed 250 mm. The ultimate resistance of anchorages shall not be less than 600 KN/m in any direction.

(c) Corrosion Protection

All steel section shall be protected against corrosion by hot dip galvanizing or any other approved anticorrosive coating with a minimum thickness of 100 micron.

(d) Joint Seal

- i) The sealing element shall be a performed continuous chloroprene or closed cell foam seal with high tear strength, insensitive to soil, gasoline and ozone. It shall have high resistance to aging and ensure water tightness. The seal should be vulcanised in a single operation for the full length of the joint required for carriageway, kerbs and footpaths, if any. The seal shall cater for a horizontal movement upto 40 mm and vertical movement of 3 mm.
- ii) The physical properties of chloroprene/ closed cell foam sealing element shall conform to the following:

Chloroprene Seal

Shall be performed extruded multi web cellular section of chloroprene of such a shape as to promote self-removal of foreign material during normal service operations. Chloroprene of joint seal shall conform to clause 915.1 of IRC:83 (Part – II) and satisfy the properties stipulated in Table – 2 Strip Seal Element Specification of these specifications except in respect of the working movement range of the sealing element which shall be as specified in Clause 2.4.1 above.

Closed Cell Foam Seal

Shall be of performed non extruded non cellular section made from low density closed cell, crossed linked ethylene vinyl acetate, polyethylene copolymer that is physically brown using nitrogen. The material shall possess properties as indicated in **Table. 1:**

Table – 1

| | Property | Specified Value |
|------|--------------------------|---|
| i) | Density | 41.7 – 51.3 Kg/ cum |
| ii) | Compression Set on 25 mm | 50 percent compression samples (ASTM D3575) for 22 hours at 23 degree Celcius, 2 hour recovery; 13 percent set. |
| iii) | Working temperature | -70 to +70 deg C. |

- | | | |
|-----|--|-------------------|
| iv) | Water absorption (total immersion for 3 months) (ASTM D3575) | 0.09766 Kg/ sqm |
| v) | Tensile strength | 0.8 Mpa |
| vi) | Elongation at break (ASTM D3575) | 195 +/-20 percent |

(e) Lubricant cum Adhesive

The type and application of material used in bonding the performed joint seal to the steel nosing and concrete shall be as recommended by the manufacturer / supplier of the seal system.

Sub-Clause 2609.3 Handling and Storage

- (a) The expansion joint material shall be handled with care and stored under cover. All joint material and assemblies shall be protected from damage and assemblies shall be supported to maintain true shape and alignment during transportation and storage.

Sub-Clause 2609.4 Installation

- (a) The expansion joint shall be installed by the manufacturer/ supplier or their authorized representative, who will ensure compliance of installation procedure and instructions.
- (b) The dimension of the joint recess and the width of the gap shall conform to the approved drawings.
- (c) Anchoring steel shall be welded to the main reinforcement in the deck maintaining the level and alignment of the joint.
- (d) Concreting of pocket/ recess shall be done with great care using proper mix conforming to same grade as that of the deck concrete but not less than M30 grade in any case. The water cement ratio shall not be more than 0.40. If needed, suitable admixtures may be used to achieve the workability. The width of pocket shall not be less than 300 mm on either side of the joint. Care shall also be taken to ensure efficient bonding between already cast/ existing deck concrete and the concrete in the joint recess.
- (e) At the time of installation, joint shall be clean and dry and free from spalls and irregularities, which might impair a proper joint seal.
- (f) Concrete or metal surfaces shall be clean, free of rust, laitance, oils, dirt, dust or other deleterious materials.
- (g) The lubricant cum Adhesive shall be applied to both faces of the joint and joint seal prior to installation in accordance with the manufacturer's instructions. The joint seal shall be compressed to the specified thickness

for the rated joint opening and ambient temperature at the time of installation, which shall be between +5 to 35°C.

- (h) The joint seal shall be installed without damage to the seal. Loose fitting or open joints shall not be permitted.

Sub-Clause 2609.5 Acceptance Criteria

- (a) All steel elements shall be furnished with corrosion protection system.
- (b) For the joint seal the acceptance test shall conform to the requirements stipulated in Para above. The manufacturer/ supplier of this type of joint shall produce a test certificate to this effect conducted in a recognized laboratory in India or aboard.
- (c) Prior to acceptance 25 percent of the completed and installed joints, subject to a minimum of one joint, shall be subjected to water tightness test. Water shall be continuously ponded along the entire length for a minimum period of 4 hours for a depth of 25 mm above the highest point of deck. The width of ponding shall be at least 50 mm beyond the anchorage block of the joint on either side. The depth of water shall not fall below 25 mm anytime during the test. A close inspection of the underside of the joint shall not reveal any leakage.

CLAUSE 2613 TEST AND STANDARDS OF ACCEPTANCE

The clause 2613 be replaced fully as Below

“The materials shall be tested in accordance with these specifications and shall meet the prescribed criteria. The manufacturer / supplier shall furnish the requisite certificates from the recognized testing laboratory of India or abroad.

The work shall conform to these specifications and shall meet the prescribed standards of acceptance.”



CLAUSE 2614 Measurement for payment

The clause 2614 be replaced fully as below

The expansion joint shall be measured in running metres. For filled joints, the rate per running metre shall include the cost of sealant for the depth provided in this drawing. The expansion joint shall be measured along the width of the deck slab from one end to the other including length through footpaths and parapets.

CLAUSE 2615 RATE

The clause 2615 be replaced fully as below

The contract unit rate shall include the cost of all material, labour, equipment and other incidental charges for fixing the joints complete in all respects as per these specifications in the case of Bridge Contractor supplying the expansion joint. If the manufacturer supplies the expansion joint directly to the Engineer, the cost of installation, handling and fixing shall be borne by the Bridge Contractor.



SECTION 2700 WEARING COAT AND APPURTENANCES

CLAUSE 2702 WEARING COAT

Sub-Clause 2702.1 Bituminous Wearing Coat

"Asphaltic concrete wearing coat shall be constructed in thickness as shown in drawings"

CLAUSE 2703 RAILINGS AND CRASH BARRIER

Sub-Clause 2703.3 Cast-in-Situ Railings and parapets

Last sentence of paragraph 3 shall be replaced by the following.

"Location of construction joints shall be determined in advance and approved by Engineer."

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 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 Engineer. Where "extrusion or slip form" method is adopted, full details of the method and literature shall be furnished.

Grade of concrete for crash barrier shall be as per BOQ or as directed by Engineer.

An expansion joint with Polysulphide Joint sealants and bituminous fiberboard 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 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 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 809.4, 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 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 cubic metres of concrete completed for the barriers including approach and departure ends. The sealing of opening in crash barrier at expansion joints with polysulphide rubber joint sealant and bituminous fibreboard as per sub-clause 2703.6 shall be incidental to work. The reinforcement in barriers shall be measured and paid separately in relevant item of B.O.Q. The painting over crash barrier shall be measured in square meter and paid separately.

Sub-Clause 2703.5.6 Rate

The Contract unit rate shall include full compensation for furnishing all labour, materials, 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 fiberboard shall be provided in the Expansion Joints/ gaps in Crash Barriers.

Before application it shall be ensured that the top of the bituminous fiberboard and the concrete faces are dry, sound, 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 color 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 @ 25°C | 22 ± 3 |
| Operating temperature | - | -20°C to + 80°C | |
| Shrinkage | - | Less than 1% | |
| Permanent dynamic | - | ± 25% | |

Movement capability

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

Measurements for Payments

Cost for providing Polysulphide Joint sealants and bituminous fiberboard 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 HOLE

This clause shall read as under:

"Weep holes shall be provided in solid plain concrete/reinforced concrete/brick masonry abutments, wing walls, return walls as shown in the drawing or as directed by the Engineer to drive moisture from the back filling. Weep holes shall be provided with 100 mm dia PVC pipe of approved thickness and shall extend through the full width of concrete with slope of about 1 vertical: 20 horizontal towards the draining face.

The spacing of weep holes shall generally be 1m 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 Engineer."

CLAUSE 2708 MEASUREMENTS FOR PAYMENT

Replace in Clause 2708- sub-clause ii, "running meters" by "running meters/ cubic meters as per unit provided in BOQ".

CLAUSE 2709 RATE

The second paragraph shall be read follows:

"The contract unit rate of parapets and railings shall include the cost of all labour, materials tools and plant required for completing the unit in accordance with specifications".

Add at the end of Para 2:

The contract unit rate for approach slab shall include cost of reinforcement and providing and laying in position bitumen joint filler with joint sealing compound in the 20 mm thick gap between dirt wall and approach slab.

CLAUSE 2819

PROVIDING AND FIXING DRAINAGE SPOUT INCLUDING SEALING WITH NON-SHRINK FREE FLOW CEMENT GROUT.

For all existing bridge decks where drainage spouts are to be replaced new drainage spouts shall be provided as shown in the drawings.

The waterproofing material shall be provided, around the area of drainage spout and spout pipe, from the top of the deck.

The work shall be executed in accordance with Specifications Section 2700 clause 2705 except to the extent modified below.

The work shall be carried out after the wearing coat around the spout is removed. The existing spouts shall be removed carefully with minimum damage to surrounding concrete. The pocket formed shall be sufficiently large to ensure good flow and compaction of non-shrink cement grout around the new spout. In case the earlier spouts were provided in railing kerb, holes shall be drilled in slab without excessively damaging surrounding concrete.

CLAUSE 2820

REPAIR TO LEACHED, HONEYCOMBED, SPALLED CONCRETE

Leached, honeycombed, spelled concrete (area of damage less than 0.5 m^2) shall be repaired with average 50 mm average thick PMC mortar in two or more layers with a bond coat of PMC slurry between two successive layers.

All loose concrete shall be chipped off with a chipping machine so that loose layers of concrete are removed exposing the reinforcement. All loose concrete sticking with the reinforcement shall be removed. Where reinforcement bars are already exposed, the chipping shall continue so as to expose half the diameter, prior to further treatment. The concrete surface shall be thoroughly cleaned with wire brush and oil free air blast. Where the damaged areas are large, sand blasting should be done to clean the reinforcement and the surrounding concrete. If reinforcement is seen, the same shall also be cleaned thoroughly. The reinforcement shall be coated with PMC slurry within one hour of cleaning to prevent rusting. The PMC shall be brush applied on the cleaned reinforcement ensuring that full surface area is covered in accordance with the manufacturers' recommendation.

Before applying PMC repair mortar the prepared concrete substrata shall be thoroughly soaked with clean water. Free surface water shall be removed before priming. The substrata shall be primed with PMC slurry.

The specifications for polymer modified cementitious (PMC) mortar / debonding slurry are as under:

The anti-corrosive polymer latex, which is to be used should consist of water based QA-Acrylic polymer incorporated with non-alcoholic bipolar corrosion inhibitor. The polymer to be used shall be MONOBOND-2000 or equivalent. Colour: Milky white liquid.

Solid content: The polymer solid content shall be 36 ± 1 percent. The particles shall be of nearly spherical shape with a diameter of 0.35 ± 0.05 micron. The manufacturer shall certify the above requirements about solid content & grain size. In order to

keep control over the quality, the manufacturer shall provide infrared absorption spectrum analysis for the material to be supplied by them.

Mixing proportion: Anti-corrosive polymer modified mortar

- Cement - 100 parts by weight
- Monobond-2000 - 40 parts by weight
- Silica sand - 300 parts by weight

The sand, which is to be used for constituting the PMC repair mortar, should be silica sand as the basic material, which is categorized in two groups.

- a) Coarse Silica and
- b) Fine Silica

The grading of the above groups should follow the limits provide below.

Quartz sand.

| I.S. Sieve No. | Percentage passing by weight |
|----------------|------------------------------|
| 10 mm | 100 |
| 4.75 mm | 100 |
| 2.36 mm | 100 |
| 1.18 mm | 85 - 90 |
| 600 microns | 45 - 55 |
| 300 microns | 15 - 20 |
| 150 microns | 5 - 10 |
| 75 microns | 0 - 3 |

In the event of using local sand, the sand to be used must satisfy the limits of deleterious materials & the requirements of soundness as given in Cl 3.2.1 & Cl 3.6 respectively of IS: 383, confirmatory test shall be conducted by the contractor and sample kept for comparison by the Engineer.

Curing

Air-corrosive polymer modified mortar curing procedure outline apply to normal weather conditions. Under hot weather, take precautions to avoid drying. PMC work should be carried out at a temperature below 40° C.

Under unusual weather conditions e.g. high humidity and / or high wind velocity or imposed constraints special curing procedure shall be followed for which approval shall be obtained from the engineer.



Anti-drying shall be considered to be taken place only during favourable uninterrupted weather condition existing throughout the existing recommend drying period. Some judgments shall be made in this respect & if conditions are deemed unfavourable for drying to occur, then drying must be prolonged for the full recommend period after weather clears.

As PMC work proceeds, precautions shall be taken to prevent rapid drying of the PMC repair mortar. This is usually accomplished by covering the filled surfaces with an impermeable sheet shortly after the work has been done.

The sheet shall be kept in place until further work is carried out over the mortar or in case where the mortar is likely to be disturbed the sheet shall be kept in place for 24 hours.

No foot traffic for further work shall be allowed over mortar until 12 hours after the time of the completion of work.

Curing compound may also be used as curing membrane. Care shall be taken to ensure complete covering particularly around the interface with the host concrete.

For the first day the repaired concrete patch shall be protected from harsh environment by laying a polythene sheet over it, lapping down the edges.

Mixing PMC

Methods of Mortar mixing

To mix PMC, it is necessary to have the following items:

- A suitable sized non-ferrous mixing container preferably plastic.
- A high-speed drill with mixing paddles.
- Promark batching containers for measuring out components to be mixed.

Pour all the liquid polymers latex into mixing container. After shaking the latex to disperse the solid uniformly throughout the liquid before use, begin mechanical mixing & while doing so, slowly add the dry components, i.e. cement & sand.

Mix for about 5 minutes until solids have been well dispersed. The resulting mix should look uniform, feel creamy & be free from lumps & grits.

Precautions shall be taken not to entrap an excessive amount of air into the mix during mixing.

Since the desired consistency depends on type & brand of cement as well as weather conditions start a trial mix with a reduced amount of cement. Once all components are mixed, add cement if necessary to achieve the desired consistency. Record the amounts of cement required & use this for subsequent mixes. Do not reduce the quantity of cement noted in the Mix Proportions.

In case the slurry sets before application of mortar, a fresh coat of slurry shall be applied. Under no circumstances, water shall be added in PMC repairs mortar mix.



Unused mortar or mortar which has partially set shall not be re-mixed & used.

Mechanical Strength of Mortar

Anti-corrosive polymer modified mortar shall have the following:

| | 7 day | 28 days |
|---|----------------------|----------------------|
| Compressive strength | 18 N/MM ² | 38 N/MM ² |
| Flexural strength (IS 5816 –1959) | - | 10 N/MM ² |
| Split tensile strength (IS 5816 – 1959) | - | 6 N/MM ² |

For anti –corrosion polymer modified bonding slurry

The anti-corrosive polymer modified bonding slurry shall be QA Acrylic base MONOBOND 2000 or equivalent.

The bonding slurry should remain in tacky state prior to placing of the freshly mixed concrete or mortar.

Mixing proportions of Bonding Slurry are as follows:

| | | |
|------------------|---|---------------------|
| Cement | - | 100 parts by weight |
| MONOBOND 2000 | - | 40 parts by weight |
| Fine Silica sand | - | 100 parts by weight |

The fine silica sand, which is to be used for consistency in anti-corrosive polymer modified bonding slurry, should be with fine silica sand with following sieve sizes.

| I.S. Sieve No. | Percentage passing by weight |
|----------------|------------------------------|
| 10 mm | 100 |
| 4.75 mm | 100 |
| 2.36 mm | 100 |
| 1.18 mm | 100 |
| 600 microns | 90-100 |
| 300 microns | 40-60 |
| 150 microns | 0-10 |
| 75 microns | 0-3 |

Mechanical Strength of Bonding Slurry



Bond Strength –

- WET - 3-4 N/MM²
- DRY - 7-8 N/MM²

Above bonding slurry should conform to following properties.

- ASTM-C1059-86 (Latex agents for bonding fresh to old concrete)
- ASTM-C1042-86 (Bond strength of latex system with cement)
- Pot life: 1 hour for 5 kg bonding slurry mix.

CLAUSE 2821 REPAIR TO VOID IN ARCHES WITH PMC MORTAR

The voids created in the masonry arches by dislodged stones shall be filled with PMC mortar.

The surface shall be thoroughly cleaned with wire brush and oil free blast. Before applying PMC repairs, the prepared substrate shall be thoroughly soaked with clean water. Free surface water shall be removed before priming. The substrata shall be primed with PMC slurry. Repair mortar shall be applied before primer has set i.e. within 20-30 minutes. The mortar shall be applied with trowel and shall be well worked inside and compacted. The surface shall be smooth finished to match the adjacent surface. Unused mortar or mortar which has partially set shall not be used. Mortar shall be applied in layers to avoid sagging. Manufacturers' recommendation shall be followed. Specifications given in Clause 2818 shall be followed.

CLAUSE 2822 SEALING OF CRACKS IN CONCRETE IN PIER / ABUTMENT CAPS, SLABS, GIRDERS, PEDESTAL WALLS ETC. WITH EPOXY RESIN INJECTION.

The work is to seal all cracks in concrete in pier/abutment caps, slabs, girders, pedestal walls etc.

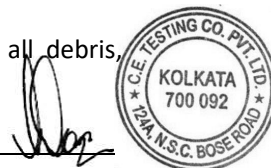
The work shall be executed in accordance with Specifications Section 2800 clauses 2803 & 2804.

The cracks shall be sealed with epoxy mortar prior to injection.

CLAUSE 2823 INSPECTION & CLEANING OF BRIDGE BEARINGS AND GREASING OF STEEL ROCKER-ROLLER / PLATE BEARINGS AND REMOVAL OF ALL DEBRIS AROUND BEARINGS.

The work shall consist of inspection of bearings to check whether the bearings are functioning properly and if any parts of the bearing or nuts and bolts are missing, to replace them. The work shall also include cleaning of bearings and oiling and greasing of metallic bearings, wherever required. Realignment/ readjustment of bearings, and replacement of missing parts of metallic bearings, requiring jacking up of superstructure is excluded from the scope of work. Replacement of existing bearings with new bearings is also excluded from the scope of the work.

The area around the bearings and their pedestals shall be cleared of all debris, vegetation, dust etc. and cleaned for proper inspection.



When grease boxes are fixed around the metallic bearings, (a) the same shall be permanently removed along with the old grease and (b) bearings shall be cleaned for proper inspection.

In case of elastomeric bearings, these shall be inspected for their proper seating, rotation, bulging, cracking, splitting etc. and a record thereof shall be provided to the Engineer for necessary instructions.

In respect of metallic bearings, fresh graphite grease as approved by the Engineer shall be applied to the surfaces, which are sliding, rotating or moving due to movement in bearings. The materials, specially, graphite grease, required for oiling and greasing of metallic bearings, wherever required, shall be as per approval of the Engineer. Grease used shall be such that it retains its properties for long life and shall not affect the bearing parts. All other surfaces of the metallic bearings shall be cleaned of all rusts, corrosion and a coat of anti-corrosive oil paint applied as per directions of the Engineer.

Missing parts of metallic bearings, nuts and bolts etc. shall be replaced by the contractor at no extra cost to the Employer.

CLAUSE 2824 CONTROLLED JACKING UP OF SUPER STRUCTURE FOR RESETTING/ REPLACEMENT OF ROCKER AND ROCKER CUM ROLLER BEARINGS, SEGMENTAL BEARINGS AND ELASTOMERIC BEARINGS

The work shall be executed before laying of new wearing coat and expansion joint. The superstructure shall be jacked up nominally at abutment end for resetting of the bearings. Jacking up of superstructure is a specialized work. Contractor shall furnish a methodology statement with his proposal for resetting/repair of bearings. Lifting shall be done through hydraulically operated jacks. The jacks shall be placed under cross diaphragm. Adequate distribution plates shall be placed at top and bottom of the jack to reduce the stress on concrete. If the soffit of the cross diaphragm is weak, the same shall be first repaired with epoxy mortar and / or epoxy injection and lifting will commence only after such repair work is fully cured. In addition to jacks, the span will also be supported on packing plates which shall be placed under the cross diaphragm between the jacks. The extent of lifting shall be decided by the Engineer.

Only proven type of jacks shall be used. These jacks shall be provided with lock nut system. The jacks shall be randomly tested for 1.5 times the capacity. In lifted condition the span will be supported on the lock nut arrangement of the jacks with no pressure on the hydraulic circuit. The contact stress on concrete shall not exceed 30 MPa. Suitable M.S. distribution plates have to be provided at top and bottom of the jack for this purpose. All jacks shall be connected to a common pump and it will be ensured that the deck is lifted equally upstream & downstream. For monitoring this, dial gauges shall be provided. Only steel packing plates shall be used. Specification for epoxy mortar / epoxy injection shall be followed for repair to soffit of cross diaphragm.

The cross diaphragms shall be closely watched during lifting and also for the entire duration when the span is supported on jacks and packing. If development of cracks is observed, the lifting will be stopped and alternate arrangement for supporting the superstructure shall be made subject to approval of Engineer.



The cost of all operations under this clause including all tools and plant, materials, jacks, pumps, labour etc. shall be incidental to cost of resetting / replacement of bearings.

CLAUSE 2825 APPLYING 1:3 CEMENT MORTAR TO EXPOSED SURFACE OF MASONRY OF EXISTING WING WALLS / RETURNS, ABUTMENT PIERS

All exposed masonry surface of existing wing walls / returns abutments, piers etc. shall be provided with 20 mm thick plaster where required. Walls / Returns and Retaining Wall at Sides of Approach Slabs with Brick Masonry shall be provided cement plaster in 1:3 cement mortar, 20 mm thick.

Existing wing walls and returns wherever deficient shall be built up and retaining walls shall be constructed at sides of the approach slabs as shown in the drawings.

The work shall be done in accordance with Specifications Section 1300. Masonry for construction of short retaining walls at sides of approach slab shall be laid over a 100 mm thick M 15 PCC levelling course.

CLAUSE 2826 BUILDING UP OF EXISTING WING WALLS/RETURNS AND RETAINING WALL AT SIDES OF APPROACH SLABS WITH BRICK MASONRY AND FINISHING WITH 1:3 CEMENT MORTAR 20mm THICK

Existing wing walls and returns wherever deficient shall be built up and retaining walls shall be constructed at sides of the approach slabs as shown in the drawings. The work shall be done in accordance with Specifications Section 1300. Masonry for construction of short retaining walls at sides of approach slab shall be laid over a 100 mm thick M 15 PCC leveling course.

CLAUSE 2827 SEALING OF WIDE GAPS AT JUNCTION OF WING WALL AND ABUTMENT WITH BRICK BATS AND FINISHING WITH 1:3 CEMENT MORTAR INCLUDING PROVIDING BITUMINOUS DEBONDING LAYER

Due to settlement of the wing wall a gap being created at the junction of the wing wall and the abutment, shall be sealed by filling with brickbats and finishing with plaster.

The abutment face of the gap shall be coated with one layer of bituminous compound. The gap shall be filled with bricks bats and rammed. The vertical exposed surface of the gap shall be plastered. Thereafter cement slurry shall be poured from the top under gravity till refusal. The top surface of the gap shall then be plastered and finally finished.

CLAUSE 2828 EARTH FILLING BELOW APPROACH SLAB

Cavities underneath the slab shall be filled.

The work shall be executed in accordance with Technical Specifications Section 300 clause 305. The cavities formed below the approach slabs shall be filled with approved back fill material. The filling shall be done in layers not exceeding 150mm. The masonry retaining wall shall also be built up in companion layers of 150mm. The compaction shall be done with the help of suitable equipment after necessary

watering.

CLAUSE 2829 CASTING OF APPROACH SLAB

The grade of concrete shall be as indicated in drawings/BOQ.

Approach slabs, which are cracked / missing or otherwise damaged shall be recast.

The work shall be executed in accordance with Specifications Section 2700 clause 2704. The approach slab shall be laid over lean concrete as per drawing. The base shall be consolidated to proctor density 98%.

CLAUSE 2830 STONE PITCHING ON SLOPES GROUTED WITH 1:3 CEMENT MORTAR

Slope protection with stone pitching shall be provided at abutments as indicated in drawing. The work shall be executed in accordance with Specifications, Section 2500.

CLAUSE 2831 PROVIDING AND PLACING IN POSITION MECHANICALLY FABRICATED GABION WALL AROUND ABUTMENT AND PIERS INCLUDING EXCAVATION AND BACK FILLING

The work shall be executed in accordance with Specifications Section 2500 clause 2503. Excavation and back filling shall be done in accordance with Specifications Section 300.

Gabions shall consist of a double twisted Zinc & PVC coated wire mesh container of variable sizes, uniformly partitioned into internal cells, interconnected with other similar units, and filled with stone at the site to form flexible permeable, monolithic structures. Mechanically fabricated double twisted hexagonal mesh type gabion such as Maccaferri or equivalent conforming to ASTM/ BS specifications shall be used.

Mechanically fabricated double twisted hexagonal mesh shall be approved by the Engineer prior to procurement and use.

CLAUSE 2832 the existing clause 2813 of the Specifications shall be renumbered as 2832

CLAUSE 2833 the existing clause 2814 of the Specifications shall be renumbered as 2833.

Add the following as items (h) to (w).

- | | | |
|----|---|-----------------|
| h) | Dismantling of kerbs, railings, parapets, footpaths, solid slab superstructure or part of slab and approach slabs, etc. RCC and masonry items shall be measured under separate heads. |cum |
| i) | Steel handrail | ..running metre |
| j) | Dismantling of existing damaged brick masonry |cum |
| k) | Dismantling of course rubble masonry wings walls, piers, abutments and their foundations |cum |
| l) | Provision of dowel bars |Nos |

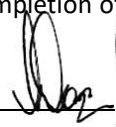
| | | |
|----|--|---------|
| m) | Drainage spouts |Nos |
| n) | Repairs to concrete with PMC mortar with average thickness of 50 mm of mortar applied. |sqm |
| o) | Sealing of cracks in masonry by cement grouting (in terms of weight of cement consumption) |kg |
| p) | Building up of existing course rubble masonry / concrete wing walls |cum |
| q) | Repair of voids in arches |cum |
| r) | Sealing of cracks in RCC abutments, piers, slabs, girders etc. by epoxy injection (In terms of weight of epoxy actually consumed for mortar and injection) |kg |
| s) | Earth fill below approach slabs |cum |
| t) | Concrete in approach slab |cum |
| u) | Inspection, cleaning and greasing of bearings |Nos |
| v) | Stone pitching |cum |
| w) | Gabion Walls |cum |

Existing clause 2813 of specifications shall be renumbered as 2832.

CLAUSE 2834 RATE

Add the following at the end of the Clause.

- i) The contract unit rate for dismantling of existing railing / parapets shall include the cost of all materials, labour, tools and plants, disposal of dismantled materials, safety measures and all other incidental expenses necessary for the completion of work as per specifications.
- ii) The contract unit rate for dismantling of existing wing walls shall include the cost of all materials, labour, tools and plants, disposal of dismantled materials, safety measures and all other incidental expenses necessary for completion of work as per specifications.
- iii) The contract unit rate for providing dowel bars shall include the cost of all materials, labour, tools and plant, drilling of holes, placing dowel bar in position, grouting with non-shrink free flow cement, wastage, sampling, testing and all other incidental expenses necessary for completion of work excluding steel reinforcement as per specifications.
- iv) The contract unit rate for repair to leached, honeycombed, spalled concrete by PMC or guniting shall include the cost of all materials, labour, tools and plants, safety measures and all other incidental expenses necessary for completion of work as per specifications for the respective items.




- v) The contract unit rate of earth filling below approach slab shall include the cost of all materials, labour, tools and plants and all other incidental expenses necessary for completion of work as per specifications.
- vi) The contract unit rate for approach slabs shall include the cost of all materials, labour, tools and plants and all other incidental expenses necessary for completion of work as per specifications.
- vii) The contract unit rate for cleaning of bearing shall include the cost of all materials, labour, operations, tools and plants and all other incidental expenses necessary for completion of work as per specifications.
- viii) The contract unit rate for stone pitching shall include the cost of all materials, labour, tools and plants and all other incidental expenses necessary for completion of work as per specifications.

SECTION 3000 MAINTENANCE OF WORK

Clause 3002 RESTORATION OF RAIN CUTS

Clause 3002.1 Scope

The work shall consist of earthwork for restoration of rain cuts in the embankment and shoulders, using suitable material, and compacting the same.

Clause 3002.2 Materials

The materials used for restoration of rain cuts shall consist of soil conforming to clause 305.2.

Clause 3002.3 Construction Operation

The area affected by rain cuts shall be cleared of all loose soil and benched. The width of the benches shall be at least 300mm and they shall extend continuously for a sufficient length the height of the benches shall be in the range of 150-300mm.

Fresh material shall be deposited in layer not exceeding 250mm loose thickness and compacted so as to match with the benching at the moisture content close to the optimum. Compaction shall be carried out using suitable equipment such as plate compactors and rammers or by suitable implements handled manually.

Clause 3002.4 Measurement of Payment

The earthwork for restoration of rain cuts shall be measured in cubic meters.

Clause 3003 MAINTENANCE OF EARTHEN SHOULDER

Clause 3003.1 Scope

The work of maintenance of earth shoulder shall include making up the irregularities/loss of material on shoulder to the design level by adding fresh approved soil and compacting it with appropriate equipment or to strip excess soil from the shoulder surface as per the requirement of this Specification.

Clause 3003.2 Material

The material to be added to the shoulder, if required, shall be a select soil.

Clause 3003.4 Measurement of Payment

Maintenance of earthen shoulder shall be measured in sq. meters.

Clause 3004.2 Filling Pot-holes and Patch Repairs

Clause 3004.2.1 Scope

This work shall include repair of Pot-holes and patching of all types of bituminous pavement.

The work shall include the removal of all failed material, in the pavement courses and, if necessary, below the pavement, until the root cause of the failure is removed; the trimming of the completed excavation to provide firm vertical faces; The replacement of material of at least as high a standard as that which was originally specified for the pavement layer; the painting of tack coat on to the sides and bases of excavations prior of placing of any bituminous materials and the compaction, trimming and finishing of the surfaces of all patches to form a smooth continuous surfaces, level with the surrounding road.

Clause 3004.2.5 Measurement of Pavement

Filling of Pot-holes and patch repair shall be measured in sq. m.



ADDITIONAL TECHNICAL SPECIFICATION

Appendix A-1 :: SPECIFICATION FOR PASSENGER SHELTER

1. Scope

The work consists of providing passenger shelter including seating arrangement as per drawing.

2. Description

2.1 Passenger Shelter

It will be a permanent structure supported on R.C. columns at the corners and having sloped reinforced concrete slab with protrusions on all sides. Panel walls on three sides shall be built with brick jail of 125mm thick set in cement mortar 1:4 (1 part cement : 4 parts sand). It shall have seating arrangement with 100mm thick R.C. slab with raised back with atleast 1.5% reinforcement. The mix of concrete for seating slab and back shall be nominal one with 1:2:4 (1 part cement : 2 parts sand : 4 parts stone chips) and it will be finished with neat cement punning not less than 3mm thickness. The flooring shall be with 75mm thick B.F.S. flooring (1:2:4) over 100mm thick M-10 grade concrete. All walls, ceiling and roof top shall be finished with cement mortar (1:3). The exposed surfaces of the structure shall be painted with two coats of cement based paint of make and brand approved by the Engineer.

3.0 Measurement for Payment

The passenger shelter shall be measured in number of finished constructed structure.

4.0 Rate

The Contract unit rate shall be payment in full for construction of the passenger shelter. Raised footpath, ground preparation etc. shall be considered as incidental to work.



Appendix A-2:: PAINTING OF STRUCTURES WITH SYNTHETIC ENAMEL PAINT FOR NUMBERING & SPAN DETAILS OF BRIGES / CULVERTS AND WATER PROOF CEMENT PAINT FOR PARAPET, RAILING, KERB AND CRASH BARRIER

1. Painting with Synthetic Enamel Paint

Materials

Synthetic enamel paint confirming 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.

Painting on New Surface

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 Engineer after inspection, before painting is commenced..

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.

Lettering and Numbering on New Surface:

The letters and numbers for bridges/culverts span and number shall be as per IRC-7-1971. The size of area for painting shall be varied depend 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.

Measurement for payment:

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

Rate:

Rate 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.

2. Water Proof Cement Painting

Material:

The water proof cement paint shall be (conforming to IS: 5410) of approved brand and manufacture.

The water cement paint shall be brought to the site of work by the contractor in its original container in sealed condition. The material shall be brought in at a time in adequate to suffice for the whole work or at least a fortnight's work, the material be kept in the joint custody of the Contractor and the Engineer-in-Charge. The empties shall not be removed from the site of work till the relevant item of the work has been completed and permission obtained from the Engineer-in-Charge.

Preparation of Surface:

For New work, the surface shall be thoroughly cleaned of all mortar dropping, dirt, dust, algae, grease and other foreign matter by brushing and washing. Pitting in plaster shall be made good and a coat of waterproof cement paint shall be applied over patches after wetting them thoroughly.

Preparation of mix:

Cement paint shall be mixed in such quantities as can be used up within an hour of its mixing as otherwise the mixture will set and thicken, affecting flow and finish, Cement paint shall be mixed with water in two stages. The first stage shall comprise of 2 parts of cement paint and one part of water stirred thoroughly and allowed to stand for 5 minutes. Care shall be taken to add the cement paint gradually to the water and not vice versa. The second stage shall comprise of adding further one part of water to the mix and stirring thoroughly to obtain a liquid of workable and uniform consistency. In all cases the manufacturer's instructions shall be followed meticulously.

The lids of cement paint drums shall be kept tightly closed when not in use, as by exposure to atmosphere the cement paint rapidly becomes air set due to its hygroscopic qualities.

In case of cement paint brought in gunny bags, once the bag is opened, the contents should be consumed in full on the day of its opening. If the same is not likely to be consumed in full, the balance quantity should be transferred and preserved in an airtight container to avoid its exposure to atmosphere.

Application :

The solution shall be applied on the clean and wetted surface with brushes or spraying machine. The solution shall be kept well stirred during the period of application. It shall be applied on the surface which is on the shady side of the building so that the direct heat of the sun on the surface is avoided. The method of application of cement paint shall be as per manufacturer's specification. The completed surface shall be watered after the day's work.

The second coat shall be applied after the first coat has been set for at least 24 hours. Before

application of the second or subsequent coats, the surface of the previous coat shall not be wetted.

For the work, the surface shall be treated with three or more coat of waterproof cement paint as found necessary to get a uniform shade.

For old work, the treatment shall be with one or more coats as found necessary to get a uniform shade.

Precaution:

Water proof cement paint shall not be applied on surfaces already treated with white wash, colour wash, distemper dry or oil bound, varnishes, paints, etc. It shall not be applied on gypsums, wood and metal surfaces.

If water proof cement paint is required to be applied on existing surfaces previously treated with white wash, colour wash, etc., the surface shall be thoroughly cleaned by scrapping off all the white wash, colour was etc., completely. Thereafter, a coat of cement primer shall be applied followed by two or more coats of water proof cement paint.

Measurement for Payment:

The painting shall be measured in square metre of surface area treated.

Rate:

Rate shall include one prime coat and two coats of the paint over the prime coat including cost of all labour and materials involved in all operations described above.



Appendix A-3 :: SPECIFICATION FOR DISMANTLED MATERIAL REUSE IN GRANULAR SUB-BASE

1. Scope

The work consists of reusing the dismantled material in preparing granular sub-base.

2. Materials

The material used for work shall be collected from dismantled material of existing granular layer of road. The dismantled material shall be transported to batching plant to separate the materials of required grading. The finished granular material shall be mixed depending upon the required gradation. Use of materials like brick metal, kankar and crushed concrete shall be permitted in the lower sub-base. The reused material collected from dismantled material shall be free from organic or other deleterious constituents and shall conform to the grading given in Table 400-1.

3.0 Measurement for Payment

The Reused Granular Sub-Base shall be measured separately as finished in position in cubic metres.

4.0 Rate

The Contract unit rate shall be payment in full for carrying out the required operations including full compensations for:

- i.) Making arrangements for traffic to clause 112 except for initial treatment to verges, shoulders and construction of diversions.
- ii.) Supplying all materials to be incorporated in the work including all royalties, fees, rents where applicable with all leads and lifts
- iii.) All labour tools, equipments and incidentals to complete work to the specifications.
- iv.) Carrying out the work in part widths of road where directed: and
- v.) Carrying out the required tests for quality control.



VOLUME - VI

RATE ANALYSIS



SCHEDULE OF RATE



Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|------------|---|------|------------|
| 1 | 02.01/i | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth from 300 mm to 600 mm | Each | 388.42 |
| 2 | 02.01/ii | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 600 mm to 900 mm | Each | 716.32 |
| 3 | 02.01/iii | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 900 mm to 1800 mm | Each | 1,360.04 |
| 4 | 02.01/iv | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 1800 mm to 2700 mm | Each | 2,550.68 |
| 5 | 02.01/v | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 2700 mm | Each | 4,287.80 |
| 6 | 02.03/a/i | Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable materials and stacking of serviceable materials and stacking of serviceable materials upto 100m. from road boundary. (by manual means) In area of light jungle | Ha | 77,440.00 |
| 7 | 02.03/a/ii | Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable materials and stacking of serviceable materials and stacking of serviceable materials upto 100m. from road boundary. (by manual means) In area of thorny jungle | Ha | 103,818.00 |
| 8 | 02.03/b | Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable materials and stacking of serviceable materials and stacking of serviceable materials upto 100m. from road boundary. (by mechanical means) | Ha | 59,319.65 |
| 9 | 02.04/i/a | Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. a) Lime concrete, cement concrete/lean mix concrete. | cum | 591.45 |

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|-------------|---|------|----------|
| 10 | 02.04/i/b | Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. b)Cement concrete M15 and M20 | cum | 693.57 |
| 11 | 02.04/i/c | Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. c)Pre- stressed/ Reinforced Cement Concrete grade M20 & above | cum | 1,739.01 |
| 12 | 02.04/ii/a | Dismantling Brick / Tile work a)In lime | cum | 387.20 |
| 13 | 02.04/ii/b | Dismantling Brick / Tile work b)In cement mortar | cum | 489.32 |
| 14 | 02.04/ii/c | Dismantling Brick / Tile work c)In mud | cum | 346.35 |
| 15 | 02.04/ii/d | Dismantling Brick / Tile work d)Dry brick pitching or brick saling | cum | 325.93 |
| 16 | 02.04/iii/a | Dismantling stone masonry a) Rubble stone masonry in lime | Cum | 423.46 |
| 17 | 02.04/iii/b | Dismantling stone masonry b) Rubble stone masonry in cement mortar | Cum | 489.32 |
| 18 | 02.04/iii/c | Dismantling stone masonry c) Rubble stone masonry in mud | Cum | 387.20 |
| 19 | 02.04/iii/d | Dismantling stone masonry d) Dry rubble masonry | Cum | 366.78 |
| 20 | 02.04/iii/e | Dismantling stone masonry e) Dismantling stone pitching/dry stone spalls | Cum | 423.02 |
| 21 | 02.04/iii/f | Dismantling stone masonry f) In wire crates including opening of crates and stacking crates materials. | Cum | 387.20 |

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|---------------------|---|------|----------|
| 22 | 02.04/v | Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. steel works in all type of sections upto a height of 5m or above plinth level excluding cutting of rivet A) Including Dismembering | cum | 2,027.17 |
| 23 | 02.04/vii/a | Removing hume pipes class NP-3 a) 300mm to 600mm dia | rm | 264.99 |
| 24 | 02.04/vii/b | Removing hume pipes class NP-4 b) Above 600mm to 900mm dia | rm | 358.77 |
| 25 | 02.04/vii/c | Removing hume pipes class NP-5 c) Above 900mm dia | rm | 614.08 |
| 26 | 02.04/viii/a | Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m a) Top bituminous surface dressing or premix carpet | sqm | 41.43 |
| 27 | 02.04/viii/b | Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m c) Stone metal crust, 50mm to 100mm thick by road roller with scarifier along with 20mm,premix carpet/surface dressing | sqm | 57.31 |
| 28 | 02.04/viii/d | Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m d) Kankar/Gravel metal crust upto 150mm thick with pickaxes. | sqm | 41.53 |
| 29 | 02.04/viii/e | Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m e)Kandar/Gravel metal crust upto 150 mm thick with power Roller with scarifier | sqm | 33.99 |
| 30 | 02.04/viii/f /ii | Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m f)Bituminous coarses 50-70mm along with premix Carpet and Surface dressing but without disturbing the base ii)With road roller attached with scarifier | sqm | 57.08 |
| 31 | 02.06 | Dismantling Guard Rails by manual means and disposal of dismantled material with all lifts and up to a lead of 1000 metres, stacking serviceable materials and unserviceable materials separately. | rm | 118.94 |
| 32 | 02.08 | Removal of Telephone / Electric Poles including excavation and dismantling of foundation concrete and lines under the supervision of concerned department, disposal with all lifts and up to a lead of 1000 metres and stacking the serviceable and unserviceable material separately | each | 258.70 |

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|---------------|--|------|----------|
| 33 | 02.4/viii/f/i | Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m f)Bituminous coarses 50-70mm along with premix Carpet and Surface dressing but without disturbing the base i)Manual Means | sqm | 93.23 |
| 34 | 02/nsc/1 | Supplying and laying Hydro Seeding on cutting Surface | sqm | 315.00 |
| 35 | 03.01/i/a | Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Ordinary soil a) Manual Means (Depth upto 3m) a) Manual Means (Depth upto 3m) | cum | 408.50 |
| 36 | 03.01/i/b | Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Ordinary soil b) Mechanical Means (Depth upto 3m) b) Mechanical Means (Depth upto 3m) | cum | 105.88 |
| 37 | 03.01/ii/a | Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Ordinary Rock (not requiring blasting) a) Manual Means (Depth upto 3m) a) Manual Means (Depth upto 3m) | cum | 510.60 |
| 38 | 03.01/ii/b | Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Ordinary Rock (not requiring blasting) b) Mechanical Means b) Mechanical Means | cum | 142.33 |

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|-------------|--|------|----------|
| 39 | 03.01/iii/a | Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Hard Rock (requiring blasting) a) Manual Means a) Manual Means | cum | 982.17 |
| 40 | 03.01/iii/b | Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Hard Rock (requiring blasting) b) Hard Rock (blasting prohibited) Mechanical Means b) Hard Rock (blasting prohibited) Mechanical Means | cum | 1,900.61 |
| 41 | 03.01/iv/a | Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Marshy soil a) Manual Means a) Manual Means | cum | 773.37 |
| 42 | 03.01/iv/b | Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Marshy soil b) Mechanical Means b) Mechanical Means | cum | 269.34 |
| 43 | 03.02/i | Earth work in excavation of foundation trenches etc. in drains and channels etc. not exceeding 2.00 metres depth including dressing of bottom and sides of trenches, stacking the excavated soil clear from the edge of excavation including disposal of surplus soil as directed within a lead of 30.00 metres. Ordinary Soil | cum | 326.80 |
| 44 | 03.02/ii/a | Earth work in excavation of foundation trenches etc. in drains and channels etc. not exceeding 2.00 metres depth including dressing of bottom and sides of trenches, stacking the excavated soil clear from the edge of excavation including disposal of surplus soil as directed within a lead of 30.00 metres. Blasting work a) Soft rock a) Soft rock | cum | 785.74 |

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|-------------|--|------|----------|
| 45 | 03.02/ii/b | Earth work in excavation of foundation trenches etc. in drains and channels etc. not exceeding 2.00 metres depth including dressing of bottom and sides of trenches, stacking the excavated soil clear from the edge of excavation including disposal of surplus soil as directed within a lead of 30.00 metres. Blasting work b) Hard rock b) Hard rock | cum | 1,520.49 |
| 46 | 03.02/iii/a | Earth work in excavation of foundation trenches etc. in drains and channels etc. not exceeding 2.00 metres depth including dressing of bottom and sides of trenches, stacking the excavated soil clear from the edge of excavation including disposal of surplus soil as directed within a lead of 30.00 metres. Chiselling/wedging out of rock (where blasting is prohibited). a) Soft rock a) Soft rock | cum | 1,765.25 |
| 47 | 03.02/iii/b | Earth work in excavation of foundation trenches etc. in drains and channels etc. not exceeding 2.00 metres depth including dressing of bottom and sides of trenches, stacking the excavated soil clear from the edge of excavation including disposal of surplus soil as directed within a lead of 30.00 metres. Chiselling/wedging out of rock (where blasting is prohibited). b) Hard rock b) Hard rock | cum | 2,647.87 |
| 48 | 03.03/a | Filling in foundation trenches as per drawing and Technical specification a) Sandy Soil | cum | 326.10 |
| 49 | 03.03/b | Filling in foundation trenches as per drawing and Technical specification b) Sand Gravel | cum | 692.96 |
| 50 | 03.04/i | Earth filling with surplus soil excavated from foundation and taken only from outside of building plinth in 15 cm layers including watering and consolidation lead 30 meters Ordinary Soil | cum | 217.49 |
| 51 | 03.12 | Construction of Embankment with Material Obtained from Borrow Pits Construction of embankment with approved material obtained from borrow pits with all lifts and leads, transporting to site, spreading, grading to required slope and compacting to meet requirement of table 300-2 | cum | 226.26 |
| 52 | 03.13 | Construction of Embankment with Material Deposited from Roadway Cutting Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2 | cum | 160.20 |
| 53 | 03.14/Nsc | Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from Roadway Cutting with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2 | cum | 246.28 |

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|----------|---|------|----------|
| 54 | 03.14 | Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2 | cum | 312.34 |
| 55 | 03.15 | Compacting original ground supporting subgrade Loosening of the ground upto a level of 500 mm below the subgrade level, watered, graded and compacted in layers to meet requirement of table 300-2 for subgrade construction. | cum | 86.65 |
| 56 | 03.16 | Compacting original ground supporting embankment Loosening, leveling and compacting original ground supporting embankment to facilitate placement of first layer of embankment, scarified to a depth of 150mm, mixed with water at OMC and then compacted dry rolling so as to achieve minimum dry density as given in Table 300-2 for embankment construction. | cum | 42.00 |
| 57 | 03.17 | Stripping and Storing Top Soil Stripping, storing of top soil by road side at 15 m internal and re-application on embankment slopes, cut slopes and other areas in localities where the available embankment material is not conducive to plant growth | cum | 302.68 |
| 58 | 03.19 | Turfing with Sods Furnishing and laying of the live sods of perennial turf forming grass on embankment slope, verges or other locations shown on the drawing or as directed by the engineer including preparation of ground, fetching of sods and watering | sqm | 61.87 |
| 59 | 03.31 | Excavation in Hill Area in Soil by Mechanical Means Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres | cum | 211.39 |
| 60 | 03.32 | Excavation in Hilly Area in Ordinary Rock by Mechanical Means not Requiring Blasting. Excavation in hilly area in ordinary rock not requiring ballasting by mechanical means including cutting and trimming of slopes and disposal of cut material with all lift and lead upto 1000 metres | cum | 304.56 |
| 61 | 03.33 | Excavation in Hilly Areas in Hard Rock Requiring Blasting Excavation in hilly areas in hard rock requiring blasting, by mechanical means including trimming of slopes and disposal of cut material with all lifts and lead upto 1000 metres. | cum | 423.10 |
| 62 | 03/nsc/1 | Island and Median Filling From Roadway Cutting | cum | 108.52 |
| 63 | 04.01/i | Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- II Material | Cum | 2,949.87 |
| 66 | 04.01/ii | Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading-III Material | Cum | 2,893.00 |

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|------------|--|------|----------|
| 69 | 04.01/Nsc1 | Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material | Cum | 2,997.00 |
| 72 | 04.02/i | Sub-base with Close Graded Material (Table:- 400-1) By Mix in Place Method Construction of granular sub-base by providing close graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401 For Grading- II Material | Cum | 2,413.12 |
| 75 | 04.02/ii | Sub-base with Close Graded Material (Table:- 400-1) By Mix in Place Method Construction of granular sub-base by providing close graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401 For Grading-III Material | Cum | 2,356.25 |
| 78 | 04.03/i | Granular Sub-Base with Coarse Graded Material (Table:- 400- 2) Construction of granular sub-base by providing coarse graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401 For Grading- II Material | Cum | 2,285.30 |
| 80 | 04.03/ii | Granular Sub-Base with Coarse Graded Material (Table:- 400- 2) Construction of granular sub-base by providing coarse graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401 For Grading-III Material | Cum | 2,230.59 |
| 82 | 04.04 | Granular Sub-Base with Naturally Occuring Sand Gravel Material Providing, laying, spreading and compacting granular base/sub-base according to lines, grades and cross sections by using naturally occurred sand gravel/conforming to IRC-Grd-II of MOST specification free from organic or other deleterious constituent spreading with motor grader and compacted by rolling with power roller of 8-10 capacity in layers not exceeding 150mm (spread thickness) i/c rolling of the road surface to proper level and grades 30 cm width edging on both side etc. complete as directed by Engineer-in-charge. | Cum | 782.55 |
| 84 | 04.06/a | Lime Stabilisation for Improving Subgrade (Laying and spreading available soil in the subgrade on a prepared surface, pulverising, mixing the spread soil in place with rotavator with 3 % slaked lime having minimum content of 70% of CaO, grading with motor grader and compacting with the road roller at OMC to the desired density to form a layer of improved sub grade) By Mechanical Means | Cum | 1,652.44 |

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|-----------|---|------|----------|
| 85 | 04.06/b | Lime Stabilisation for Improving Subgrade (Laying and spreading available soil in the subgrade on a prepared surface, pulverising, mixing the spread soil in place with rotavator with 3 % slaked lime having minimum content of 70% of CaO, grading with motor grader and compacting with the road roller at OMC to the desired density to form a layer of improved sub grade) By Manual Means | Cum | 1,662.67 |
| 86 | 04/nsc1 | Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 | Cum | 2,063.00 |
| 87 | 05.01/b/a | WBM/Providing, laying, spreading and compacting stone aggregate of specific sizes to water bound macadam specification including spreading in uniform thickness, hand packing, rolling with power roller 8-10 tones in stages to proper grade and camber, applying and brooming requisite type of screening & binding materials to fill up the interstices of coarse aggregates, watering and rolling making necessary earthen bund to protect edges, lighting, guarding, barricading and maintenance of diversion etc. | cum | 2,216.15 |
| 90 | 05.02 | Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.) | Cum | 2,965.34 |
| 92 | 05.03 | Construction of footpath/separator by providing a 150 mm compacted granular sub base as per clause 401 and 25 mm thick cement concrete grade M15, over laid with pre-cast concrete tiles in cement mortar including provision of all drainage arrangements but excluding kerb channel. | sqm | 1,374.51 |
| 96 | 06.01/a | Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm | sqm | 57.54 |
| 97 | 06.01/b | Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) B) Stabilised Soil Based / Crusher run macadam 0.9 - 1.2kg /sqm | sqm | 97.04 |
| 98 | 06.02/i | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm | sqm | 15.63 |
| 99 | 06.02/ii | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. ii) On granular Surface Pre treated with prime Coat @ 0.25 - 0.30 kg/sqm | sqm | 17.16 |
| 100 | 06.02/iii | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. iii) On cement concrete pavement @ 0.300 - 0.35 kg/sqm | sqm | 22.22 |

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|-----------|--|------|-----------|
| 101 | 06.06/i | Dense Graded Bituminous Macadam (Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects.) for Grading I (40 mm nominal size) Using bitumen 60/70 | cum | 10,661.33 |
| 104 | 06.06/ii | Dense Graded Bituminous Macadam (Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects.) for GradingII(19 mm nominal size) Using bitumen 60/70 | cum | 10,707.15 |
| 107 | 06.08/i/a | Bituminous Concrete (Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) for Grading-I (19 mm nominal size) A) Using Bitumen 60/70 | cum | 12,064.76 |
| 110 | 06.08/i/b | Bituminous Concrete (Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) for Grading-I (19 mm nominal size) B) Using Bitumen CRMB Gr-55 | cum | 12,622.49 |

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|------------|---|------|-----------|
| 111 | 06.08/i/c | Bituminous Concrete (Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) for Grading-I (19 mm nominal size) C) Using Bitumen PMB 70 | cum | 15,913.73 |
| 112 | 06.08/ii/a | Bituminous Concrete (Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) for Grading-II(13 mm nominal size) A) Using Bitumen 60/70 | cum | 11,950.36 |
| 115 | 06.08/ii/b | Bituminous Concrete (Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) for Grading-II(13 mm nominal size) B) Using Bitumen CRMB Gr-55 | cum | 15,599.71 |
| 116 | 06.08/ii/c | Bituminous Concrete (Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) for Grading-II(13 mm nominal size) C) Using Bitumen PMB 70 | cum | 15,898.91 |
| 117 | 06.10/A | Open - Graded Premix Surfacing Providing, laying and rolling of open - graded premix surfacing of 20 mm thickness composed of 13.2 mm to 5.6 mm aggregates either using penetration grade bitumen or cut-back or emulsion to required line, grade and level to serve as wearing course on a previously prepared base, including mixing in a suitable plant, laying and rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades. A) Mechanical method using Penetration grade Bitumen and HMP of appropriate capacity not less than 75 tonnes/hour . | Sqm | 149.23 |

Item Rate Analysis has been done considering

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|----------|--|------|-----------|
| 119 | 06.10/C | Open - Graded Premix Surfacing Providing, laying and rolling of open - graded premix surfacing of 20 mm thickness composed of 13.2 mm to 5.6 mm aggregates either using penetration grade bitumen or cut-back or emulsion to required line, grade and level to serve as wearing course on a previously prepared base, including mixing in a suitable plant, laying and rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades. C)Open-Graded Premix Surfacing using cationic Bitumen Emulsion | Sqm | 183.17 |
| 121 | 06.12/I | Providing and laying seal coat sealing in the voids in a bituminous surface laid to the specific levels,grade and cross fall using Type A and B Seal Coats Type A | sqm | 67.22 |
| 122 | 06.12/II | Providing and laying seal coat sealing in the voids in a bituminous surface laid to the specific levels,grade and cross fall using Type A and B Seal Coats Type B/Providing and Laying of premix sand seal coat with HMP of appropriate capacity not less than 75 tonnes/hour using crushed stone chipping 6.7mm size and penetration bitumen of suitable grade | sqm | 53.67 |
| 123 | 06.16 | Mastic Asphalt (Providing and laying 25 mm thick mastic asphalt wearing course with paving grade bitumen meeting the requirements given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine-grained hard stone chipping of 13.2 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10 cm center to center in both directions, pressed into surface when the temperature of surfaces not less than 1000C, protruding 1 mm to 4 mm over mastic surface, all complete as per clause 515.) | sqm | 1,182.63 |
| 129 | 06/Nsc1 | Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40 | cum | 11,264.00 |
| 132 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | cum | 12,371.00 |
| 135 | 08.01 | Precast Cement concrete M20 Kerb including fixing at site | rm | 622.79 |

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|-----------|--|------|----------|
| 138 | 08.02/a | Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. a) 5th KM stone | each | 4,556.84 |
| 142 | 08.02/b | Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. b) Ordinary kilometer stone | each | 2,676.24 |
| 146 | 08.02/nsc | M15 stone of standard design fixed in Position including painting and painting letters etc. Hectometer stone (precast) | each | 2,269.00 |
| 150 | 08.04 | Reinforced Cement Concrete M15 Boundary pillars of standard design, fixed in position including finishing but excluding painting | each | 843.03 |
| 153 | 08.05 | Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface. | sqm | 93.41 |
| 154 | 08.06 | Painting on Steel Surfaces Providing and applying two coats of ready mix paint of approved brand on steel surface after through cleaning of surface to give an even shade | sqm | 85.06 |
| 155 | 08.11/i | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm equilateral triangle | each | 4,931.35 |
| 159 | 08.11/ii | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm equilateral triangle | each | 3,621.96 |
| 163 | 08.11/iii | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm circular | each | 4,440.80 |

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|-----------|---|------|-----------|
| 167 | 08.11/iv | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 80 mm x 60 mm rectangular | each | 5,706.23 |
| 171 | 08.11/v | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm x 45 cm rectangular | each | 4,249.15 |
| 175 | 08.11/vi | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm x 60 cm square | each | 5,200.94 |
| 179 | 08.11/vii | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm high octagon | each | 8,165.25 |
| 183 | 08.12 | Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign as per IRC:67 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area not exceeding 0.9 sqm supported on a mild steel single angle iron post 75 x 75 x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing) | sqm | 12,223.04 |
| 187 | 08.13 | Direction and Place Identification signs with size more than 0.9 sqm size board. (Providing and erecting direction and place identification retro- reflectorised sign as per IRC :67 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area exceeding 0.9 sqm supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm, 2 Nos. firmly fixed to the ground by means of properly designed foundation with M 15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) | sqm | 12,831.40 |

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|-------------|--|-------|----------|
| 191 | 08.14 | Road Marking with Hot Applied Thermoplastic Compound with Reflectorisng Glass Beads on Bituminous Surface (Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorisng glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes.) | sqm | 1,002.14 |
| 192 | 08.15/a | Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and confirming toIRC-79 and the drawings.) a)Cat Eye | Nos | 296.53 |
| 193 | 08.15/b | Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and confirming toIRC-79 and the drawings.) b)Median Marker | Nos | 545.50 |
| 194 | 08.15/c/v | Road Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and confirming toIRC-79 and the drawings.) 120x120 -Road Delineator | each | 1,063.19 |
| 195 | 08.15/f/iii | Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and confirming toIRC-79 and the drawings.) f)Speed Bumps(500mm x 425mm x 75mm) | Piece | 3,078.32 |
| 196 | 08.17/nsc | RCC Crash Barrier | m | 6,947.00 |
| 200 | 08.18/A/a | Metal Beam Crash Barrier Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fitments to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810) For post Height of 1.2 m | Rm | 2,757.81 |

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|-----------|--|------|-----------|
| 201 | 08.18/A/b | Metal Beam Crash Barrier Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fitments to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810) For post Height of 1.5 m | Rm | 3,334.08 |
| 202 | 08.18/A/c | Metal Beam Crash Barrier Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fitments to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810) For post Height of 1.8 m | Rm | 3,591.20 |
| 203 | 08.19 | Cable Duct Across the Road Single row for one utility service | m | 3,039.00 |
| 204 | 08.20/ii | Road Markers/Road stud with lense reflector Providing & fixing of road stud 100x100 mm, die-cast in aluminium , resistance to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30mm upto a depth of 60mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973 Light Reflecting Lense Type | nos | 383.64 |
| 205 | 08.21/i | Road Markers/Road stud with lense reflector Providing & fixing of road stud 100x100 mm, die-cast in aluminium , resistance to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30mm upto a depth of 60mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973 Solar light emitting Diodes | nos | 2,595.21 |
| 206 | 08.22 | Lighting on Bridges Providing & fixing lighting on Bridges, mounted on steel hollow circular poles of standard specification, 5 m high fixed on parapets with cement concrete, 20 m apart and fitted with sodium vapour lamp | nos | 21,165.02 |
| 207 | 08/nsc/2 | Convex Mirror For Blind Curve | nos | 5,000.00 |

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|------------|---|------|------------|
| 208 | 08/nsc/4/a | Overhead Signs Providing and erecting overhead signs with a corrosion resistant 2mm thick aluminium alloy sheet reflectorised with high intensity retro-reflective sheeting of encapsulated lense type with vertical and lateral clearance given in clause 802.2 and 802.3 and installed as per clause 802.7 over a designed support system of aluminium alloy or galvanised steel trestles and trusses of sections and type as per structural design requirements and approved plans A)Truss and Vertical Support with Base plate on foundation column. | Ton | 183,662.00 |
| 209 | 08/nsc/4/b | Overhead Signs Providing and erecting overhead signs with a corrosion resistant 2mm thick aluminium alloy sheet reflectorised with high intensity retro-reflective sheeting of encapsulated lense type with vertical and lateral clearance given in clause 802.2 and 802.3 and installed as per clause 802.7 over a designed support system of aluminium alloy or galvanised steel trestles and trusses of sections and type as per structural design requirements and approved plans B)Aluminium Alloy Plate for Over Head Sign | sqm | 695.00 |
| 210 | 08/nsc/5 | Reinforced Cement Concrete Crash Barrier-Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-40 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified | m | 6,927.00 |
| 211 | 08/nsc/6 | Rumble Strips Provision of 15 nos rumble strips covered with premix bituminous carpet, 15-20 mm high at center, 250 mm wide placed at 1 m center to center at approved locations to control speed, marked with white strips of road marking paint. | sqm | 1,224.98 |
| 212 | 09.01/nsc1 | Laying Reinforced Cement Concrete Pipe NP4 / Prestressed Concrete Pipe on First Class Bedding in Single Row . B)1200 mm dia | Rm | 11,638.00 |
| 215 | 10.02/Nsc | Plain cement concrete M-15 mix with stone aggregate 20mm. Nominal size mechanically mixed and vibrated in foundation depth of 1.5m. below ground / bed level and or 1.5m. above ground/bed level i/c formwork. At Protection | cum | 7,496.35 |
| 218 | 10.06/a | Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Sub-Structure | Ton | 72,983.59 |
| 219 | 10.06/b | Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Super-Structure | Ton | 72,983.59 |
| 220 | 10.11 | Random rubble masonry (uncoursed) in cement sand mortar 1:3 in foundation upto a depth of 1.5m. and 1.5m. above ground/bed level. | cum | 5,662.85 |
| 221 | 10.16 | Cement Plaster 12mm Thick in Cement Mortar 1:3 | sqm | 223.49 |

Item Rate Analysis has been done considering

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|---------|---|------|-----------|
| 222 | 10.19 | Dry Boulder pitching | cum | 1,701.75 |
| 223 | 10.20/a | Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting a)Good Sandy Soil free from organic material | cum | 785.50 |
| 224 | 10.20/b | Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting b)Selected Granular Material in Filling | cum | 1,174.31 |
| 225 | 10.20/c | Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting c)Filler Media behind abutment ,wing and return wall | cum | 1,157.28 |
| 226 | 10.20 | Plain cement concrete M-15 mix with stone aggregate 20mm. Nominal size mechanically mixed and vibrated in foundation depth of 1.5m. below ground / bed level and or 1.5m. above ground/bed level i/c formwork. | cum | 7,496.35 |
| 229 | 10.23/a | Reinforced Cement Concrete M-30 Mixed with Stone aggregate 20 mm nominal soze mechanical mixed and vibrated for reinforced concrete work in slab excluding steel reinforcement but including centering and shuttering and laied in position. a)For Sub-Structure | cum | 14,404.16 |
| 232 | 10.23/b | Reinforced Cement Concrete M-30 Mixed with Stone aggregate 20 mm nominal soze mechanical mixed and vibrated for reinforced concrete work in slab excluding steel reinforcement but including centering and shuttering and laied in position. b)For Super-Structure | cum | 14,404.16 |
| 235 | 10.24/a | Laying Reinforced Cement Concrete Pipe(Hume Pipe)/Prestressed Concrete Pipe on First Class Bedding in Single ROW(Cost of NP 4 To be Paid Separately). This includes fixing collar with cement mortar 1:2 but excluding excavation,protection works,backfilling,concrete and masonry works in heads walls and parapet a)1000 mm dia | m | 711.07 |
| 236 | 10.24/b | Laying Reinforced Cement Concrete Pipe(Hume Pipe)/Prestressed Concrete Pipe on First Class Bedding in Single ROW(Cost of NP 4 To be Paid Separately). This includes fixing collar with cement mortar 1:2 but excluding excavation,protection works,backfilling,concrete and masonry works in heads walls and parapet b)1200 mm dia | m | 877.98 |
| 237 | 12/Nsc1 | Geo-synthetics and Reinforced Earth With reinforcing elements of synthetic geogrids | Sqm | 512.00 |
| 238 | 12/Nsc2 | Geo-synthetics and Reinforced Earth Facing elements of RCC | Sqm | 3,873.00 |
| 242 | 23/Nsc1 | 560 mm Dia cover with frame(Heavy Duty)[Ref: Delhi CPWD SOR 2007 Code 3860] | Nos | 9,160.80 |

Item Rate Analysis has been done considering

Schedule Of Rate

| SI No | SOR Ref | Item description | Unit | SOR Rate |
|-------|-----------|---|------|-----------|
| 243 | 23/Nsc2 | Rectangular shape 600x450 mm precast R.C.C. manhole cover(CPWD; Delhi SOR 2014) | Each | 958.00 |
| 244 | 24/i/b | Galvanised Mild steel J /L hook | kg | 120.00 |
| 245 | 40 | Gextextile material (fine net) | sqm | 25.50 |
| 246 | 9.2/b/Nsc | Laying Reinforced Cement Concrete Pipe(Hume Pipe)/Prestressed Concrete Pipe on First Class Bedding in Single ROW(Cost of NP 4 To be Paid Separately). This includes fixing collar with cement mortar 1:2 but excluding excavation,protection works,backfilling,concrete and masonry works in heads walls and parapet b)1200 mm dia | m | 11,638.00 |

LEAD CHART



Leads for Various Materials

| Sl. No. | Name of Material | Name of Source | Distance from Source to Mid Point of Project Road (Km) | Approach Road (Km) | Total Lead (Km) |
|---------|------------------------|----------------|--|--------------------|-----------------|
| 1 | Sand (Fine) | Noney | 22.87 | 2 | 24.87 |
| 2 | Filling Material | Local | - | - | 10.00 |
| 3 | Stone Metal | Noney | 22.87 | 2 | 24.87 |
| 4 | Stone Boulder | Barak | 103.87 | 2 | 105.87 |
| 5 | Stone Chips, Aggregate | Barak | 103.87 | 2 | 105.87 |
| 6 | Coarse Sand | Noney | 22.87 | 2 | 24.87 |
| 7 | Cement | Imphal | 41.13 | - | 41.13 |
| 8 | Steel | Imphal | 41.13 | - | 41.13 |
| 9 | Bitumen | Imphal | 41.13 | - | 41.13 |
| 10 | Bitumen Emulsion | Imphal | 41.13 | - | 41.13 |
| 11 | Structural Steel | Imphal | 41.13 | - | 41.13 |
| 12 | RCC Pipe | Imphal | 41.13 | - | 41.13 |



CARRIAGE COST



Carriage Cost of Material (Including loading & unloading)

Rubbish

Name of Quarries Local
Lead Upto Site (Km)= 10

| Lead Upto Site (km)– 10 | | | | | | |
|-------------------------|-----------|--------------------------------------|--------------------|---------------|--------------|--------------------------|
| Sl.No. | Lead (km) | Kilometer | Unit | Carriage (Km) | Rate (Rs) | Cost of Carriage (In Rs) |
| 1 | 10.00 | Upto 1 | per m ³ | | 163.65 | |
| | | Upto 2 | per m ³ | | 190.55 | |
| | | Upto 3 | per m ³ | | 216.97 | |
| | | Upto 4 | per m ³ | | 242.32 | |
| | | Upto 5 | per m ³ | 5 | 266.68 | 266.68 |
| | | for Every km beyond 5 km up to 10 km | per m ³ | 5 | 26.51 | 132.55 |
| | | | | | Total | 399.23 |

Stone aggregate below 40mm nominal size

Name of Quarries Noney
Lead Upto Site (Km)= 24.87

| Sl.No. | Lead in km | Kilometer | Unit | Carriage (Km) | Rate (Rs) | Cost of Carriage (In Rs) |
|--------|------------|--------------------------------------|--------------------|---------------|--------------|--------------------------|
| 2 | 24.87 | Upto 1 | per m ³ | | 156.35 | |
| | | Upto 2 | per m ³ | | 182.05 | |
| | | Upto 3 | per m ³ | | 207.29 | |
| | | Upto 4 | per m ³ | | 231.51 | |
| | | Upto 5 | per m ³ | 5 | 254.79 | 254.79 |
| | | for Every km beyond 5 km up to 10 km | per m ³ | 5 | 25.33 | 126.65 |
| | | for Every km beyond10 km up to 20 km | per m ³ | 10 | 20.42 | 204.20 |
| | | for Every km beyond 20 km | per m ³ | 4.87 | 16.51 | 80.40 |
| | | | | | Total | 666.04 |

Sand

Name of Quarries Noney
Lead Upto Site (Km)= 24.87

| Sl.No. | Lead in km | Kilometer | Unit | Carriage (Km) | Rate (Rs) | Cost of Carriage (In Rs) |
|--------|------------|--------------------------------------|--------------------|---------------|--------------|--------------------------|
| 3 | 24.87 | Upto 1 | per m ³ | | 156.35 | |
| | | Upto 2 | per m ³ | | 182.05 | |
| | | Upto 3 | per m ³ | | 207.29 | |
| | | Upto 4 | per m ³ | | 231.51 | |
| | | Upto 5 | per m ³ | 5 | 254.79 | 254.79 |
| | | for Every km beyond 5 km up to 10 km | per m ³ | 5 | 25.33 | 126.65 |
| | | for Every km beyond10 km up to 20 km | per m ³ | 10 | 20.42 | 204.20 |
| | | for Every km beyond 20 km | per m ³ | 4.87 | 16.51 | 80.40 |
| | | | | | Total | 666.04 |

Boulder

Name of Quarries Barak
Lead Upto Site (Km)= 105.87



| Sl.No. | Lead in km | Kilometer | Unit | Carriage | Rate (Rs) | Cost of Carriage (In Rs) |
|--------|------------|--------------------------------------|--------------------|----------|--------------|--------------------------|
| 4 | 105.87 | Upto 1 | per m ³ | | 173.23 | |
| | | Upto 2 | per m ³ | | 201.95 | |
| | | Upto 3 | per m ³ | | 229.94 | |
| | | Upto 4 | per m ³ | | 256.81 | |
| | | Upto 5 | per m ³ | 5 | 282.63 | 282.63 |
| | | for Every km beyond 5 km up to 10 km | per m ³ | 5.00 | 28.10 | 140.50 |
| | | for Every km beyond10 km up to 20 km | per m ³ | 10.00 | 22.65 | 226.50 |
| | | for Every km beyond 20 km | per m ³ | 85.87 | 18.31 | 1572.28 |
| | | | | | Total | 2221.91 |

Cement, Steel

Name of Quarries

Imphal

Lead Upto Site (Km)=

41.13

| Sl.No. | Lead in km | Kilometer | Unit | Carriage | Rate (Rs) | Cost of Carriage (In Rs) |
|--------|------------|--------------------------------------|----------|----------|--------------|--------------------------|
| 5 | 41.13 | Upto 1 | per Tone | | 112.15 | |
| | | Upto 2 | per Tone | | 130.59 | |
| | | Upto 3 | per Tone | | 148.70 | |
| | | Upto 4 | per Tone | | 166.07 | |
| | | Upto 5 | per Tone | 5 | 182.77 | 182.77 |
| | | for Every km beyond 5 km up to 10 km | per Tone | 5 | 18.17 | 90.85 |
| | | for Every km beyond10 km up to 20 km | per Tone | 10 | 14.65 | 146.50 |
| | | for Every km beyond 20 km | per Tone | 21.13 | 11.84 | 250.18 |
| | | | | | Total | 670.30 |

Bitumen

Name of Quarries

Imphal

Lead Upto Site (Km)=

41.13

| Sl.No. | Lead in km | Kilometer | Unit | Carriage | Rate (Rs) | Cost of Carriage (In Rs) |
|--------|------------|--------------------------------------|----------|----------|--------------|--------------------------|
| 6 | 41.13 | Upto 1 | per Tone | | 112.15 | |
| | | Upto 2 | per Tone | | 130.59 | |
| | | Upto 3 | per Tone | | 148.70 | |
| | | Upto 4 | per Tone | | 166.07 | |
| | | Upto 5 | per Tone | 5 | 182.77 | 182.77 |
| | | for Every km beyond 5 km up to 10 km | per Tone | 5 | 18.17 | 90.85 |
| | | for Every km beyond10 km up to 20 km | per Tone | 10 | 14.65 | 146.50 |
| | | for Every km beyond 20 km | per Tone | 21.13 | 11.84 | 250.18 |
| | | | | | Total | 670.30 |

PIPE

300 mm Dia RCC Pipe from Imphal

Lead Upto Site (Km)=

41.13

| Sl.No. | Lead in km | Kilometer | Unit | Carriage | Rate (Rs) | Cost of Carriage (In Rs) |
|--------|------------|---------------------------------------|------|----------|-----------|--------------------------|
| 7 | 41 | upto 5 | Rm | 5 | 18.73 | 18.73 |
| | | for Every km beyond 5 km up to 10 km | Rm | 5 | 1.86 | 9.30 |
| | | for Every km beyond 10 km up to 20 km | Rm | 10 | 1.50 | 15.00 |
| | | for Every km beyond 20 km | Rm | 21 | 1.21 | 25.57 |
| | | | | | | 68.60 |



FINISHED RATE



FINISHER RATE**Road Works**

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|----------|----------|-------------------|---------------|--------------------|---------------|---------------|
| 1 | 02.01/i | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth from 300 mm to 600 mm | Each | 388.42 | | | | | 0.00 | 392.3 |
| 2 | 02.01/ii | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 600 mm to 900 mm | Each | 716.32 | | | | | 0.00 | 723.4 |
| 3 | 02.01/iii | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 900 mm to 1800 mm | Each | 1,360.04 | | | | | 0.00 | 1,373.6 |
| 4 | 02.01/iv | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 1800 mm to 2700 mm | Each | 2,550.68 | | | | | 0.00 | 2,576.1 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|-----------|----------|-------------------|---------------|--------------------|---------------|---------------|
| 5 | 02.03/b | Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable materials and stacking of serviceable materials and stacking of serviceable materials upto 100m. from road boundary. (by mechanical means) | Ha | 59,319.65 | | | | | 0.00 | 59,912.8 |
| 6 | 02.04/i/c | Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. c)Pre- stressed/ Reinforced Cement Concrete grade M20 & above | cum | 1,739.01 | | | | | 0.00 | 1,756.4 |
| 7 | 02.04/iii/b | Dismantling stone masonry b) Rubble stone masonry in cement mortar | Cum | 489.32 | | | | | 0.00 | 494.2 |
| 8 | 02.04/vii/a | Removing hume pipes class NP-3 a) 300mm to 600mm dia | rm | 264.99 | | | | | 0.00 | 267.6 |
| 9 | 02.04/vii/b | Removing hume pipes class NP-4 b) Above 600mm to 900mm dia | rm | 358.77 | | | | | 0.00 | 362.3 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|------------------|--|------|----------|----------|-------------------|---------------|--------------------|---------------|---------------|
| 10 | 02.04/vii/c | Removing hume pipes class NP-5 c) Above 900mm dia | rm | 614.08 | | | | | 0.00 | 620.2 |
| 11 | 02.04/viii/e | Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m e)Kandar/Gravel metal crust upto 150 mm thick with power Roller with scarifier | sqm | 33.99 | | | | | 0.00 | 34.3 |
| 12 | 02.04/viii/f /ii | Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m f)Bituminous coarses 50-70mm along with premix Carpet and Surface dressing but without disturbing the base ii)With road roller attatched with scarifier | sqm | 57.08 | | | | | 0.00 | 57.6 |
| 13 | 02/nsc/1 | Supplying and laying Hydro Seeding on cutting Surface | sqm | 315.00 | | | | | 0.00 | 318.1 |
| 14 | 03.13 | Construction of Embankment with Material Deposited from Roadway Cutting Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2 | cum | 160.20 | | | | | 0.00 | 161.8 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|----------|----------|-------------------|---------------|--------------------|---------------|---------------|
| 15 | 03.14/Nsc | Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from Roadway Cutting with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2 | cum | 246.28 | | | | | 0.00 | 248.7 |
| 16 | 03.14 | Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2 | cum | 312.34 | | | | | 0.00 | 315.4 |
| 17 | 03.15 | Compacting original ground supporting subgrade Loosening of the ground upto a level of 500 mm below the subgrade level, watered, graded and compacted in layers to meet requirement of table 300-2 for subgrade construction. | cum | 86.65 | | | | | 0.00 | 87.5 |
| 18 | 03.31 | Excavation in Hill Area in Soil by Mechanical Means Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres | cum | 211.39 | | | | | 0.00 | 213.5 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|----------|---|-------------------------|-------------------|----------------------------|---------------|---------------|
| 19 | 03.32 | Excavation in Hilly Area in Ordinary Rock by Mechanical Means not Requiring Blasting. Excavation in hilly area in ordinary rock not requiring ballasting by mechanical means including cutting and trimming of slopes and disposal of cut material with all lift and lead upto 1000 metres | cum | 304.56 | | | | | 0.00 | 307.6 |
| 20 | 04.01/Nsc1 | Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material | Cum | 2,997.00 | Course Sand Stone Chips/Aggregate Stone Metal Cat1 | 0.380 0.250 0.640 | cum cum cum | 940.11 666.04 666.04 | 950.02 | 3,986.4 |
| 21 | 04/nsc1 | Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 | Cum | 2,063.00 | | | | | 0.00 | 2,083.6 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|----------|------------------|-------------------|---------------|--------------------|---------------|---------------|
| 22 | 05.02 | Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.) | Cum | 2,965.34 | | | | | 987.70 | 3,992.5 |
| | | | | | Course Sand | 0.396 | cum | 940.11 | | |
| | | | | | Stone Metal Cat1 | 0.924 | cum | 666.04 | | |
| 23 | 05.03 | Construction of footpath/separator by providing a 150 mm compacted granular sub base as per clause 401 and 25 mm thick cement concrete grade M15, over laid with pre-cast concrete tiles in cement mortar including provision of all drainage arrangements but excluding kerb channel. | sqm | 1,374.51 | | | | | 171.22 | 1,561.1 |
| | | | | | Cement | 0.012 | Ton | 670.30 | | |
| | | | | | Sand | 0.064 | cum | 666.04 | | |
| | | | | | Stone | 0.112 | cum | 666.04 | | |
| | | | | | Chips/Aggregate | | | | | |
| | | | | | Stone Metal Cat1 | 0.069 | cum | 666.04 | | |
| 24 | 06.01/a | Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm | sqm | 57.54 | | | | | 0.47 | 58.5 |
| | | | | | Bitumen Emulsion | 0.001 | Ton | 670.30 | | |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|-----------|----------------------------|-------------------|---------------|--------------------|---------------|---------------|
| 25 | 06.02/i | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm | sqm | 15.63 | Bitumen Emulsion | 0.000 | Ton | 670.30 | 0.13 | 15.9 |
| 26 | 06.02/ii | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. ii) On granular Surface Pre treated with prime Coat @ 0.25 - 0.30 kg/sqm | sqm | 17.16 | Bitumen Emulsion | 0.000 | Ton | 670.30 | 0.17 | 17.5 |
| 27 | 06/Nsc1 | Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40 | cum | 11,264.00 | Aggregate Bitumen 30/40 | 1.440 0.104 | cum Ton | 666.04 670.30 | 1,044.78 | 12,431.8 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|-----------|-----------------|-------------------|---------------|--------------------|---------------|---------------|
| | | | | | Filler | 0.040 | Ton | 399.23 | | |
| 28 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | cum | 12,371.00 | | | | | 1,068.87 | 13,574.2 |
| | | | | | Aggregate | 1.456 | cum | 666.04 | | |
| | | | | | Bitumen 30/40 | 0.130 | Ton | 670.30 | | |
| | | | | | Filler | 0.030 | Ton | 399.23 | | |
| 29 | 08.02/a | Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. a) 5th KM stone | each | 4,556.84 | | | | | 427.41 | 5,034.0 |
| | | | | | Cement | 0.108 | Ton | 670.30 | | |
| | | | | | Sand | 0.176 | cum | 666.04 | | |
| | | | | | Steel | 0.004 | Ton | 670.30 | | |
| | | | | | Stone | 0.353 | cum | 666.04 | | |
| | | | | | Chips/Aggregate | | | | | |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|----------|-----------------------|-------------------|---------------|--------------------|---------------|---------------|
| 30 | 08.02/b | Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. b) Ordinary kilometer stone | each | 2,676.24 | Cement | 0.074 | Ton | 670.30 | 292.65 | 2,998.5 |
| | | | | | Sand | 0.121 | cum | 666.04 | | |
| | | | | | Steel | 0.002 | Ton | 670.30 | | |
| | | | | | Stone Chips/Aggregate | 0.242 | cum | 666.04 | | |
| 31 | 08.04 | Reinforced Cement Concrete M15 Boundary pillars of standard design, fixed in position including finishing but excluding painting | each | 843.03 | Sand | 0.566 | cum | 666.04 | 1,196.55 | 2,059.9 |
| | | | | | Steel | 0.080 | Ton | 670.30 | | |
| | | | | | Stone Chips/Aggregate | 1.150 | cum | 666.04 | | |
| 32 | 08.05 | Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface. | sqm | 93.41 | | | | | 0.00 | 94.3 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|----------|-----------------|-------------------|---------------|--------------------|---------------|---------------|
| 33 | 08.11/i | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm equilateral triangle | each | 4,931.35 | | | | | 466.45 | 5,451.7 |
| | | | | | Cement | 0.033 | Ton | 670.30 | | |
| | | | | | Sand | 0.540 | cum | 666.04 | | |
| | | | | | Steel | 0.019 | Ton | 670.30 | | |
| | | | | | Stone | 0.108 | cum | 666.04 | | |
| | | | | | Chips/Aggregate | | | | | |
| 34 | 08.11/iii | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm circular | each | 4,440.80 | | | | | 466.45 | 4,956.3 |
| | | | | | Cement | 0.033 | Ton | 670.30 | | |
| | | | | | Sand | 0.540 | cum | 666.04 | | |
| | | | | | Steel | 0.019 | Ton | 670.30 | | |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|----------|-----------------------|-------------------|---------------|--------------------|---------------|---------------|
| | | | | | Stone Chips/Aggregate | 0.108 | cum | 666.04 | | |
| 35 | 08.11/iv | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 80 mm x 60 mm rectangular | each | 5,706.23 | | | | | 466.45 | 6,234.4 |
| | | | | | Cement | 0.033 | Ton | 670.30 | | |
| | | | | | Sand | 0.540 | cum | 666.04 | | |
| | | | | | Steel | 0.019 | Ton | 670.30 | | |
| | | | | | Stone Chips | 0.108 | cum | 666.04 | | |
| 36 | 08.11/vii | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm high octagon | each | 8,165.25 | | | | | 466.45 | 8,718.0 |
| | | | | | Cement | 0.033 | Ton | 670.30 | | |
| | | | | | Sand | 0.540 | cum | 666.04 | | |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|-----------|-----------------------|-------------------|---------------|--------------------|---------------|---------------|
| | | | | | Steel | 0.019 | Ton | 670.30 | | |
| | | | | | Stone Chips/Aggregate | 0.108 | cum | 666.04 | | |
| 37 | 08.12 | Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign as per IRC:67 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area not exceeding 0.9 sqm supported on a mild steel single angle iron post 75 x 75 x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing) | sqm | 12,223.04 | | | | | 158.76 | 12,505.6 |
| | | | | | Cement | 0.037 | Ton | 670.30 | | |
| | | | | | Sand | 0.060 | cum | 666.04 | | |
| | | | | | Steel | 0.021 | Ton | 670.30 | | |
| | | | | | Stone Chips/Aggregate | 0.120 | cum | 666.04 | | |
| 38 | 08.14 | Road Marking with Hot Applied Thermoplastic Compound with Reflectorising Glass Beads on Bituminous Surface (Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes.) | sqm | 1,002.14 | | | | | 0.00 | 1,012.1 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|----------|----------|-------------------|---------------|--------------------|---------------|---------------|
| 39 | 08.15/c/v | Road Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and confirming to IRC-79 and the drawings.) 120x120 -Road Delineator | each | 1,063.19 | | | | | 0.00 | 1,073.8 |
| 40 | 08.18/A/b | Metal Beam Crash Barrier Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fitments to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810) For post Height of 1.5 m | Rm | 3,334.08 | | | | | 0.00 | 3,367.4 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|-----------|----------|-------------------|---------------|--------------------|---------------|---------------|
| 41 | 08.20/ii | Road Markers/Road stud with lense reflector Providing & fixing of road stud 100x100 mm, die-cast in aluminium , resistance to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30mm upto a depth of 60mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973 Light Reflecting Lense Type | nos | 383.64 | | | | | 0.00 | 387.4 |
| 42 | 08.22 | Lighting on Bridges Providing & fixing lighting on Bridges, mounted on steel hollow circular poles of standard specification, 5 m high fixed on parapets with cement concrete, 20 m apart and fitted with sodium vapour lamp | nos | 21,165.02 | | | | | 0.00 | 21,376.6 |
| 43 | 08/nsc/2 | Convex Mirror For Blind Curve | nos | 5,000.00 | | | | | 0.00 | 5,050.0 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|-----------|-------------|-------------------|---------------|--------------------|---------------|---------------|
| 44 | 08/nsc/5 | Reinforced Cement Concrete Crash Barrier-Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-40 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified | m | 6,927.00 | | | | | 0.00 | 6,996.2 |
| 45 | 08/nsc/6 | Rumble Strips Provision of 15 nos rumble strips covered with premix bituminous carpet, 15-20 mm high at center, 250 mm wide placed at 1 m center to center at approved locations to control speed, marked with white strips of road marking paint. | sqm | 1,224.98 | | | | | 0.00 | 1,237.2 |
| 46 | 09.01/nsc1 | Laying Reinforced Cement Concrete Pipe NP4 / Prestressed Concrete Pipe on First Class Bedding in Single Row . B)1200 mm dia | Rm | 11,638.00 | Aggregate | 0.400 | cum | 666.04 | 276.94 | 12,034.0 |
| | | | | | Cement | 0.006 | Ton | 670.30 | | |
| | | | | | Course Sand | 0.007 | cum | 940.11 | | |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|-----------|-----------------------|-------------------|---------------|--------------------|---------------|---------------|
| 47 | 10.06/a | Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Sub-Structure | Ton | 72,983.59 | Steel | 1.050 | Ton | 670.30 | 703.82 | 74,424.2 |
| 48 | 10.06/b | Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Super-Structure | Ton | 72,983.59 | Steel | 1.050 | Ton | 670.30 | 703.82 | 74,424.2 |
| 49 | 10.16 | Cement Plaster 12mm Thick in Cement Mortar 1:3 | sqm | 223.49 | | | | | 0.00 | 225.7 |
| 50 | 10.19 | Dry Boulder pitching | cum | 1,701.75 | Stone Bolder | 1.200 | cum | 2,221.91 | 2,666.29 | 4,411.7 |
| 51 | 10.20/b | Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting b)Selected Granular Material in Filling | cum | 1,174.31 | Stone Chips/Aggregate | 1.200 | cum | 666.04 | 799.25 | 1,993.3 |
| 52 | 10.20/c | Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting c)Filler Media behind abutment ,wing and return wall | cum | 1,157.28 | | | | | 799.25 | 1,976.1 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|----------|-----------------------|-------------------|---------------|--------------------|---------------|---------------|
| | | | | | Stone Chips/Aggregate | 1.200 | cum | 666.04 | | |
| 53 | 10.20 | Plain cement concrete M-15 mix with stone aggregate 20mm. Nominal size mechanically mixed and vibrated in foundation depth of 1.5m. below ground / bed level and or 1.5m. above ground/bed level i/c formwork. | cum | 7,496.35 | Aggregate | 0.850 | cum | 666.04 | 1,087.05 | 8,669.2 |
| | | | | | Cement | 0.330 | Ton | 670.30 | | |
| | | | | | Sand | 0.450 | cum | 666.04 | | |
| 54 | 23/Nsc4 | Providing and spreading Mechanically Woven Double Twisted Hexagonal Shaped Wire Mesh Netting of Mesh Type 10x12 with D=100mm tolerance of $\pm 2\%$, Zn + PVC coated, Mesh Wire dia. 2.7/3.7mm (ID/OD), mechanically edged/selvedged with galvanization as per EN 10223-3, and shall have minimum 10 numbers of mesh openings per meter of mesh perpendicular to twist, lacing with wire of diameter 2.2/3.2 mm (ID/OD), at easily accessible location including top and bottom, with all leads and lifts, manpower and machinery, materials, labour etc. complete and as directed by Engineer - In - Charge | sqm | 463.00 | | | | | 0.00 | 467.6 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

FINISHER RATE

Road Works

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|----------|----------|-------------------|---------------|--------------------|---------------|---------------|
| 55 | 23/Nsc5 | Supply and installation of Continuous threaded Anchors (32mm dia, yield strength > 500 N/mm2) nut, washer plate, coupler for connecting bars and full length grouting with admixture including all ancillary items for top/bottom/cortical anchoring as per detailed technical specifications and as directed by engineer in charge. | Rm | 3,200.00 | | | | | 0.00 | 3,232.0 |
| 56 | 24/i/b | Galvanised Mild steel J /L hook | kg | 120.00 | | | | | 0.00 | 121.2 |
| 57 | 40 | Gextextile material (fine net) | sqm | 25.50 | | | | | 0.00 | 25.7 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

FINISHER RATE**Minor Bridge**

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|----------------|--|------|----------|----------|-------------------|---------------|--------------------|---------------|---------------|
| 1 | 13.01/a/i/N sc | Earth work in excavation Ordinary soil For Protection Work | cum | 218.93 | | | | | 0.00 | 221.1 |
| 2 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | cum | 218.93 | | | | | 0.00 | 221.1 |
| 3 | 13.01/a/iii | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Above 6 m depth | cum | 409.42 | | | | | 0.00 | 413.5 |
| 4 | 13.01/b/ii | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary rock if blasting is not resorted to | cum | 209.22 | | | | | 0.00 | 211.3 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Minor Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|-----------|-----------------------|-------------------|---------------|--------------------|---------------|---------------|
| 5 | 13.03/a | Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials | cum | 1,007.86 | Stone Chips/Aggregate | 1.200 | cum | 666.04 | 799.25 | 1,825.1 |
| 6 | 13.03/b | Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Good Sandy Soil free from organic material | cum | 617.02 | Sand | 1.200 | cum | 666.04 | 799.25 | 1,430.4 |
| 7 | 13.04 | Filter medium behind abutment, wing wall and return wall complete as per drawing and technical specification . | cum | 1,274.65 | Stone Chips/Aggregate | 1.200 | cum | 666.04 | 799.25 | 2,094.6 |
| 8 | 13/nsc1 | Confirmatory Boring in Soil | cum | 2,000.00 | | | | | 0.00 | 2,020.0 |
| 9 | 13/nsc2 | Confirmatory Boring in Hard Rock | cum | 4,000.00 | | | | | 0.00 | 4,040.0 |
| 10 | 14.01 | Brick masonry work in cement mortar 1:3 in foundation complete excluding pointing and plastering, as per drawing and technical specifications | cum | 11,849.87 | | | | | 0.00 | 11,968.3 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)



FINISHER RATE

Minor Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|----------|------------------|-------------------|---------------|--------------------|---------------|---------------|
| 11 | 14.02/b | Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed) | cum | 6,306.36 | Cement | 0.170 | Ton | 670.30 | 1,086.37 | 7,466.6 |
| | | | | | Sand | 0.300 | cum | 666.04 | | |
| | | | | | Stone Metal Cat1 | 1.160 | cum | 666.04 | | |
| 12 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | cum | 8,348.21 | Aggregate | 0.850 | cum | 666.04 | 1,087.05 | 9,529.6 |
| | | | | | Cement | 0.330 | Ton | 670.30 | | |
| | | | | | Sand | 0.450 | cum | 666.04 | | |
| 13 | 14.03/b | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M20 Grade | cum | 9,333.75 | Aggregate | 0.900 | cum | 666.04 | 1,153.87 | 10,592.5 |
| | | | | | Cement | 0.380 | Ton | 670.30 | | |
| | | | | | Sand | 0.450 | cum | 666.04 | | |
| 14 | 14.03/e/II | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M25Grade | cum | 9,077.25 | Aggregate | 0.900 | cum | 666.04 | 1,173.98 | 10,353.7 |
| | | | | | Cement | 0.410 | Ton | 670.30 | | |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Minor Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|-----------|-----------|-------------------|---------------|--------------------|---------------|---------------|
| | | | | | Sand | 0.450 | cum | 666.04 | | |
| 15 | 14.08 | HYSD bar reinforcement in foundation complete as per drawing and technical specification | MT | 77,427.65 | | | | | 703.82 | 78,912.7 |
| | | | | | Steel | 1.050 | Ton | 670.30 | | |
| 16 | 14.11.I/a | Bored Cast in situ of different grades RCC pile excluding reinforcement complete as per drawing and technical specifications and removal of excavated earth with all lifts and lead upto 1000m I.M35 Grade a)1200 mm Dia | m | 20,126.29 | | | | | 0.00 | 20,327.5 |
| 17 | 14.11/a/I | Initial and Routine Load test(for 750mm to 1200 mm dia) | Ton | 503.12 | | | | | 0.00 | 508.1 |
| 18 | 14.11/a/II | Lateral Load test(for 750mm to 1200 mm dia) | Ton | 15,901.68 | | | | | 0.00 | 16,060.7 |
| 19 | 14.15/b | Cement concrete for Reinforced concrete in pile cap i/c form work complete as per drawing and technical specification M-35 Grade | cum | 11,182.62 | | | | | 1,182.02 | 12,488.2 |
| | | | | | Aggregate | 0.900 | cum | 666.04 | | |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Minor Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|-----------|-----------------------|-------------------|---------------|--------------------|---------------|---------------|
| | | | | | Cement | 0.422 | Ton | 670.30 | | |
| | | | | | Sand | 0.450 | cum | 666.04 | | |
| 20 | 14/nsc2 | Brick Flat Soling at Foundation | Sqm | 1,077.89 | | | | | 40.00 | 1,129.0 |
| | | | | | Brick | 1.000 | Sqm | 40.00 | | |
| 21 | 15.01 | Brick masonry work in cement mortar 1:3 in Sub-structure complete excluding pointing and plastering, as per drawing and technical specifications | cum | 11,961.59 | | | | | 0.00 | 12,081.2 |
| 22 | 15.02/b | Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed) | cum | 6,787.85 | | | | | 1,086.37 | 7,952.9 |
| | | | | | Cement | 0.170 | Ton | 670.30 | | |
| | | | | | Sand | 0.300 | cum | 666.04 | | |
| | | | | | Stone Metal Cat1 | 1.160 | cum | 666.04 | | |
| 23 | 15.03/b/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade Upto 5m | cum | 9,067.33 | | | | | 1,129.74 | 10,299.0 |
| | | | | | Cement | 0.344 | Ton | 670.30 | | |
| | | | | | Sand | 0.450 | cum | 666.04 | | |
| | | | | | Stone Chips/Aggregate | 0.900 | cum | 666.04 | | |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Minor Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|-----------|--|-------------------------|-------------------|----------------------------|---------------|---------------|
| 24 | 15.03/f/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M25 Grade upto 5m height | cum | 9,938.25 | Cement Sand Stone Chips/Aggregate | 0.403 0.450 0.900 | Ton cum cum | 670.30 666.04 666.04 | 1,169.28 | 11,218.6 |
| 25 | 15.05 | HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification | MT | 77,427.65 | Steel | 1.050 | Ton | 670.30 | 703.82 | 78,912.7 |
| 26 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | Rm | 445.75 | Cement Sand | 0.001 0.002 | Ton cum | 670.30 666.04 | 1.80 | 452.0 |
| 27 | 16.01/a/i | cement concrete Reinforced concrete in super-structure as per drawing and Technical Specification i/c form work complete as per drawing and technical specification RCC Grade M25 For solid slab super-structure Upto 5m Upto 5m | cum | 10,446.36 | Cement | 0.400 | Ton | 670.30 | 1,292.49 | 11,856.2 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

FINISHER RATE

Minor Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|-----------|-----------------------|-------------------|---------------|--------------------|---------------|---------------|
| | | | | | Course Sand | 0.452 | cum | 940.11 | | |
| | | | | | Stone Chips/Aggregate | 0.900 | cum | 666.04 | | |
| 28 | 16.03 | HYSD bar reinforcement in super-structure complete as per drawing and technical specifications | MT | 85,183.86 | | | | | 703.82 | 86,746.5 |
| | | | | | Steel | 1.050 | Ton | 670.30 | | |
| 29 | 16.09 | Mild steel railling complete as per drawing and Technical Specifications | Rm | 4,559.31 | | | | | 28.76 | 4,633.9 |
| | | | | | Steel | 0.043 | Ton | 670.30 | | |
| 30 | 16.11 | Drainage Spouts complete as per drawing and Technical specification | each | 2,158.99 | | | | | 2.68 | 2,183.2 |
| | | | | | Structural Steel | 0.004 | Ton | 670.30 | | |
| 31 | 16.17 | Mastic asphalt (providing and laying 12mm thik mastic asphalt wearing coures on top of deck slab excluding prime coat with paving grade bitumem meeting the requirement given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10sqm and at an aproximate spacing of 10cm centre in both direction ,pressed into surface not less than 100 deg. C. protruding 1mm to 4mm over mastic surface ,all complete as per clause 515) using Bitumen VG-40 (3/40) | sqm | 532.56 | | | | | 12.86 | 550.8 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Minor Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|------------|-----------------------|-------------------|---------------|--------------------|---------------|---------------|
| | | | | | Bitumen | 0.003 | Ton | 670.30 | | |
| | | | | | Lime | 0.005 | Ton | 399.23 | | |
| | | | | | Stone Chips/Aggregate | 0.014 | cum | 666.04 | | |
| 32 | 16/nsc | For Protection Work - cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade upto 5m height | cum | 9,067.33 | | | | | 1,129.74 | 10,299.0 |
| | | | | | Cement | 0.344 | Ton | 670.30 | | |
| | | | | | Sand | 0.450 | cum | 666.04 | | |
| | | | | | Stone Chips/Aggregate | 0.900 | cum | 666.04 | | |
| 33 | 16/Nsc1 | Supply, fabrication, delivery at bridge site and erection of structural steel works as per IS 2062, including two coats of primer, one at shop and the other at site and two coats of aluminium paints including all labour, material, consumables etc. | MT | 120,762.00 | | | | | 703.82 | 122,680.4 |
| | | | | | Steel | 1.050 | Ton | 670.30 | | |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

FINISHER RATE**Major Bridge**

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|----------|-----------------------|-------------------|---------------|--------------------|---------------|---------------|
| 1 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | cum | 218.93 | | | | | 0.00 | 221.1 |
| 2 | 13.01/a/ii | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth 3 m to 6 m | cum | 294.28 | | | | | 0.00 | 297.2 |
| 3 | 13.03/a | Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials | cum | 1,007.86 | Stone Chips/Aggregate | 1.200 | cum | 666.04 | 799.25 | 1,825.1 |
| 4 | 13.03/b | Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Good Sandy Soil free from organic material | cum | 617.02 | Sand | 1.200 | cum | 666.04 | 799.25 | 1,430.4 |
| 5 | 13.04 | Filter medium behind abutment, wing wall and return wall complete as per drawing and technical specification . | cum | 1,274.65 | | | | | 799.25 | 2,094.6 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)



FINISHER RATE

Major Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|-----------|-----------------------|-------------------|---------------|--------------------|---------------|---------------|
| | | | | | Stone Chips/Aggregate | 1.200 | cum | 666.04 | | |
| 6 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | cum | 8,348.21 | Aggregate | 0.850 | cum | 666.04 | 1,087.05 | 9,529.6 |
| | | | | | Cement | 0.330 | Ton | 670.30 | | |
| | | | | | Sand | 0.450 | cum | 666.04 | | |
| 7 | 14.03/g | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M30 Grade | cum | 10,966.06 | Aggregate | 0.860 | cum | 666.04 | 1,160.83 | 12,248.1 |
| | | | | | Cement | 0.450 | Ton | 670.30 | | |
| | | | | | Sand | 0.430 | cum | 666.04 | | |
| 8 | 14.08 | HYSD bar reinforcement in foundation complete as per drawing and technical specification | MT | 77,427.65 | Steel | 1.050 | Ton | 670.30 | 703.82 | 78,912.7 |
| 9 | 14/nsc1/i | Filler joint i) Providing & fixing 2 mm thick corrugated copper plate in expansion joint complete as per drawing & Technical Specification. | m | 2,060.00 | | | | | 0.00 | 2,080.6 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

FINISHER RATE

Major Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|-----------|-----------|-------------------|---------------|--------------------|---------------|---------------|
| 10 | 14/nsc1/ii | Filler joint Providing & fixing 20 mm thick compressible fibre board in expansion joint complete as per drawing & Technical Specification. | m | 698.00 | | | | | 0.00 | 704.9 |
| 11 | 14/nsc1/iii | Filler joint iii)Providing and fixing in position 20 mm thick premoulded joint filler in expansion joint for fixed ends of simply supported spans not exceeding 10 m to cater for a horizontal movement upto 20 mm, covered with sealant complete as per drawing and technical specifications. | m | 223.00 | | | | | 0.00 | 225.2 |
| 12 | 14/nsc1/iv | Filler joint iv)Providing and filling joint sealing compound as per drawings and technical specifications with coarse sand and 6 per cent bitumen by weight. | m | 36.00 | | | | | 0.00 | 36.3 |
| 13 | 15.03/g/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M30 Grade upto 5m height | cum | 11,786.08 | | | | | 1,171.97 | 13,087.6 |
| | | | | | Aggregate | 0.900 | cum | 666.04 | | |
| | | | | | Cement | 0.407 | Ton | 670.30 | | |
| | | | | | Sand | 0.450 | cum | 666.04 | | |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

FINISHER RATE

Major Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|-----------|-----------|-------------------|---------------|--------------------|---------------|---------------|
| 14 | 15.03/g/ii | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M30 Grade Between 5 to 10 m height | cum | 12,921.64 | Aggregate | 0.900 | cum | 666.04 | 1,171.97 | 14,234.5 |
| | | | | | Cement | 0.407 | Ton | 670.30 | | |
| | | | | | Sand | 0.450 | cum | 666.04 | | |
| 15 | 15.03/h/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M35 Grade Pedestal | cum | 11,975.71 | | | | | 0.00 | 12,095.4 |
| 16 | 15.05 | HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification | MT | 77,427.65 | Steel | 1.050 | Ton | 670.30 | 703.82 | 78,912.7 |
| 17 | 15.09 | Supplying, fitting and fixing in position true to line and level elastomeric bearing conforming to IRC: 83 (Part-II) section IX and clause 2005 of MoRTH specifications complete including all accessories as per drawing and Technical Specifications. | cc | 3.19 | | | | | 0.00 | 3.2 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Major Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------------|---|------|-----------|----------|-------------------|---------------|--------------------|---------------|---------------|
| 18 | 15.10 | Supplying, fitting and fixing in position true to line and level POT-PTFE bearing consisting of a metal piston supported by a disc or unreinforced elastomer confined within a metal cylinder, sealing rings, dust seals, PTFE surface sliding against stainless steel mating surface, complete assembly to be of cast steel/fabricated structural steel, metal and elastomer elements to be as per IRC: 83 part-I & II respectively and other parts conforming to BS: 5400, section 9.1 & 9.2 and clause 2006 of MoRTH Specifications complete as per drawing and approved technical specifications. | Ton | 505.27 | | | | | 0.00 | 510.3 |
| 19 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | Rm | 445.75 | | | | | 1.80 | 452.0 |
| | | | | | Cement | 0.001 | Ton | 670.30 | | |
| | | | | | Sand | 0.002 | cum | 666.04 | | |
| 20 | 16.01/b/i/c 2/ii | RCC Grade M30 For solid slab super-structure Approach Slab | cum | 13,287.15 | | | | | 0.00 | 13,420.0 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Major Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|-----------|------------------|-------------------|---------------|--------------------|---------------|---------------|
| 21 | 16.01/d/ii | cement concrete Reinforced concrete in super-structure as per drawing and Technical Specification i/c form work complete as per drawing and technical specification RCC Grade M40 For T beam and slab using batching plant, Transit Mixure and concrete pump Upto 5m | cum | 14,396.84 | Aggregate | 0.850 | cum | 666.04 | 1,277.33 | 15,830.9 |
| | | | | | Cement | 0.500 | Ton | 670.30 | | |
| | | | | | Course Sand | 0.400 | cum | 940.11 | | |
| 22 | 16.03 | HYSD bar reinforcement in super-structure complete as per drawing and technical specifications | MT | 85,183.86 | Steel | 1.050 | Ton | 670.30 | 703.82 | 86,746.5 |
| 23 | 16.05 | Cement concrete wearing coat M-30 grade including reinforcement complete as per drawing and Technical Specifications | cum | 18,782.51 | Aggregate | 0.860 | cum | 666.04 | 1,278.68 | 20,261.8 |
| | | | | | Cement | 0.450 | Ton | 670.30 | | |
| | | | | | Course Sand | 0.430 | cum | 940.11 | | |
| 24 | 16.11 | Drainage Spouts complete as per drawing and Technical specification | each | 2,158.99 | Structural Steel | 0.004 | Ton | 670.30 | 2.68 | 2,183.2 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

FINISHER RATE

Major Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|---|------|-----------|-----------------------|-------------------|---------------|--------------------|---------------|---------------|
| 25 | 16.12/Nsc | Reinforced cement concrete approach slab M-30 including reinforcement and formwork complete as per drawing and Technical specification | cum | 15,325.00 | | | | | 1,994.42 | 17,492.6 |
| | | | | | Aggregate | 0.900 | cum | 666.04 | | |
| | | | | | Cement | 0.400 | Ton | 670.30 | | |
| | | | | | Course Sand | 0.450 | cum | 940.11 | | |
| | | | | | Steel | 1.050 | Ton | 670.30 | | |
| 26 | 16.13 | PCC M15 ordinary Grade leveling course below approach slab complete as per drawing and Technical specification Below Approach Slab | cum | 8,109.93 | | | | | 1,083.69 | 9,285.5 |
| | | | | | Cement | 0.275 | Ton | 670.30 | | |
| | | | | | Sand | 0.450 | cum | 666.04 | | |
| | | | | | Stone Chips/Aggregate | 0.900 | cum | 666.04 | | |
| 27 | 16.16 | Providing single gap(unitary) strip/seal type of expansion joint of movement capacity of 80 mm with fatigue tested structure section at the nosing and ancourage assembly complete as per approved drawing and standard specification to be installed under supervision of a specialist manufacture | Rm | 41,863.77 | | | | | 0.00 | 42,282.4 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Major Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|--|------|----------|---|-------------------------|-------------------|----------------------------|---------------|---------------|
| 28 | 16.17 | Mastic asphalt (providing and laying 12mm thick mastic asphalt wearing courses on top of deck slab excluding prime coat with paving grade bitumen meeting the requirement given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10sqm and at an approximate spacing of 10cm centre in both direction, pressed into surface not less than 100 deg. C. protruding 1mm to 4mm over mastic surface, all complete as per clause 515) using Bitumen VG-40 (3/40) | sqm | 532.56 | Bitumen Lime Stone Chips/Aggregate | 0.003 0.005 0.014 | Ton Ton cum | 670.30 399.23 666.04 | 12.86 | 550.8 |
| 29 | 17.01/a | laying apron complete as per drawing and Technical specification. Boulder | cum | 2,280.25 | Stone Bolder | 1.200 | cum | 2,221.91 | 2,666.29 | 4,996.0 |
| 30 | 17.02 | Filter material underneath pitching in slopes complete as per drawing and Technical specification | cum | 2,426.95 | Aggregate | 1.200 | cum | 666.04 | 799.25 | 3,258.4 |
| 31 | 17.03/a | Pitching on slopes complete as per drawing and Technical specifications Stone | cum | 1,655.65 | | | | | 2,666.29 | 4,365.1 |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Major Bridge

| SI No | State SOR Ref | Item description | Unit | SOR Rate | Material | Material Qty/Unit | Material Unit | Material Carr Cost | Carriage Cost | Finished Rate |
|-------|---------------|------------------|------|----------|--------------|-------------------|---------------|--------------------|---------------|---------------|
| | | | | | Stone Bolder | 1.200 | cum | 2,221.91 | | |

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

NON SCHEDULE ITEM



| Analysis of Non-Schedule Rate | | | | | | | |
|---|---------------------|-----|--|--------|----------|----------|----------------|
| SUB-BASES, BASES (NON- BITUMINOUS) AND SHOULDERS | | | | | | | |
| Sr No | Ref. to MoRTH Spec. | | Description | Unit | Quantity | Rate Rs | Cost Rs |
| 4.1 | 401 | | Granular Sub-Base with Close Graded Material (Table:- 400-1) (Material Reuse) | | | | |
| | | A | Plant Mix Method | | | | |
| | | | Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on | | | | |
| | | | Unit = cum | | | | |
| | | | Taking output = 225 cum (450 tonne) | | | | |
| | | | a) Labour | | | | |
| | | | Mate | day | 0.400 | 550.000 | 220.00 |
| | | | Mazdoor skilled | day | 2.000 | 450.000 | 900.00 |
| | | | Mazdoor Unskilled | day | 8.000 | 400.000 | 3200.00 |
| | | | b) Machinery | | | | |
| | | | Wet mix plant @ 60 tonne capacity per hour | hour | 6.000 | 5362.583 | 32175.50 |
| | | | Electric generator 160 KVA | hour | 6.000 | 2202.500 | 13215.00 |
| | | | Water tanker | hour | 4.500 | 992.333 | 4465.50 |
| | | | Excavator Cum Loader | hour | 6.000 | 1755.333 | 10532.00 |
| | | | Tipper 6.5-10 tonne | tonne. | 450 x L | 63.897 | 258782.51 |
| | | | Add 10 per cent of cost of carriage to cover loading and unloading | | | | 25878.25 |
| | | | Motor Grader (BEML-092) | hour | 6.000 | 5049.167 | 30295.00 |
| | | | Vibratory roller 8-10 t | hour | 6.000 | 1743.333 | 10460.00 |
| | | | c) Material | | | | |
| | | | Close graded Granular sub-base Material as per table 400-1 | | | | |
| | | | For Grading-II Material | | | | |
| | | | 26.5 mm to 9.5 mm @ 35 per cent | cum | 100.800 | 0.00 | 0.00 |
| | | | 9.5 mm to 2.36 mm @ 25 per cent | cum | 72.000 | 0.00 | 0.00 |
| | | | 2.36 mm below @ 40 per cent | cum | 115.200 | 0.00 | 0.00 |
| | | | Cost of water | KL | 27.000 | 125.00 | 3375.00 |
| 4.1A | | (i) | Rate per cum for grading-II Material | | | | |
| | | | d) Overhead charges @ input on (a+b+c) | | | | 31479.90 |
| | | | e) Contractor's profit @ input on (a+b+c+d) | | | | 42497.87 |
| | | | Cost for 225 cum = a+b+c+d+e | | | | 464101.53 |
| | | | Rate per cum = (a+b+c+d+e)/225 | | | | 2062.67 |
| | | | | | | say | <u>2063.00</u> |
| | | | Labour Cess@1% | | | | 20.63 |
| | | | Rate per cum = | | | | <u>2083.63</u> |



| CHAPTER - 3 | | | | | | |
|--|---------------------|--|--|------|----------|------------------------|
| EARTH WORK, EROSION CONTROL AND DRAINAGE | | | | | | |
| Sr No | Ref. to MoRTH Spec. | | Description | Unit | Quantity | Rate Rs Cost Rs |
| 3.12 | 305 | | Construction of Embankment with Material obtained from Borrowpits | | | |
| | | | Construction of embankment with approved material obtained from borrow pits with all lifts and leads, transporting to site, spreading, grading to required slope and compacting to meet requirement of table 300-2. | cum | | 226.26 -----i |
| 3.13 | 305 | | Construction of Embankment with Material Deposited from Roadway Cutting | | | |
| | | | Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2. | cum | | 160.20 -----ii |
| | | | So, Cost of Material obtained from Borrow Pit is Rs. = | | | 66.06 -----(iii=i-ii) |
| 3.14 | 305 | | Construction of Subgrade and Earthen Shoulders | | | |
| | | | Construction of sub-grade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2 | cum | | 312.34 -----iv |
| | | | So, | | | |
| | | | Construction of Subgrade and Earthen Shoulders | | | |
| | | | Construction of embankment with approved material obtained from borrow pits with all lifts and leads, transporting to site, spreading, grading to required slope and compacting to meet requirement of table 300-2. | cum | | 246.28 -----(v=iv-iii) |
| | | | | | | |
| | | | | | | |



| CHAPTER-8 | | | | | | | | |
|--|---------------------|-------------|--|-------|----------|------------|------------------|---------------------|
| TRAFFIC SIGNS, MARKINGS & OTHER ROAD APPURTENANCES | | | | | | | | |
| Sr No | Ref. to MoRTH Spec. | | Description | Unit | Quantity | Rate Rs | Cost Rs | Remarks/ Input ref. |
| 8.7 | 802 | | Overhead Signs | | | | | |
| | | | Providing and erecting overhead signs with a corrosion resistant 2mm thick aluminium alloy sheet reflectorised with high intensity retro-reflective sheeting of encapsulated lense type with vertical and lateral clearance given in clause 802.2 and 802.3 and installed as per clause 802.7 over a designed support system of aluminium alloy or galvanised steel trestles and trusses of sections and type as per structural design requirements and approved plans | | | | | |
| | | A | Truss and Vertical Support | | | | | |
| | | | <i>Unit = tonne</i> | | | | | |
| | | | <i>Taking output = 1 tonne</i> | | | | | |
| | | | a) Labour | | | | | |
| | | | Mate | day | 0.240 | 550.00 | 132.00 | L-12 |
| | | | Blacksmith | day | 2.000 | 550.00 | 1100.00 | L-02 |
| | | | Mazdoor including for handling & fixing at site. | day | 4.000 | 450.00 | 1800.00 | L-13 |
| | | | b) Material | | | | | |
| | | | Aluminium alloy/galvanised steel including 5 per cent wastage | tonne | 1.050 | 120000.00 | 126000.00 | M-060 |
| | | | Add 1 per cent on cost of material for nuts, bolts and drilling and welding consumables | | | | 1260.00 | |
| | | | Add 15 per cent on cost of material for fabrication of trusses as per approved design | | | | 19089.00 | |
| | | | c) Machinery | | | | | |
| | | | Crane 3 tonne capacity | hour | 3.000 | 1525.88 | 4577.65 | P&M-013 |
| | | | Truck | hour | 0.500 | 1277.94 | 638.97 | P&M-057 |
| | | | d) Overhead charges @ 8% on (a+b+c) | | | | 12367.81 | |
| | | | e) Contractor's profit @ 10% on (a+b+c+d) | | | | 16696.54 | |
| | | | Rate per tonne = (a+b+c+d+e) | | | | 183661.97 | |
| | | | | | | say | 183662.00 | |
| 8.7 | | B | Aluminium Alloy Plate for Over Head Sign | | | | | |
| | | | <i>Unit = sqm</i> | | | | | |
| | | | Taking output = 1 sqm | | | | | |
| | | | a) Labour | | | | | |
| | | | Mate | day | 0.020 | 550.00 | 11.00 | L-12 |
| | | | Blacksmith | day | 0.100 | 550.00 | 55.00 | L-02 |
| | | | Mazdoor | day | 0.150 | 450.00 | 67.50 | L-13 |
| | | | b) Material | | | | | |
| | | | Aluminium alloy plate, 2 mm thick, fixed with high intensity grade sheeting vide clause 801.3 | sqm | 1.000 | 450.00 | 450.00 | M-059 |
| | | | Miscellaneous | | | | | |
| | | | Add 1 per cent of cost of labour for lifting arrangement, like ladders, pulleys, ropes etc | | | | 1.34 | |
| | | | c) Overhead charges @ 8% on (a+b) | | | | 46.79 | |
| | | | d) Contractor's profit @ 10% on (a+b+c) | | | | 63.16 | |
| | | | Rate per sqm = (a+b+c+d) | | | | 694.78 | |
| | | | | | | say | 695.00 | |
| | | Note | 1. The cost of excavation and foundation concrete for fixing of vertical support system to be worked out separately as per the approved drawing/design and to be included in the estimate. | | | | | |
| | | | 2. Lettering and arrow marks on sign board to be provided separately as per actual requirement. Rates for these items have been included separately in this chapter. | | | | | |



| CHAPTER-8 | | | | | | | | |
|--|---------------------|--|-------------|------|----------|---------|---------|------------------------|
| TRAFFIC SIGNS, MARKINGS & OTHER ROAD APPURTENANCES | | | | | | | | |
| Sr No | Ref. to MoRTH Spec. | | Description | Unit | Quantity | Rate Rs | Cost Rs | Remarks/ Input ref. |



| Sr No | Ref. to MoRTH Spec. | Description | Unit | Quantity | Rate Rs | Cost Rs | Remarks/ Input ref. |
|-------|---------------------|--|-------|----------|------------|----------------|---------------------|
| 8.22 | 809 | Reinforced Cement Concrete Crash Barrier | | | | | |
| | | Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-40 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified | | | | | |
| | | Unit = Linear metre | | | | | |
| | | Taking output = 10 m | | | | | |
| | | (i) a) M 40 grade concrete | | | | | |
| | | M 40 grade concrete | cum | 3.000 | 11992.30 | 35976.90 | 0.00 |
| | | b) Labour | | | | | |
| | | Mate | day | 0.040 | 550.00 | 22.00 | 0.00 |
| | | Mazdoor | day | 1.000 | 450.00 | 450.00 | 0.00 |
| | | c) Material | | | | | |
| | | HYSD steel reinforcement including dowel bars | tonne | 0.280 | 77427.65 | 21679.74 | 0.00 |
| | | Pre-moulded asphalt filler board | sqm | 0.320 | 1084.84 | 347.15 | 0.00 |
| | | d) Overhead charges @ on (b+c) | | | | 4678.06 | |
| | | e) Contractor's profit @ on (b+c+d) | | | | 6315.39 | |
| | | Cost for 10 metre = a+b+c+d+e | | | | 69469.24 | |
| | | Rate per metre = (a+b+c+d+e)/10 | | | | 6946.92 | |
| | | | | | say | 6947.00 | |



| Sr No | Ref. to MoRTH Spec. | | Description | Unit | Quantity | Rate Rs | Cost Rs | Remarks/ Input ref. |
|-------|---------------------|-------|---|------|----------|---------|----------|---------------------|
| 14.18 | 2605 | | Filler joint | | | | | |
| | | (i) | Providing & fixing 2 mm thick corrugated copper plate in expansion joint complete as per drawing & Technical Specification. | | | | | |
| | | | Unit = Running meter | | | | | |
| | | | Taking output = 12 m | | | | | |
| | | a) | Labour | | | | | |
| | | | Cutting, bending, carrying & fixing etc. | | | | | |
| | | | Mate | day | 0.04 | 550.00 | 22.00 | L-12 |
| | | | Mazdoor | day | 0.50 | 400.00 | 200.00 | L-13 |
| | | | Mazdoor (Skilled) | day | 0.50 | 450.00 | 225.00 | L-15 |
| | | b) | Material | | | | | |
| | | | Copper plate - 12m long x 250 mm wide | kg | 55.00 | 325.45 | 17899.75 | M-086 |
| | | | Area = 12 x 0.25 = 3 sqm | | | | | |
| | | | Weight = 3 x 0.002 x 8900 = 53.4 kg | | | | | |
| | | | Wastage @ 2.5 per cent = 1.33 kg/54.73 kg say = 55 kg. | | | | | |
| | | c) | Overhead charges @ 0.25 on (a+b) | | | | 4586.69 | |
| | | d) | Contractor's profit @ 0.1 on (a+b+c) | | | | 2293.34 | |
| | | | Cost for 12 m = (a+b+c+d) | | | | 25226.78 | |
| | | | Rate per m = (a+b+c+d)/12 | | | | 2102.23 | |
| | | | | | | say | 2102.00 | |
| | | | | | | | 2102.00 | |
| 14.18 | | (ii) | Providing & fixing 20 mm thick compressible fibre board in expansion joint complete as per drawing & Technical Specification. | | | | | |
| | | | Unit = Running meter | | | | | |
| | | | Taking output = 12 m | | | | | |
| | | a) | Labour | | | | | |
| | | | For carrying, placing & fixing. | | | | | |
| | | | Mate | day | 0.01 | 550.00 | 4.40 | L-12 |
| | | | Mazdoor | day | 0.10 | 400.00 | 40.00 | L-13 |
| | | | Mazdoor (Skilled) | day | 0.10 | 450.00 | 45.00 | L-15 |
| | | b) | Material | | | | | |
| | | | 20 mm thick compressible fibre board 12 m long x 25 cm deep. | sqm | 3.00 | 2042.05 | 6126.15 | M-084 |
| | | | Area = 12 x 0.25 = 3 sqm | | | | | |
| | | c) | Overhead charges @ 0.25 on (a+b) | | | | 1553.89 | |
| | | d) | Contractor's profit @ 0.1 on (a+b+c) | | | | 776.94 | |
| | | | Cost for 12 m = (a+b+c+d) | | | | 8546.38 | |
| | | | Rate per m = (a+b+c+d)/12 | | | | 712.20 | |
| | | | | | | say | 712.00 | |
| | | | | | | | 712.00 | |
| 14.18 | | (iii) | Providing and fixing in position 20 mm thick premoulded joint filler in expansion joint for fixed ends of simply supported spans not exceeding 10 m to cater for a horizontal movement upto 20 mm, covered with sealant complete as per drawing and technical specifications. | | | | | |
| | | | Unit = Running meter | | | | | |
| | | | Taking output = 12 m | | | | | |
| | | a) | Labour | | | | | |
| | | | Mate | day | 0.01 | 550.00 | 5.50 | L-12 |
| | | | Mazdoor | day | 0.20 | 400.00 | 80.00 | L-13 |
| | | | Mazdoor (Skilled) | day | 0.10 | 450.00 | 45.00 | L-15 |
| | | b) | Material | | | | | |
| | | | Premoulded joint filler 12 m long, 20 mm thick and 300 mm deep. | sqm | 3.60 | 516.12 | 1858.03 | M-141 |
| | | c) | Overhead charges @ 0.25 on (a+b) | | | | 497.13 | |
| | | d) | Contractor's profit @ 0.1 on (a+b+c) | | | | 248.57 | |
| | | | Cost for 12 m = (a+b+c+d) | | | | 2734.23 | |
| | | | Rate per m = (a+b+c+d)/12 | | | | 227.85 | |
| | | | | | | say | 228.00 | |
| | | | | | | | 228.00 | |



| Sr No | Ref. to MoRTH Spec. | | Description | Unit | Quantity | Rate Rs | Cost Rs | Remarks/ Input ref. |
|-------|---------------------|------|---|------|----------|----------|---------|---------------------|
| 14.18 | | (iv) | Providing and filling joint sealing compound as per drawings and technical specifications with coarse sand and 6 per cent bitumen by weight | | | | | |
| | | | Unit = Running meter | | | | | |
| | | | Taking output = 12 m | | | | | |
| | | | 12m long x 100 mm wide x 10mm deep recess | | | | | |
| | | | a) Labour | | | | | |
| | | | Mate | day | 0.02 | 550.00 | 11.00 | L-12 |
| | | | Mazdoor | day | 0.50 | 400.00 | 200.00 | L-13 |
| | | | Mazdoor (Skilled) | day | 0.10 | 450.00 | 45.00 | L-15 |
| | | | b) Material | | | | | |
| | | | Sand | cum | 0.012 | 1612.00 | 19.34 | M-005 |
| | | | Volume $12 \times 0.1 \times 0.01 = 0.012$ cum | | | | | |
| | | | Weight $0.012 \times 1400 = 16.8$ kg | | | | | |
| | | | Bitumen | cum | 0.001 | 42361.44 | 42.36 | Schedule M-4 (xix) |
| | | | $16.8 \times 0.06 = 1$ kg | | | | | |
| | | | c) Overhead charges @ 0.25 on (a+b) | | | | 79.43 | |
| | | | d) Contractor's profit @ 0.1 on (a+b+c) | | | | 39.71 | |
| | | | Cost for 12 m = (a+b+c+d) | | | | 436.84 | |
| | | | Rate per m = (a+b+c+d)/12 | | | | 36.40 | |
| | | | | | | say | 36.40 | |
| | | | | | | | 36.00 | |
| | | Note | For arriving at the final rate of filler joints per m | | | | | |
| | | | length and per cm depth of joint filling compound, | | | | | |
| | | | the rates at Sl. No. i), ii), iii) & iv) shall be added | | | | | |



| Ref. to MoRTH Spec. | Description | Unit | Quantity | Rate Rs | Cost Rs |
|--|---|-------|----------|------------|------------------|
| Rate Analysis performed on basis of sample analysis published in "Guidebook for Fabrication & Erection of Steel Structures" by Alok Baishya, BE(Civil), MBA and published by Institute for Steel Development & Growth (INSDAG) | Supply, fabrication, delivery at bridge site and erection of structural steel works as per IS 2062, including two coats of primer, one at shop and the other at site and two coats of aluminium paints including all labour, material, consumables etc. | | | | |
| | Unit =1MT | | | | |
| | Taking output = 1MT | | | | |
| | a) Material | | | | |
| | Structural Steel | tonne | 1.05 | 61092.77 | 64147.41 |
| | Permanent Bolts of tested quality | kg | 7.00 | 105.00 | 735.00 |
| | Electrode (@10 kg of weld metal (approx 275 nos. of 4mm electrode / ton of fabrication) | nos. | 275.00 | 9.35 | 2570.70 |
| | Electrode (@2 kg of weld metal (approx 275 nos. of 4mm electrode / ton of erection) | nos. | 50.00 | 9.35 | 467.40 |
| | DA Gas for fabrication | cum | 2.00 | 734.40 | 1468.80 |
| | DA Gas for erection | cum | 0.50 | 734.40 | 367.20 |
| | Oxygen for fabrication | cum | 6.00 | 126.84 | 761.04 |
| | Oxygen for erection | cum | 1.50 | 126.84 | 190.26 |
| | Red Lead Primer for fabrication | l | 1.50 | 160.27 | 240.41 |
| | Red Lead Primer for erection | l | 1.00 | 160.27 | 160.27 |
| | Paint | l | 2.00 | 191.44 | 382.88 |
| | Service bolts for erection | kg | 7.00 | 105.00 | 735.00 |
| | b) Labour | | | | |
| | Marker for fabrication | day | 0.60 | 450.00 | 270.00 |
| | Fitter-I for fabrication | day | 0.90 | 550.00 | 495.00 |
| | Gas Cutter for fabrication | day | 0.90 | 450.00 | 405.00 |
| | Hammer man | day | 0.30 | 400.00 | 120.00 |
| | Welder-I for fabrication | day | 1.50 | 450.00 | 675.00 |
| | Foreman for fabrication | day | 0.90 | 450.00 | 405.00 |
| | Grinder for fabrication | day | 0.90 | 450.00 | 405.00 |
| | Work Supervisor for fabrication | day | 0.30 | 550.00 | 165.00 |
| | Unskilled for fabrication | day | 6.00 | 400.00 | 2400.00 |
| | Painter for fabrication | day | 1.52 | 550.00 | 836.00 |
| | Painter for erection | day | 5.05 | 550.00 | 2777.50 |
| | Sarang for erection | day | 1.00 | 450.00 | 450.00 |
| | Riggers for erection | day | 8.00 | 400.00 | 3200.00 |
| | Welder for erection | day | 1.00 | 450.00 | 450.00 |
| | Gas Cutter for erection | day | 1.00 | 450.00 | 450.00 |
| | Fitter for erection | day | 1.00 | 550.00 | 550.00 |
| | Semi skilled for erection | day | 3.00 | 350.00 | 1050.00 |
| | c) Machinery | | | | |
| | Welding machine, grinding machine for fabrication | LS | | 890.40 | 890.40 |
| | Tools, Zigs and fixtures for fabrication | LS | | 254.40 | 254.40 |
| | Crane, inch, Welding generator, rectifier, transformer, etc. for erection | LS | | 890.40 | 890.40 |
| | Tools, tackles, safety appliances, etc for erection | LS | | 254.40 | 254.40 |
| | d)Overheads @ 22.5% on (a+b+c) | | | | 20164.38 |
| | e)Contractor's profit @ 10% on (a+b+c+d) | | | | 10978.39 |
| | Rate for per MT (a+b+c+d+e) | | | | 120762.24 |
| | | | | say | 120762.00 |



Flexible Apron

| Sr No | Ref. to MoRTH Spec. | Description | Unit | Quantity | Rate Rs | Cost Rs | Remarks/ Input ref. |
|-------|---------------------|--|------|----------|------------|----------------|---------------------|
| 15.11 | 2507.2 | Flexible Apron :Construction of flexible apron 1 m thick comprising of loose stone boulders weighing not less than 40 kg beyond curtain wall | | | | | |
| | | Unit = cum | | | | | |
| | | Taking Output = 1 cum | | | | | |
| | | a) Material | | | | | |
| | | Stone | cum | 1.00 | 575.00 | 575.00 | M-003 |
| | | Stone Spalls | cum | 0.20 | 66.00 | 13.20 | M-008 |
| | | b) Labour | | | | | |
| | | Mate | day | 0.05 | 450.00 | 22.50 | L-12 |
| | | Mason | day | 0.25 | 500.00 | 125.00 | L-11 |
| | | Mazdoor | day | 1.00 | 400.00 | 400.00 | L-13 |
| | | Add 1 per cent of cost of (a+b) for trimming and preparation of bed. | | | | 11.36 | |
| | | c) Overhead charges @ 8% on (a+b) | | | | 91.76 | |
| | | d) Contractor's profit @ 10% on (a+b+c) | | | | 123.88 | |
| | | Rate per cum = (a+b+c+d) | | | | 1362.70 | |
| | | | | | say | 1363.00 | |



Approach Slab

| Sr No | Ref. to MoRTH Spec. | Description | Unit | Quantity | Rate Rs | Cost Rs | Remarks / Input ref. |
|-------|-----------------------|---|-------|----------|----------|----------|----------------------|
| 14.11 | 1500,1600,1700 & 2704 | Reinforced cement concrete approach slab including reinforcement and formwork complete as per drawing and Technical specification | | | | | |
| | | Unit = 1 cum | | | | | |
| | | Taking output = 1 cum | | | | | |
| | | a) Material | | | | | |
| | | Cement concrete M30 Grade Refer relevant item of concrete in item 12.8(G) by using batching plant, excluding formwork i.e. per cum basic cost (a+b+c) (Excluding OH & CP) | cum | 1.00 | 8235.60 | 8235.60 | Item 12.8 (G) |
| | | (Refer relevant item of concrete in item No. 13.8 (G) except that form work may be added at the rate of 2 per cent of cost against 3.5 per cent provided in the foundation concrete. | | | | 164.71 | |
| | | HYSD bar reinforcement Rate as per item No 14.2(Excluding OH & CP) | tonne | 0.05 | 59458.22 | 2972.91 | Item 14.2 A |
| | | b) Overhead charges @ 22.5% on (a) | | | | 2558.97 | |
| | | c) Contractor's profit @ 10% on (a+b) | | | | 1393.22 | |
| | | Rate per cum (a+b+c) | | | | 15325.42 | |
| | | | | | say | 15325.00 | |
| | | | | | | 15325.00 | |



| BASES AND SURFACE COURSES (BITUMINOUS VG-40) | | | | | | | | |
|--|---------------------|--|--|----------|------------|----------|-----------|----------------------|
| Sr No | Ref. to MoRTH Spec. | | Description | Unit | Quantity | Rate Rs | Cost Rs | Remarks/ Input ref. |
| 5.6 | 507 | | Dense Graded Bituminous Macadam | | | | | |
| | | | Providing and laying dense graded bituminous macadam with 100-120 TPH batch type HMP producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.0 to 4.5 per cent by weight of total mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in | | | | | |
| | | | Unit = cum | | | | | |
| | | | Taking output = 195 cum (450 tonnes) | | | | | |
| | | | a) Labour | | | | | |
| | | | Mate | day | 0.840 | 550.00 | 462.00 | L-12 |
| | | | Mazdoor working with HMP, mechanical broom, paver, roller, asphalt cutter and assistance for setting out lines, levels and layout of construction | day | 16.000 | 400.00 | 6400.00 | L-13 |
| | | | Skilled mazdoor for checking line & levels | day | 5.000 | 450.00 | 2250.00 | L-15 |
| | | | b) Machinery | | | | | |
| | | | Batch mix HMP @ 75 tonne per hour | hour | 6.000 | 49595.33 | 297572.00 | P&M-022 |
| | | | Paver finisher hydrostatic with sensor control @ 75 cum per hour | hour | 6.000 | 6852.67 | 41116.00 | P&M-034 |
| | | | Generator 250 KVA | hour | 6.000 | 3441.41 | 20648.44 | P&M-081 |
| | | | Front end loader 1 cum bucket capacity | hour | 6.000 | 1755.33 | 10532.00 | P&M-017 |
| | | | Tipper 10 tonne capacity | tonne.km | 450 x L | 547.69 | 246459.54 | Lead =1 km & P&M-058 |
| | | | Add 10 per cent of cost of carriage to cover cost of loading and unloading | | | | 24645.95 | |
| | | | smooth wheeled roller 8-10 tonnes for initial break down rolling. | hour | 6.00x0.65* | 1072.88 | 4184.25 | P&M-044 |
| | | | Vibratory roller 8 tonnes for intermediate rolling. | hour | 6.00x0.65* | 1743.33 | 6799.00 | P&M-059 |
| | | | Finish rolling with 6-8 tonnes smooth wheeled tandem roller. | hour | 6.00x0.65* | 1191.66 | 4647.47 | P&M-045 |

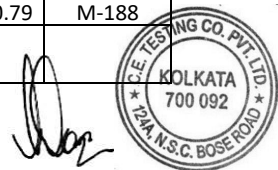


| | | | | | | | |
|--|--|--|-------|---------|------------|-----------------|-------|
| | | c) Materials | | | | | |
| | | Bitumen @ 4.25 per cent of weight of mix | tonne | 19.130 | 42361.44 | 810374.35 | M-074 |
| | | Aggregate | | | | | |
| | | Total weight of mix = 450 tonnes | | | | | |
| | | Weight of bitumen = 19.13 tonnes | | | | | |
| | | Weight of aggregate = 450 - 19.13 = 430.87 tonnes | | | | | |
| | | Taking density of aggregate = 1.5 ton/cum | | | | | |
| | | Volume of aggregate = 287.25 cum | | | | | |
| | | Grading - I (40 mm Nominal Size) | | | | | |
| | | 37.5 - 25 mm 22 per cent | cum | 63.190 | 1214.45 | 76741.10 | M-049 |
| | | 25 - 10 mm 13 per cent | cum | 37.340 | 1351.50 | 50464.92 | M-046 |
| | | 10 - 4.75 mm 19 per cent | cum | 54.580 | 1224.55 | 66835.94 | M-040 |
| | | 4.75 mm and below 44 per cent | cum | 126.390 | 1174.20 | 148407.14 | M-030 |
| | | Filler @ 2 per cent of weight of aggregates. | tonne | 8.620 | 2653.22 | 22870.79 | M-188 |
| | | or | | | | | |
| | | Grading - II (19 mm Nominal Size) | | | | | |
| | | 25 - 10 mm 30 per cent | cum | 86.160 | 1351.50 | 116445.02 | M-046 |
| | | 10 - 5 mm 28 per cent | cum | 80.430 | 1224.55 | 98490.56 | M-040 |
| | | 5 mm and below 40 per cent | cum | 114.900 | 1174.20 | 134915.58 | M-030 |
| | | Filler @ 2 per cent of weight of aggregates. | tonne | 8.620 | 2653.22 | 22870.79 | M-188 |
| | | * Any one of the alternative may be adopted as per approved design | | | | | |
| | | (i) For Grading I (40 mm nominal size) | | | | | |
| | | d) Overhead charges @ 0.08 on (a+b+c) | | | | 147312.87 | |
| | | e) Contractor's profit @ 0.1 on (a+b+c+d) | | | | 198872.37 | |
| | | Cost for 205 cum = a+b+c+d+e | | | | 2187596.12 | |
| | | Rate per cum = (a+b+c+d+e)/195 (For Grading I) | | | | 11218.44 | |
| | | | | | say | 11218.00 | |
| | | (ii) For Grading II (19 mm nominal size) | | | | | |
| | | d) Overhead charges @ 0.08 on (a+b+c) | | | | 147905.04 | |
| | | e) Contractor's profit @ 0.1 on (a+b+c+d) | | | | 199671.80 | |
| | | Cost for 205 cum = a+b+c+d+e | | | | 2196389.78 | |
| | | Rate per cum = (a+b+c+d+e)/195 (For Grading-II) | | | | 11263.54 | |
| | | | | | say | 11264.00 | |



| | | | | | | | | |
|--|--|-------------|---|--|--|--|--|--|
| | | Note | *1. Although the roller are required only for 3 hours as per norms of output, but the same have to be available at site for six hours as the hot mix plant and paver will take six hours for mixing and paving the output of 450 tonnes considered in this analysis. To cater for the idle period of these rollers, their usage rates have been multiplied by a factor of 0.65. | | | | | |
| | | | 2.Quantity of Bitumen has been taken for analysis purpose. The actual quantity will depend upon job mix formula. | | | | | |
| | | | 3. Labour for traffic control, watch and ward and other miscellaneous duties at site including sundries have been included in administrative overheads of the contractor. | | | | | |
| | | | 4. In case DBM is laid over freshly laid tack coat, provision of mechanical broom and 2 mazdoors shall be deleted as the same has been included in the cost of tack coat. | | | | | |
| | | | 5. The individual density for each size of aggregates to be used for construction i.e. 37.5-25 mm, 25-10 mm etc. should be found in the laboratory and accordingly the quantities should be ammended for use in field. The average density of 1.5 tonne/cum is only a reference density in this Data Book. | | | | | |
| | | | 6. The individual percentage of aggregates should be calculated from the total weight of dry aggregates i.e.. excluding the weight of bitumen. The weight of filler will also be 2 per cent by weight of dry aggregates. | | | | | |

| | | | | | | | |
|-----|-----|--|----------|------------|----------|-----------|----------------------|
| 5.8 | 509 | Bituminous Concrete | | | | | |
| | | Providing and laying bituminous concrete with 100-120 TPH batch type hot mix plant producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.4 to 5.6 per cent of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all | | | | | |
| | | Unit = cum | | | | | |
| | | Taking output = 191 cum (450 tonnes) | | | | | |
| | | a) Labour | | | | | |
| | | Mate | day | 0.840 | 550.00 | 462.00 | L-12 |
| | | Mazdoor working with HMP, mechanical broom, paver, roller, asphalt cutter and assistance for setting out lines, levels and layout of construction | day | 16.000 | 400.00 | 6400.00 | L-13 |
| | | Skilled mazdoor for checking line & levels | day | 5.000 | 450.00 | 2250.00 | L-15 |
| | | b) Machinery | | | | | |
| | | Batch mix HMP @ 75 tonne per hour | hour | 6.000 | 49595.33 | 297572.00 | P&M-022 |
| | | Paver finisher hydrostatic with sensor control @ 75 cum per hour | hour | 6.000 | 6852.67 | 41116.00 | P&M-034 |
| | | Generator 250 KVA | hour | 6.000 | 3441.41 | 20648.44 | P&M-081 |
| | | Front end loader 1 cum bucket capacity | hour | 6.000 | 1755.33 | 10532.00 | P&M-017 |
| | | Tipper 10 tonne capacity | tonne.km | 450 x L | 547.69 | 246459.54 | Lead =1 km & P&M-058 |
| | | Add 10 per cent of cost of carriage to cover cost of loading and unloading | | | | 24645.95 | |
| | | Smooth wheeled roller 8-10 tonnes for initial break down rolling. | hour | 6.00x0.65* | 1072.88 | 4184.25 | P&M-044 |
| | | Vibratory roller 8 tonnes for intermediate rolling. | hour | 6.00x0.65* | 1743.33 | 6799.00 | P&M-059 |
| | | Finish rolling with 6-8 tonnes smooth wheeled tandem roller. | hour | 6.00x0.65* | 1191.66 | 4647.47 | P&M-045 |
| | | c) Material | | | | | |
| | | i) Bitumen@ 5 per cent of weight of mix | tonne | 22.500 | 42361.44 | 953132.40 | M-074 |
| | | ii) Aggregate | | | | | |
| | | Total weight of mix = 450 tonnes | | | | | |
| | | Weight of bitumen = 22.5 tonnes | | | | | |
| | | Weight of aggregate = 450 -22.50 = 427.50 tonnes | | | | | |
| | | Taking density of aggregate = 1.5 ton/cum | | | | | |
| | | Volume of aggregate = 285 cum | | | | | |
| | | Grading - I (19 mm Nominal Size) | | | | | |
| | | 20 - 10 mm 35 per cent | cum | 99.750 | 1399.51 | 139601.46 | M-045 |
| | | 10 - 5 mm 23 per cent | cum | 65.550 | 1224.55 | 80269.25 | M-040 |
| | | 5 mm and below 40 per cent | cum | 114.000 | 1174.20 | 133858.80 | M-030 |
| | | Filler @ 2 per cent of weight of aggregates. | tonne | 8.620 | 2653.22 | 22870.79 | M-188 |
| | | or | | | | | |
| | | Grading - II (13 mm Nominal Size) | | | | | |
| | | 13.2 - 10 mm 30 per cent | cum | 85.500 | 1358.50 | 116151.75 | M-044 |
| | | 10 - 5 mm 25 per cent | cum | 71.250 | 1224.55 | 87249.19 | M-040 |
| | | 5 mm and below 43 per cent | cum | 122.550 | 1174.20 | 143898.21 | M-030 |
| | | Filler @ 2 per cent of weight of aggregates. | tonne | 8.620 | 2653.22 | 22870.79 | M-188 |
| | | *Any one of the alternative may be adopted as per approved design | | | | | |



| | | | | | | | |
|-----|--|------|--|--|-----|-----------------|--|
| | | (i) | for Grading-I (19 mm nominal size) | | | | |
| | | | d) Overhead charges @ 0.08 on (a+b+c) | | | 159635.95 | |
| | | | e) Contractor's profit @ 0.1 on (a+b+c+d) | | | 215508.53 | |
| | | | Cost for 205 cum = a+b+c+d+e | | | 2370593.82 | |
| | | | Rate per cum = (a+b+c+d+e)/191 | | | 12411.49 | |
| | | | | | say | 12411.00 | |
| 5.8 | | (ii) | for Grading-II(13 mm nominal size) | | | | |
| | | | d) Overhead charges @ 0.08 on (a+b+c) | | | 159121.52 | |
| | | | e) Contractor's profit @ 0.1 on (a+b+c+d) | | | 214814.05 | |
| | | | Cost for 205 cum = a+b+c+d+e | | | 2362954.55 | |
| | | | Rate per cum = (a+b+c+d+e)/191 (For Grading-II) | | | 12371.49 | |
| | | | | | say | 12371.00 | |
| | | Note | *1. Although the rollers are required only for 3 hours as per norms of output, but the same have to be available at site for six hours as the hot mix plant and paver will take six hours for mixing and paving the output of 450 tonnes considered in this analysis. To cater for the idle period of these rollers, their usage rates have been multiplied by a factor of 0.65. | | | | |
| | | | 2.Quantity of Bitumen has been taken for analysis purpose. The actual quantity will depend upon job mix formula. | | | | |
| | | | 3. Labour for traffic control, watch and ward and other miscellaneous duties at site including sundries have been included in administrative overheads of the contractor. | | | | |
| | | | 4. In case BC is laid over freshly laid tack coat, provision of mechanical broom and 2 mazdoors shall be deleted as the same has been included in the cost of tack coat. | | | | |
| | | | 5. The individual density for each size of aggregates to be used for construction i.e. 37.5-25 mm, 25-10 mm etc. should be found in the laboratory and accordingly the quantities should be ammended for use in field. The average density of 1.5 tonne/cum is only a reference density in this Data Book | | | | |
| | | | 6. The individual percentage of aggregates should be calculated from the total weight of dry aggregates i.e.. excluding the weight of bitumen. The weight of filler will also be 2 per cent by weight of dry aggregates | | | | |

CHAPTER-9

PIPE CULVERTS

| Sr No | to MoRTH Spec. | Description | Unit | Quantity | Rate Rs | Cost Rs |
|-------|----------------|---|-------|----------|------------|-----------------|
| 9.2 | 2900 | Laying Reinforced Cement Concrete Pipe NP4 / Prestressed Concrete Pipe on First Class Bedding in Single Row . | | | | |
| | | Laying Reinforced cement concrete pipe NP4/prestressed concrete pipe for culverts on first class bedding of granular material in single row including fixing collar with cement mortar 1:2 but excluding excavation, protection works, backfilling, concrete and masonry works in head walls and parapets . | | | | |
| | | Unit = metre | | | | |
| | | Taking output = 12.5 metres (5 pipes of 2.5 m length each) | | | | |
| 9.2 | B | 1200 mm dia | | | | |
| | | a) Labour | | | | |
| | | Mate | day | 0.280 | 550.00 | 154.00 |
| | | Mason | day | 1.000 | 400.00 | 400.00 |
| | | Mazdoor | day | 6.000 | 450.00 | 2700.00 |
| | | b) Material | | | | |
| | | Sand at site | cum | 0.090 | 1612.00 | 145.08 |
| | | Cement at site | tonne | 0.070 | 9830.60 | 688.14 |
| | | RCC pipe NP-4/prestressed concrete pipe including collar | metre | 12.500 | 8970.00 | 112125.00 |
| | | Granular material passing 5-6 mm sieve for class bedding | cum | 5.000 | 1174.20 | 5871.00 |
| | | c) Overhead charges @ on (a+b) | | | | 9766.66 |
| | | d) Contractor's profit @ on (a+b+c) | | | | 13184.99 |
| | | Cost for 12.5 metres = a+b+c+d | | | | 145034.87 |
| | | Rate per metre= (a+b+c+d)/12.5 | | | | 11602.79 |
| | | | | | say | 11603.00 |
| | | Note | | | | |
| | | 1. In case of cement craddle bedding, quantity of PCC M15 is to be calculated as per design and priced separately and added . | | | | |
| | | 2. The rate analysis does not include excavation, cement /masonry works in head walls, backfilling, protection works and parapet walls. The same are to be calculated as per approved design and drawings and priced separately on rates available under respective sections | | | | |



| CHAPTER - 4 | | | | | | |
|---|---------------------|---|----------|----------|---------|-----------|
| SUB-BASES, BASES (NON- BITUMINOUS) AND SHOULDERS | | | | | | |
| Sr No | Ref. to MoRTH Spec. | Description | Unit | Quantity | Rate Rs | Cost Rs |
| 4.1 | 401 | Granular Sub-Base with Close Graded Material (Table:- 400-1) | | | | |
| | A | Plant Mix Method | | | | |
| | | Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 | | | | |
| | | Unit = cum | | | | |
| | | Taking output = 225 cum (450 tonne) | | | | |
| | | a) Labour | | | | |
| | | Mate | day | 0.400 | 550.00 | 220.00 |
| | | Mazdoor skilled | day | 2.000 | 450.00 | 900.00 |
| | | Mazdoor | day | 8.000 | 400.00 | 3200.00 |
| | | b) Machinery | | | | |
| | | Wet mix plant @ 75 tonne capacity per hour | hour | 6.000 | 5362.58 | 32175.50 |
| | | Electric generator 125 KVA | hour | 6.000 | 2202.50 | 13215.00 |
| | | Water tanker 6 KL capacity 5 km lead with one trip per hour | hour | 4.500 | 992.33 | 4465.50 |
| | | Front end loader 1 cum bucket capacity | hour | 6.000 | 1755.33 | 10532.00 |
| | | Tipper 10 tonne (taking Lead, L= 2km) | tonne.km | 450 x L | 63.90 | 57507.23 |
| | | Add 10 per cent of cost of carriage to cover loading and unloading | | | | 5750.72 |
| | | Motor Grader 110 HP | hour | 6.000 | 5049.17 | 30295.00 |
| | | Vibratory roller 8-10 t | hour | 6.000 | 1743.33 | 10460.00 |
| | | c) Material | | | | |
| | | Close graded Granular sub-base Material as per table 400-1 | | | | |
| | | For Grading-V Material | | | | |
| | | 53 mm to 9.5 mm @ 50 per cent | cum | 144.000 | 1325.49 | 190870.27 |
| | | 9.5 mm to 2.36 mm @ 20 per cent | cum | 57.000 | 1224.55 | 69799.35 |
| | | 2.36 mm below @ 30 per cent | cum | 86.400 | 1560.72 | 134846.21 |
| | | Cost of water | KL | 27.000 | 125.00 | 3375.00 |
| 4.1A | (i) | Rate per cum for grading-V Material | | | | |
| | | d) Overhead charges @ on (a+b+c) | | | | 45408.94 |
| | | e) Contractor's profit @ on (a+b+c+d) | | | | 61302.07 |
| | | Cost for 225 cum = a+b+c+d+e | | | | 674322.79 |
| | | Rate per cum = (a+b+c+d+e)/225 | | | | 2996.99 |
| | | | | | say | 2997.00 |
| | Note | Any one of the grading for material may be adopted as per design | | | | |



| | | | | | | |
|------|--------------------|--|--|--|--|----------------|
| 8.38 | Sug ges tive | Rumble Strips | | | | |
| | | Provision of 15 nos rumble strips covered with premix bituminous carpet, 15-20 mm high at center, 250 mm wide placed at 1 m center to center at approved locations to control speed, marked with white strips of road marking paint. | | | | |
| | | Unit = sqm | | | | |
| | | Taking output = 1 sqm (including gaps) | | | | |
| | | The rate per sqm of premix carpet and road marking may be adopted | | | | |
| 6.1 | 511 | Open - Graded Premix Surfacing By Manual Method | | | | 222.54 |
| 8.14 | | Road Marking With Hot Applied Thermo Plastic Compound | | | | 1002.44 |
| | | Rate per sqm = | | | | 1224.98 |



Dumping of Excavated Soil over Tunnel

| | | | | | | |
|------|-----|--|------|--------|------------|---------------------|
| 3.11 | 301 | Dumping of Excavated Soil over Tunnel | | | | |
| | | <i>Unit = cum</i> | | | | |
| | | <i>Taking output = 360 cum</i> | | | | |
| | | a) Labour | | | | |
| | | Mate | day | 0.080 | 450.00 | 36.00 |
| | | Mazdoor | day | 2.000 | 400.00 | 800.00 |
| | | b) Machinery | | | | |
| | | Excavator 0.90 cum bucket capacity @ 60 cum per hour | hour | 6.000 | 1316.50 | 7899.00 |
| | | Tipper 5.5 cum capacity, 4 trips per hour. | hour | 16.360 | 0.00 | 0.00 |
| | | c) Overhead charges @ input on (a+b) | | | | 698.80 |
| | | d) Contractor's profit @ input on (a+b+c) | | | | 943.38 |
| | | Cost for 360 cum = a+b+c+d | | | | 10377.18 |
| | | Rate per cum = (a+b+c+d)/360 | | | | 28.83 |
| | | | | | say | <u>29.00</u> |

| | | | Description | Unit | Quantity | Rate Rs | Cost Rs |
|------|------|------|---|------|----------|---------|-----------------|
| 12.9 | 1200 | | WELL FOUNDATION | | | | |
| | | | Providing and Constructing Temporary Island 16 m diameter for Construction of Well Foundation for 8m dia. Well. | | | | |
| | | A | Assuming depth of water 1.0 m and height of island to be 1.25 m. | | | | |
| | | | <i>Unit = 1 No</i> | | | | |
| | | | <i>Taking output = 1 No.</i> | | | | |
| | | | a) Material | | | | |
| | | | Earth (compacted) | cum | 251.20 | 60.5 | 15197.60 |
| | | | Sand bags | each | 750.00 | 2.25 | 1686.75 |
| | | | b) Labour | | | | |
| | | | Mate | day | 0.40 | 450.00 | 180.00 |
| | | | Mazdoor for filling sand bags, stitching and placing | day | 15.00 | 450.00 | 6750.00 |
| | | | c) Machinery | | | | |
| | | | Crane with grab 1 cum capacity | hour | 20.00 | 762.94 | 15258.83 |
| | | | Consumables @ 2.5 per cent of (c) above | | | | 381.47 |
| | | | d) Overhead charges @ input on (a+b+c) | | | | 3156.37 |
| | | | e) Contractor's profit @ input on (a+b+c+d) | | | | 4261.10 |
| | | | Rate per No. (a+b+c+d+e) | | | | 46872.13 |
| | | | | | | say | 46872.00 |
| | | Note | It is assumed that earth will be available within the working space of crane with grab bucket. | | | | |
| 12.9 | C | | Providing and constructing one span service road to reach island location from one pier location to another pier location | | | | |
| | | | Assuming span length 30 m, width of service road 10m and depth of water 1m | | | | |
| | | | <i>Unit = 1 meter</i> | | | | |
| | | | <i>Taking output = 30 metre</i> | | | | |
| | | | a) Material | | | | |
| | | | Earth | cum | 450.00 | 60.50 | 27225.00 |
| | | | Sand bags | each | 300.00 | 2.25 | 674.70 |
| | | | b) Labour | | | | |
| | | | Mate | day | 0.24 | 450.00 | 108.00 |
| | | | Mazdoor for filling sand bags, stitching and placing | day | 6.00 | 450.00 | 2700.00 |
| | | | c) Machinery | | | | |
| | | | Front end Loader 1 cum capacity | hour | 27.00 | 1316.50 | 35545.50 |
| | | | Tipper 5.5 cum capacity | hour | 28.00 | 958.45 | 26836.71 |
| | | | d) Overhead charges @ input on (a+b+c) | | | | 7447.19 |
| | | | e) Contractor's profit @ input on (a+b+c+d) | | | | 10053.71 |
| | | | Cost for 30 m (a+b+c+d+e) | | | | 110590.82 |
| | | | Rate per m (a+b+c+d+e)/30 | | | | 3686.36 |
| | | | | | | say | 3686.00 |

VOLUME VII

COST ESTIMATE



ABSTRACT OF COST



Road name- IMPHAL-JIRIBAM ROAD SECTION OF NH-53 (OLD NH-37)
PKG-III
(FROM DESIGN CH KM 33+000 TO KM 49+250)
GENERAL ABSTRACT OF COST

Length of Road (KM)

:

16.250

| DESCRIPTION OF WORKS | | TOTAL COST (IN Cr.) | COST PER KM. OF TOTAL ROAD LENGTH (IN Cr.) | % of Cost of Civil Works (% of C) |
|----------------------|---|------------------------|---|--|
| A. | ROAD WORKS | | | |
| 1 | Site Clearance and Dismantling | 1.80 | 0.11 | 1.10% |
| 2 | Earth work ,Subgrade and Erosion control | 37.37 | 2.30 | 22.87% |
| 3 | Sub-Base & Base | 31.11 | 1.91 | 19.04% |
| 4 | Bituminous Courses | 25.36 | 1.56 | 15.52% |
| 5 | Junction Improvement | 0.03 | 0.00 | 0.02% |
| 6 | Traffic signs, Road marking & other road appurtenances | 3.10 | 0.19 | 1.90% |
| 7 | Passenger Shelter | 0.08 | 0.00 | 0.05% |
| 8 | Busbay | 0.55 | 0.03 | 0.34% |
| | Drainage and Protective Works | | | |
| 9 | Longitudinal Drains | 8.82 | 0.54 | 5.40% |
| 10 | Protection Works | 20.55 | 1.26 | 12.57% |
| 11 | Retaining wall | 1.86 | 0.11 | 1.14% |
| 12 | Breast wall | 8.32 | 0.51 | 5.09% |
| B. | BRIDGES & CULVERTS | | | |
| 13 | Culvert | 15.59 | 0.96 | 9.54% |
| 14 | Minor Bridge | 4.13 | 0.25 | 2.53% |
| C. | COST OF CIVIL WORKS IN LAKHS (AS PER SOR 2018) | 158.67 | 9.76 | |
| D. | Escalation @ 3% WPI | 4.76 | | |
| E. | Total Civil Cost including Escalation@3% | 163.43 | 10.06 | |
| F. | Maintenance for 5 years, i.e 2.5% on civil cost (E) | 4.09 | | |
| G. | GST @ 12% of (E) | 19.61 | | |
| H. | Contingencies @ 2.8% over Civil Cost (E) | 4.58 | | |
| I. | Supervision Charges @ 3% of (E) | 4.90 | | |
| J. | Agency Charges @3% of (E) | 4.90 | | |
| K | Escalation Cost @ 2.5% during Construction Period(For 1.5 Yrs of construction period, No escalation in 1st Year and 2.5% for 0.5 Years) | 4.09 | | |
| L. | TOTAL CONSTRUCTION COST (C+D+E+F+G+H+I)=J | 205.60 | 12.65 | |
| M. | DEPARTMENTAL COST | | | |
| a. | LA Cost | 14.53 | | |
| b. | Encroachment Demolition Cost | 3.27 | | |
| c. | Utility Shifting(Electrical+PHE) | 2.45 | | |
| d. | Environmental Budget | 3.00 | | |
| N | Sub Total (L) | 23.25 | | |
| O | TOTAL PROJECT COST (N+M)=O | 228.85 | 14.08 | |

BILL

(ROAD PART)



Summary of Bill of Quantity

Bill No : 01. Site Clearance and Dismantling

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|---------------|-----------------|--|------|------------|-----------|------------|
| 1 | 02.01/i | Cutting of Girth 300-600mm | Each | 10.00 | 392.30 | 3,923 |
| 2 | 02.01/ii | Cutting of Girth 600-900mm | Each | 30.00 | 723.48 | 21,704 |
| 3 | 02.01/iii | Cutting of Girth 900-1800mm | Each | 46.00 | 1,373.64 | 63,187 |
| 4 | 02.01/iv | Cutting of Girth 1800-2700mm | Each | 3.00 | 2,576.19 | 7,729 |
| 5 | 02.03/b | Clearing & grubbing(Mechanical - Light Jungle) | Ha | 27.17 | 59,912.85 | 1,627,832 |
| 6 | 02.04/i/c | Dismantling Structure RCC | cum | 38.00 | 1,756.40 | 66,743 |
| 7 | 02.04/iii/b | Dismantling Structure Rubble Stone Masonry Cement | Cum | 866.00 | 494.21 | 427,986 |
| 8 | 02.04/vii/a | Mortar Dismantle HP (300-600) | rm | 30.00 | 267.64 | 8,029 |
| 9 | 02.04/vii/b | Dismantle HP (upto 600 - 900 mm dia) | rm | 180.00 | 362.36 | 65,225 |
| 10 | 02.04/vii/c | Dismantle HP (above 900 mm dia) | rm | 60.00 | 620.22 | 37,213 |
| 11 | 02.04/viii/e | Dismantle Flexible Pavement Granular | sqm | 168,284.00 | 34.33 | 5,777,190 |
| 12 | 02.04/viii/f/ii | Dismantle Flexible Pavement Bituminous(Roller & Scarifier) | sqm | 171,814.00 | 57.65 | 9,905,077 |
| Total of Bill | | | | | | 18,011,839 |

Bill No : 02. Earth work,Subgrade and Erosion control

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|---------------|------------|---|------|--------------|--------|-------------|
| 1 | 02/nsc/1 | Hydro Seeding On Cutting Surface | sqm | 18,180.00 | 318.15 | 5,783,967 |
| 2 | 03.13 | Embankment fill from Roadway Cutting | cum | 137,417.00 | 161.80 | 22,234,071 |
| 3 | 03.14 | Subgrade and Earthen Shoulder Fill From Borrow Pit | cum | 14,285.93 | 315.46 | 4,506,638 |
| 4 | 03.15 | Compacting original ground supporting sub-grade | cum | 28,739.90 | 87.52 | 2,515,316 |
| 5 | 03.31 | Excavation in Hill in Soil For Roadway | cum | 1,166,116.00 | 213.50 | 248,965,766 |
| 6 | 03.32 | Excavation for Roadway Ordinary Rock Mechanical (Without Blasting) | cum | 291,529.00 | 307.61 | 89,677,236 |
| Total of Bill | | | | | | 373,682,993 |

Bill No : 03. Sub-Base & Base Courses

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|---------------|------------|-----------------------|------|-----------|----------|-------------|
| 1 | 04.01/Nsc1 | GSB Close Graded GR V | Cum | 26,676.11 | 3,986.49 | 106,344,050 |
| 2 | 04/nsc1 | GSB Reuse | Cum | 15,313.18 | 2,083.63 | 31,907,003 |
| 3 | 05.02 | WMM | Cum | 43,284.70 | 3,992.57 | 172,817,211 |
| Total of Bill | | | | | | 311,068,264 |

Summary of Bill of Quantity

Bill No : 04. Bituminous Courses

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|----------------------|------------|---------------------------|------|------------|-----------|--------------------|
| 1 | 06.01/a | Prime Coat | sqm | 170,433.00 | 58.59 | 9,985,669 |
| 2 | 06.02/ii | Tack Coat(Granular Layer) | sqm | 160,350.00 | 17.50 | 2,806,125 |
| 3 | 06/Nsc1 | DBM GR II | cum | 11,930.31 | 12,431.87 | 148,316,063 |
| 4 | 06/Nsc2 | BC GR II | cum | 6,817.32 | 13,574.27 | 92,540,142 |
| Total of Bill | | | | | | 253,648,000 |

Bill No : 05. Junction Improvement (Major & Minor)

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|----------------------|------------|-----------------------------|------|----------|-----------|----------------|
| 1 | 04.01/Nsc1 | GSB Close Graded GR V | Cum | 12.55 | 3,986.49 | 50,018 |
| 2 | 04/nsc1 | GSB Reuse | Cum | 7.25 | 2,083.63 | 15,113 |
| 3 | 05.02 | WMM | Cum | 24.75 | 3,992.57 | 98,816 |
| 4 | 06.01/a | Prime Coat | sqm | 99.00 | 58.59 | 5,800 |
| 5 | 06.02/i | Tack Coat(Bituminous Layer) | sqm | 99.00 | 15.92 | 1,576 |
| 6 | 06/Nsc1 | DBM GR II | cum | 6.93 | 12,431.87 | 86,153 |
| 7 | 06/Nsc2 | BC GR II | cum | 3.96 | 13,574.27 | 53,754 |
| Total of Bill | | | | | | 311,231 |

Bill No : 06. Traffic signs, Road marking & other road appurtenances

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|-------|------------|--|------|----------|-----------|------------|
| 1 | 08.02/a | 5 th km Stone | each | 3.00 | 5,034.09 | 15,102 |
| 2 | 08.02/b | Ordinary km Stone | each | 13.00 | 2,998.58 | 38,982 |
| 3 | 08.04 | Boundary Stone | each | 163.00 | 2,059.98 | 335,777 |
| 4 | 08.11/i | 90 cm equilateral triangle | each | 208.00 | 5,451.78 | 1,133,970 |
| 5 | 08.11/iii | 60 cm circular | each | 34.00 | 4,956.32 | 168,515 |
| 6 | 08.11/iv | 80 cm x 60 cm rectangular | each | 6.00 | 6,234.41 | 37,406 |
| 7 | 08.11/vii | 90 cm high octagon | each | 2.00 | 8,718.02 | 17,436 |
| 8 | 08.14 | Paint on Bituminous Surface | sqm | 5,346.80 | 1,012.16 | 5,411,816 |
| 9 | 08.15/c/v | Road Delineators(100 cm long above Road) | each | 1,887.00 | 1,073.82 | 2,026,298 |
| 10 | 08.18/A/b | Type-A, "W" Metal Beam Crash Barrier | Rm | 3,470.00 | 3,367.42 | 11,684,947 |
| 11 | 08.20/ii | Road Stud/Road Markers | nos | 9,537.00 | 387.48 | 3,695,397 |
| 12 | 08.22 | Lighting on Bridges | nos | 53.00 | 21,376.67 | 1,132,964 |
| 13 | 08/nsc/2 | Convex Mirror for Blind Curve | nos | 20.00 | 5,050.00 | 101,000 |

Summary of Bill of Quantity

Bill No : 06. Traffic signs, Road marking & other road appurtenances

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|----------------------|------------|-------------------------------|------|----------|----------|-------------------|
| 14 | 08/nsc/6 | Rumble Strip | sqm | 120.00 | 1,237.23 | 148,468 |
| 15 | 16.09 | Protection Work Steel Railing | Rm | 1,092.00 | 4,633.95 | 5,060,273 |
| Total of Bill | | | | | | 31,008,351 |

Bill No : 07. Passenger Shelter

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|----------------------|------------|---|------|----------|-----------|----------------|
| 1 | 08.05 | Paint on Concrete Surface(2 Coat) | sqm | 264.27 | 94.34 | 24,931 |
| 2 | 10.16 | Sub Structure Plaster with 1:3 Cement Morter | sqm | 264.27 | 225.72 | 59,651 |
| 3 | 13.01/a/i | Foundation Earthwork Ordinary Soil (0 -3m) | cum | 39.63 | 221.12 | 8,764 |
| 4 | 14.01 | Foundation Brick Work C.M. 1:3 | cum | 6.08 | 11,968.37 | 72,708 |
| 5 | 14.03/a | Foundation PCC M15 | cum | 4.03 | 9,529.61 | 38,357 |
| 6 | 14.03/e/II | Foundation RCC M25 | cum | 2.78 | 10,353.74 | 28,732 |
| 7 | 14.08 | Foundation Steel (HYSD) | MT | 0.33 | 78,912.78 | 26,278 |
| 8 | 14/nsc2 | Brick Flat Soling | Sqm | 53.75 | 1,129.07 | 60,688 |
| 9 | 15.01 | Sub Structure Brick Work | cum | 12.96 | 12,081.21 | 156,512 |
| 10 | 16.01/a/i | Super Structure RCC M25 - Solid Slab Super | cum | 16.61 | 11,856.24 | 196,885 |
| 11 | 16.03 | Structure(Upto 5m) Super Structure Steel(HYSD) | MT | 1.66 | 86,746.56 | 144,086 |
| Total of Bill | | | | | | 817,590 |

Bill No : 08. Bus Bay

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|----------------------|------------|---|------|----------|-----------|------------------|
| 1 | 03.14/Nsc | Subgrade and Earthen Shoulder Fill From Roadway | cum | 708.00 | 248.74 | 176,108 |
| 2 | 04.01/Nsc1 | Cutting GSB Close Graded GR V | Cum | 179.46 | 3,986.49 | 715,431 |
| 3 | 04/nsc1 | GSB Reuse | Cum | 103.74 | 2,083.63 | 216,147 |
| 4 | 05.02 | WMM | Cum | 354.00 | 3,992.57 | 1,413,370 |
| 5 | 05.03 | Foothpath Area | sqm | 590.00 | 1,561.19 | 921,102 |
| 6 | 06.01/a | Prime Coat | sqm | 1,416.00 | 58.59 | 82,963 |
| 7 | 06.02/i | Tack Coat(Bituminous Layer) | sqm | 1,416.00 | 15.92 | 22,543 |
| 8 | 06/Nsc1 | DBM GR II | cum | 99.12 | 12,431.87 | 1,232,247 |
| 9 | 06/Nsc2 | BC GR II | cum | 56.64 | 13,574.27 | 768,847 |
| Total of Bill | | | | | | 5,548,758 |

Summary of Bill of Quantity

Bill No : 09. Longitudinal Drains

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|---------------|------------|--|------|-----------|-----------|------------|
| 1 | 13.01/a/i | Foundation Earthwork Ordinary Soil (0 -3m) | cum | 24,181.47 | 221.12 | 5,347,008 |
| 2 | 14.02/b | Foundation Random Rubble Masonry (| cum | 8,242.74 | 7,466.66 | 61,545,707 |
| 3 | 14.03/a | coursed/uncoursed) Cement Morter(1:3) Foundation PCC M15 | cum | 168.68 | 9,529.61 | 1,607,407 |
| 4 | 14.03/b | Foundation PCC M20 | cum | 34.65 | 10,592.50 | 367,030 |
| 5 | 15.02/b | Sub Structure Random Rubble Masonry Cement | cum | 911.46 | 7,952.96 | 7,248,821 |
| 6 | 15.03/b/i | Morter(1:3) Sub Structure PCC M20 | cum | 80.33 | 10,299.04 | 827,270 |
| 7 | 15.03/f/i | Sub Structure RCC M25 (Upto 5m) | cum | 727.68 | 11,218.61 | 8,163,569 |
| 8 | 15.05 | Sub Structure Steel (HYSD) | MT | 36.38 | 78,912.78 | 2,871,163 |
| 9 | 15.12 | Sub Structure Weepholes per Meter | Rm | 433.50 | 452.03 | 195,955 |
| 10 | 24/i/b | MS Hook(300gm each) | kg | 69.20 | 121.20 | 8,387 |
| 11 | 40 | Geotextile filter(75mm sqm) | sqm | 77.85 | 25.76 | 2,005 |
| Total of Bill | | | | | | 88,184,322 |

Bill No : 10. Protection Work

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|---------------|------------|--|------|-----------|----------|-------------|
| 1 | 12/Nsc1 | Reinforced Earth Synthetic Geo Grids | Sqm | 1,352.00 | 517.12 | 699,146 |
| 2 | 12/Nsc9 | 100mm diameter semi-perforated PVC pipe | m | 43,027.00 | 1,212.00 | 52,148,724 |
| 3 | 15.12/Nsc | Protection Work Gabian Structure for Retaining Earth | cum | 32,868.00 | 1,706.90 | 56,102,389 |
| 4 | 23/Nsc4 | Land Slide(Mesh Netting 3.2mm) | sqm | 32,270.00 | 467.63 | 15,090,420 |
| 5 | 23/Nsc5 | Threaded Anchors | Rm | 25,213.00 | 3,232.00 | 81,488,416 |
| Total of Bill | | | | | | 205,529,096 |

Bill No : 11. Breast wall

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|-------|------------|--|------|----------|----------|------------|
| 1 | 13.01/a/i | Foundation Earthwork Ordinary Soil (0 -3m) | cum | 5,924.74 | 221.12 | 1,310,078 |
| 2 | 13.01/b/ii | Foundation Earthwork Ordinary Rock(0-3m) | cum | 1,481.18 | 211.31 | 312,989 |
| 3 | 13.03/a | Sub Structure Backfill Granular Material | cum | 1,304.43 | 1,825.18 | 2,380,820 |
| 4 | 13.03/b | Sub Structure Backfill Sandy Material | cum | 283.77 | 1,430.43 | 405,913 |
| 5 | 14.02/b | Foundation Random Rubble Masonry (| cum | 2,786.13 | 7,466.66 | 20,803,048 |
| 6 | 14.03/a | coursed/uncoursed) Cement Morter(1:3) Foundation PCC M15 | cum | 1,314.43 | 9,529.61 | 12,526,043 |

Summary of Bill of Quantity

Bill No : 11. Breast wall

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|----------------------|------------|--|------|----------|----------|-------------------|
| 7 | 15.02/b | Sub Structure Random Rubble Masonry Cement | cum | 5,580.66 | 7,952.96 | 44,382,742 |
| 8 | 15.12 | Morter(1:3) Sub Structure Weepholes per Meter | Rm | 2,388.78 | 452.03 | 1,079,798 |
| Total of Bill | | | | | | 83,201,431 |

Bill No : 12. Retaining wall

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|----------------------|------------|--|------|----------|-----------|-------------------|
| 1 | 13.01/a/i | Foundation Earthwork Ordinary Soil (0 -3m) | cum | 1,077.69 | 221.12 | 238,298 |
| 2 | 13.01/b/ii | Foundation Earthwork Ordinary Rock(0-3m) | cum | 258.02 | 211.31 | 54,523 |
| 3 | 13.04 | Sub Structure Filter Media | cum | 954.84 | 2,094.64 | 2,000,036 |
| 4 | 14.02/b | Foundation Random Rubble Masonry (coursed/uncoursed) Cement Morter(1:3) | cum | 589.03 | 7,466.66 | 4,398,079 |
| 5 | 14.03/a | Foundation PCC M15 | cum | 329.47 | 9,529.61 | 3,139,759 |
| 6 | 15.02/b | Sub Structure Random Rubble Masonry Cement | cum | 907.47 | 7,952.96 | 7,217,049 |
| 7 | 15.03/b/i | Morter(1:3) Sub Structure PCC M20 | cum | 88.00 | 10,299.04 | 906,295 |
| 8 | 15.12 | Sub Structure Weepholes per Meter | Rm | 1,444.00 | 452.03 | 652,731 |
| Total of Bill | | | | | | 18,606,770 |

Bill No : 01. Site Clearance and Dismantling

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|----------|----------|--------------|
| 1 | 02.01/i | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth from 300 mm to 600 mm | Each | 10.00 | 392.30 | 3,923.00 |
| 2 | 02.01/ii | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 600 mm to 900 mm | Each | 30.00 | 723.48 | 21,704.40 |
| 3 | 02.01/iii | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 900 mm to 1800 mm | Each | 46.00 | 1373.64 | 63,187.44 |
| 4 | 02.01/iv | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 1800 mm to 2700 mm | Each | 3.00 | 2576.19 | 7,728.57 |
| 5 | 02.03/b | Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable materials and stacking of serviceable materials and stacking of serviceable materials upto 100m. from road boundary. (by mechanical means) | Ha | 27.17 | 59912.85 | 1,627,832.13 |
| 6 | 02.04/i/c | Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. c)Pre- stressed/ Reinforced Cement Concrete grade M20 & above | | | | |

Bill No : 01. Site Clearance and Dismantling

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|-----------------|--|------|------------|----------|----------------------|
| | | | cum | 38.00 | 1756.40 | 66,743.20 |
| 7 | 02.04/iii/b | Dismantling stone masonry b) Rubble stone masonry in cement mortar | Cum | 866.00 | 494.21 | 427,985.86 |
| 8 | 02.04/vii/a | Removing hume pipes class NP-3 a) 300mm to 600mm dia | rm | 30.00 | 267.64 | 8,029.20 |
| 9 | 02.04/vii/b | Removing hume pipes class NP-4 b) Above 600mm to 900mm dia | rm | 180.00 | 362.36 | 65,224.80 |
| 10 | 02.04/vii/c | Removing hume pipes class NP-5 c) Above 900mm dia | rm | 60.00 | 620.22 | 37,213.20 |
| 11 | 02.04/viii/e | Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m e)Kandar/Gravel metal crust upto 150 mm thick with power Roller with scarifier | sqm | 168,284.00 | 34.33 | 5,777,189.72 |
| 12 | 02.04/viii/f/ii | Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m f)Bituminous coarses 50-70mm along with premix Carpet and Surface dressing but without disturbing the base ii)With road roller attached with scarifier | sqm | 171,814.00 | 57.65 | 9,905,077.10 |
| | | Total of Bill 01. Site Clearance and Dismantling | | | | 18,011,838.62 |

Item Rate Analysis has been done considering

Bill No : 02. Earth work,Subgrade and Erosion control

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|--|------------|---|------|--------------|----------|-----------------------|
| 1 | 02/nsc/1 | Supplying and laying Hydro Seeding on cutting Surface | sqm | 18,180.00 | 318.15 | 5,783,967.00 |
| 2 | 03.13 | Construction of Embankment with Material Deposited from Roadway Cutting Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2 | cum | 137,417.00 | 161.80 | 22,234,070.60 |
| 3 | 03.14 | Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2 | cum | 14,285.93 | 315.46 | 4,506,637.90 |
| 4 | 03.15 | Compacting original ground supporting subgrade Loosening of the ground upto a level of 500 mm below the subgrade level, watered, graded and compacted in layers to meet requirement of table 300-2 for subgrade construction. | cum | 28,739.90 | 87.52 | 2,515,316.05 |
| 5 | 03.31 | Excavation in Hill Area in Soil by Mechanical Means Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres | cum | 1,166,116.00 | 213.50 | 248,965,766.00 |
| 6 | 03.32 | Excavation in Hilly Area in Ordinary Rock by Mechanical Means not Requiring Blasting. Excavation in hilly area in ordinary rock not requiring ballasting by mechanical means including cutting and trimming of slopes and disposal of cut material with all lift and lead upto 1000 metres | cum | 291,529.00 | 307.61 | 89,677,235.69 |
| Total of Bill 02. Earth work,Subgrade and Erosion control | | | | | | 373,682,993.24 |

Bill No : 03. Sub-Base & Base Courses

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|-----------|----------|-----------------------|
| 1 | 04.01/Nsc1 | Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material | Cum | 26,676.11 | 3986.49 | 106,344,049.74 |
| 2 | 04/nsc1 | Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 | Cum | 15,313.18 | 2083.63 | 31,907,003.33 |
| 3 | 05.02 | Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.) | Cum | 43,284.70 | 3992.57 | 172,817,210.65 |
| | | Total of Bill 03. Sub-Base & Base Courses | | | | 311,068,263.72 |

Bill No : 04. Bituminous Courses

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|------------|----------|----------------|
| 1 | 06.01/a | Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm | sqm | 170,433.00 | 58.59 | 9,985,669.47 |
| 2 | 06.02/ii | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. ii) On granular Surface Pre treated with prime Coat @ 0.25 - 0.30 kg/sqm | sqm | 160,350.00 | 17.50 | 2,806,125.00 |
| 3 | 06/Nsc1 | Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40 | cum | 11,930.31 | 12431.87 | 148,316,062.98 |

Bill No : 04. Bituminous Courses

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|---|------------|---|------|----------|----------|-----------------------|
| 4 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | cum | 6,817.32 | 13574.27 | 92,540,142.36 |
| Total of Bill 04. Bituminous Courses | | | | | | 253,647,999.81 |

Bill No : 05. Junction Improvement (Major & Minor)

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|-----------|
| 1 | 04.01/Nsc1 | Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material | Cum | 12.55 | 3986.49 | 50,018.49 |
| 2 | 04/nsc1 | Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 | Cum | 7.25 | 2083.63 | 15,112.57 |
| 3 | 05.02 | Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.) | Cum | 24.75 | 3992.57 | 98,816.11 |
| 4 | 06.01/a | Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm | sqm | 99.00 | 58.59 | 5,800.41 |

Bill No : 05. Junction Improvement (Major & Minor)

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|---|------------|--|------|----------|----------|-------------------|
| 5 | 06.02/i | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm | sqm | 99.00 | 15.92 | 1,576.08 |
| 6 | 06/Nsc1 | Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40 | cum | 6.93 | 12431.87 | 86,152.86 |
| 7 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | cum | 3.96 | 13574.27 | 53,754.11 |
| Total of Bill 05. Junction Improvement (Major & Minor) | | | | | | 311,230.62 |

Bill No : 06. Traffic signs, Road marking & other road appurtenances

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|--------------|
| 1 | 08.02/a | Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. a) 5th KM stone | each | 3.00 | 5034.09 | 15,102.27 |
| 2 | 08.02/b | Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. b) Ordinary kilometer stone | each | 13.00 | 2998.58 | 38,981.54 |
| 3 | 08.04 | Reinforced Cement Concrete M15 Boundary pillars of standard design, fixed in position including finishing but excluding painting | each | 163.00 | 2059.98 | 335,776.74 |
| 4 | 08.11/i | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm equilateral triangle | each | 208.00 | 5451.78 | 1,133,970.24 |
| 5 | 08.11/iii | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm circular | each | 34.00 | 4956.32 | 168,514.88 |

Bill No : 06. Traffic signs, Road marking & other road appurtenances

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|----------|----------|--------------|
| 6 | 08.11/iv | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 80 mm x 60 mm rectangular | each | 6.00 | 6234.41 | 37,406.46 |
| 7 | 08.11/vii | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm high octagon | each | 2.00 | 8718.02 | 17,436.04 |
| 8 | 08.14 | Road Marking with Hot Applied Thermoplastic Compound with Reflectorisng Glass Beads on Bituminous Surface (Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorisng glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes.) | sqm | 5,346.80 | 1012.16 | 5,411,816.08 |

Bill No : 06. Traffic signs, Road marking & other road appurtenances

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|---------------|
| 9 | 08.15/c/v | Road Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and confirming to IRC-79 and the drawings.) 120x120 -Road Delineator | each | 1,887.00 | 1073.82 | 2,026,298.34 |
| 10 | 08.18/A/b | Metal Beam Crash Barrier Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fittings to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810) For post Height of 1.5 m | Rm | 3,470.00 | 3367.42 | 11,684,947.40 |
| 11 | 08.20/ii | Road Markers/Road stud with lense reflector Providing & fixing of road stud 100x100 mm, die-cast in aluminium , resistance to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30mm upto a depth of 60mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973 Light Reflecting Lense Type | nos | 9,537.00 | 387.48 | 3,695,396.76 |
| 12 | 08.22 | Lighting on Bridges Providing & fixing lighting on Bridges, mounted on steel hollow circular poles of standard specification, 5 m high fixed on parapets with cement concrete, 20 m apart and fitted with sodium vapour lamp | nos | 53.00 | 21376.67 | 1,132,963.51 |

Bill No : 06. Traffic signs, Road marking & other road appurtenances

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|----------|----------|----------------------|
| 13 | 08/nsc/2 | Convex Mirror For Blind Curve | nos | 20.00 | 5050.00 | 101,000.00 |
| 14 | 08/nsc/6 | Rumble Strips Provision of 15 nos rumble strips covered with premix bituminous carpet, 15-20 mm high at center, 250 mm wide placed at 1 m center to center at approved locations to control speed, marked with white strips of road marking paint. | sqm | 120.00 | 1237.23 | 148,467.60 |
| 15 | 16.09 | Mild steel railing complete as per drawing and Technical Specifications | Rm | 1,092.00 | 4633.95 | 5,060,273.40 |
| | | Total of Bill 06. Traffic signs, Road marking & other road appurtenances | | | | 31,008,351.26 |

Bill No : 07. Passenger Shelter

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|-----------|
| 1 | 08.05 | Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface. | sqm | 264.27 | 94.34 | 24,931.23 |
| 2 | 10.16 | Cement Plaster 12mm Thick in Cement Mortar 1:3 | sqm | 264.27 | 225.72 | 59,651.02 |
| 3 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | cum | 39.63 | 221.12 | 8,763.65 |
| 4 | 14.01 | Brick masonry work in cement mortar 1:3 in foundation complete excluding pointing and plastering, as per drawing and technical specifications | cum | 6.08 | 11968.37 | 72,707.85 |
| 5 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | cum | 4.03 | 9529.61 | 38,356.68 |
| 6 | 14.03/e/l | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M25Grade | cum | 2.78 | 10353.74 | 28,731.63 |
| 7 | 14.08 | HYSD bar reinforcement in foundation complete as per drawing and technical specification | MT | 0.33 | 78912.78 | 26,277.96 |
| 8 | 14/nsc2 | Brick Flat Soling at Foundation | Sqm | 53.75 | 1129.07 | 60,687.51 |
| 9 | 15.01 | Brick masonry work in cement mortar 1:3 in Sub-structure complete excluding pointing and plastering, as per drawing and technical specifications | | | | |

Bill No : 07. Passenger Shelter

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|-------------------|
| | | | cum | 12.96 | 12081.21 | 156,512.08 |
| 10 | 16.01/a/i | cement concrete Reinforced concrete in super-structure as per drawing and Technical Specification i/c form work complet eas per drawing and technical specification RCC Grade M25 For solid slab super-structure Upto 5m Upto 5m | cum | 16.61 | 11856.24 | 196,884.72 |
| 11 | 16.03 | HYSD bar reinforcement in super-structure complete as per drawing and technical specifications | MT | 1.66 | 86746.56 | 144,086.04 |
| | | Total of Bill 07. Passenger Shelter | | | | 817,590.36 |

Bill No : 08. Bus Bay

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|--------------|
| 1 | 03.14/Nsc | Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from Roadway Cutting with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2 | cum | 708.00 | 248.74 | 176,107.92 |
| 2 | 04.01/Nsc1 | Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material | Cum | 179.46 | 3986.49 | 715,431.44 |
| 3 | 04/nsc1 | Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 | Cum | 103.74 | 2083.63 | 216,147.44 |
| 4 | 05.02 | Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.) | Cum | 354.00 | 3992.57 | 1,413,369.78 |

Bill No : 08. Bus Bay

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|--------------|
| 5 | 05.03 | Construction of footpath/separator by providing a 150 mm compacted granular sub base as per clause 401 and 25 mm thick cement concrete grade M15, over laid with pre-cast concrete tiles in cement mortar including provision of all drainage arrangements but excluding kerb channel. | sqm | 590.00 | 1561.19 | 921,102.10 |
| 6 | 06.01/a | Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm | sqm | 1,416.00 | 58.59 | 82,963.44 |
| 7 | 06.02/i | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm | sqm | 1,416.00 | 15.92 | 22,542.72 |
| 8 | 06/Nsc1 | Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40 | cum | 99.12 | 12431.87 | 1,232,246.95 |

Bill No : 08. Bus Bay

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|----------------------------------|------------|---|------|----------|----------|---------------------|
| 9 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | cum | 56.64 | 13574.27 | 768,846.65 |
| Total of Bill 08. Bus Bay | | | | | | 5,548,758.45 |

Bill No : 09. Longitudinal Drains

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|-----------|----------|---------------|
| 1 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | cum | 24,181.47 | 221.12 | 5,347,007.53 |
| 2 | 14.02/b | Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed) | cum | 8,242.74 | 7466.66 | 61,545,707.18 |
| 3 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | cum | 168.68 | 9529.61 | 1,607,406.97 |
| 4 | 14.03/b | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M20 Grade | cum | 34.65 | 10592.50 | 367,030.13 |
| 5 | 15.02/b | Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed) | cum | 911.46 | 7952.96 | 7,248,820.83 |
| 6 | 15.03/b/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade Upto 5m | cum | 80.33 | 10299.04 | 827,270.39 |
| 7 | 15.03/f/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M25 Grade upto 5m height | cum | 727.68 | 11218.61 | 8,163,569.34 |

Bill No : 09. Longitudinal Drains

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|--|------------|---|------|----------|----------|----------------------|
| 8 | 15.05 | HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification | MT | 36.38 | 78912.78 | 2,871,162.59 |
| 9 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | Rm | 433.50 | 452.03 | 195,955.01 |
| 10 | 24/i/b | Galvanised Mild steel J /L hook | kg | 69.20 | 121.20 | 8,387.04 |
| 11 | 40 | Gextextile material (fine net) | sqm | 77.85 | 25.76 | 2,005.42 |
| Total of Bill 09. Longitudinal Drains | | | | | | 88,184,322.41 |

Item Rate Analysis has been done considering

Bill No : 10. Protection Work

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|-----------|----------|---------------|
| 1 | 12/Nsc1 | Geo-synthetics and Reinforced Earth With reinforcing elements of synthetic geogrids | Sqm | 1,352.00 | 517.12 | 699,146.24 |
| 2 | 12/Nsc9 | Composite RE Wall Drilling of 100mm diameter semi-perforated PVC pipe inside the hill slope wrapped with non woven geotextile complete as per drawing and as directed by the engineer. | m | 43,027.00 | 1212.00 | 52,148,724.00 |
| 3 | 15.12/Nsc | Supply and Installation of Mechanically woven double twisted hexagonal shaped steel wire mesh gabion boxes with Zinc + PVC coating having mesh size of 100 mm x 120 mm by using mesh wire 2.7 mm (Inner dia) and 3.7 (outer dia) with selvedged wire 3.4 mm(inner dia) and 4.4 mm (outer dia) and lacing with 2.2mm inner dia and 3.3 mm outer dia.placing at indicated places in dry condition at easily accessible location as per direction of Engineer including tools, plant, labour etc. complete in all respect, carrying the material from nearest approach with all leads & lifts, manpower & machinery, materials, labor etc. complete as per detailed technical specifications and as directed by Engineer-In-Charge. | cum | 32,868.00 | 1706.90 | 56,102,389.20 |
| 4 | 23/Nsc4 | Providing and spreading Mechanically Woven Double Twisted Hexagonal Shaped Wire Mesh Netting of Mesh Type 10x12 with D=100mm tolerance of $\pm 2\%$, Zn + PVC coated, Mesh Wire dia. 2.7/3.7mm (ID/OD), mechanically edged/selvedged with galvanization as per EN 10223-3, and shall have minimum 10 numbers of mesh openings per meter of mesh perpendicular to twist, lacing with wire of diameter 2.2/3.2 mm (ID/OD), at easily accessible location including top and bottom, with all leads and lifts, manpower and machinery, materials, labour etc. complete and as directed by Engineer - In - Charge | | | | |

Item Rate Analysis has been done considering

Bill No : 10. Protection Work

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|-----------|----------|-----------------------|
| | | | sqm | 32,270.00 | 467.63 | 15,090,420.10 |
| 5 | 23/Nsc5 | Supply and installation of Continuous threaded Anchors (32mm dia, yield strength > 500 N/mm ²) nut, washer plate, coupler for connecting bars and full length grouting with admixture including all ancillary items for top/bottom/cortical anchoring as per detailed technical specifications and as directed by engineer in charge. | Rm | 25,213.00 | 3232.00 | 81,488,416.00 |
| | | Total of Bill 10. Protection Work | | | | 205,529,095.54 |

Item Rate Analysis has been done considering

Bill No : 11. Breast wall

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|---------------|
| 1 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | cum | 5,924.74 | 221.12 | 1,310,077.62 |
| 2 | 13.01/b/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary rock if blasting is not resorted to | cum | 1,481.18 | 211.31 | 312,988.99 |
| 3 | 13.03/a | Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials | cum | 1,304.43 | 1825.18 | 2,380,819.55 |
| 4 | 13.03/b | Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Good Sandy Soil free from organic material | cum | 283.77 | 1430.43 | 405,913.12 |
| 5 | 14.02/b | Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed) | cum | 2,786.13 | 7466.66 | 20,803,048.09 |
| 6 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | cum | 1,314.43 | 9529.61 | 12,526,043.39 |
| 7 | 15.02/b | Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed) | cum | 5,580.66 | 7952.96 | 44,382,741.89 |
| 8 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | Rm | 2,388.78 | 452.03 | 1,079,797.96 |

| | | | |
|--|--|------------------------------|---------------|
| | | Total of Bill11. Breast wall | 83,201,430.63 |
|--|--|------------------------------|---------------|

Bill No : 12. Retaining wall

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|--------------|
| 1 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | cum | 1,077.69 | 221.12 | 238,298.37 |
| 2 | 13.01/b/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary rock if blasting is not resorted to | cum | 258.02 | 211.31 | 54,522.63 |
| 3 | 13.04 | Filter medium behind abutment,wing wall and return wall complete as per drawing and technical specification . | cum | 954.84 | 2094.64 | 2,000,035.58 |
| 4 | 14.02/b | Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed) | cum | 589.03 | 7466.66 | 4,398,079.27 |
| 5 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | cum | 329.47 | 9529.61 | 3,139,758.73 |
| 6 | 15.02/b | Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed) | cum | 907.47 | 7952.96 | 7,217,048.75 |
| 7 | 15.03/b/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade Upto 5m | cum | 88.00 | 10299.04 | 906,294.92 |
| 8 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | | | | |

Bill No : 12. Retaining wall

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|----------|----------|----------------------|
| | | | Rm | 1,444.00 | 452.03 | 652,731.32 |
| | | Total of Bill 12. Retaining wall | | | | 18,606,769.58 |

BILL
(STRUCTURE PART)



Summary of Bill of Quantity

Bill No : 13. Culvert

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|--|---------------|---|------|----------|-----------|--------------------|
| Foundation | | | | | | |
| 1 | 10.20 | Foundation Culvert PCC M15 | cum | 1,064.00 | 8,669.23 | 9,224,061 |
| 2 | 13.01/a/i | Foundation Earthwork Ordinary Soil (0 -3m) | cum | 7,806.00 | 221.12 | 1,726,063 |
| End of Sub Total Foundation | | | | | | 10,950,123 |
| Sub Structure | | | | | | |
| 3 | 10.06/a | Steel culvert for Sub-Structure | Ton | 412.00 | 74,424.28 | 30,662,803 |
| 4 | 10.20/b | Culvert Backfilling culvert by Gravelly materials | cum | 3,161.00 | 1,993.30 | 6,300,821 |
| 5 | 10.20/c | Filter Media culvert behind abutment, wing and return wall | cum | 3,935.00 | 1,976.10 | 7,775,954 |
| 6 | 15.03/f/i | Sub Structure RCC M25 (Upto 5m) | cum | 5,144.00 | 11,218.61 | 57,708,530 |
| 7 | 15.12 | Sub Structure Weepholes per Meter | Rm | 1,962.00 | 452.03 | 886,883 |
| End of Sub Total Sub Structure | | | | | | 103,334,991 |
| Super Structure | | | | | | |
| 8 | 06.02/i | Tack Coat(Bituminous Layer) | sqm | 1,847.00 | 15.92 | 29,404 |
| 9 | 06/Nsc2 | BC GR II | cum | 72.00 | 13,574.27 | 977,347 |
| 10 | 08.05 | Paint on Concrete Surface(2 Coat) | sqm | 935.00 | 94.34 | 88,208 |
| 11 | 08/nsc/5 | Crash Barrier RCC M40 | m | 366.00 | 6,996.27 | 2,560,635 |
| 12 | 10.06/b | Steel culvert for Super-Structure | Ton | 75.00 | 74,424.28 | 5,581,821 |
| 13 | 16.01/a/i | Super Structure RCC M25 - Solid Slab Super Structure(Upto 5m) | cum | 943.00 | 11,856.24 | 11,180,434 |
| 14 | 16.11 | Super Structure Drainage Spout | each | 128.00 | 2,183.29 | 279,461 |
| 15 | 16.17 | Super Structure Mastic Asphalt | sqm | 1,847.00 | 550.87 | 1,017,457 |
| End of Sub Total Super Structure | | | | | | 21,714,768 |
| Protection Work | | | | | | |
| 16 | 10.19 | Stone Pitching Culvert | cum | 489.00 | 4,411.72 | 2,157,331 |
| 17 | 13.01/a/i/Nsc | Excavation For Protection work | cum | 2,995.00 | 221.12 | 662,254 |
| 18 | 16/nsc | Protection Work Curtain Wall- PCC (M-15) | cum | 1,651.00 | 10,299.04 | 17,003,715 |
| End of Sub Total Protection Work | | | | | | 19,823,301 |
| Miscellaneous Work | | | | | | |
| 19 | 08.05 | Paint on Concrete Surface(2 Coat) | sqm | 935.00 | 94.34 | 88,208 |
| End of Sub Total Miscellaneous Work | | | | | | 88,208 |
| Total | | | | | | 155,911,390 |

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|-------------------|------------|-------------|------|----------|------|------|
| Foundation | | | | | | |

Summary of Bill of Quantity

Bill No : 14. Minor Bridge

| Sl No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|----------------------------------|----------------|--|------|----------|-----------|------------|
| 1 | 13.01/a/i | Foundation Earthwork Ordinary Soil (0 -3m) | cum | 1,285.00 | 221.12 | 284,139 |
| 2 | 14.03/a | Foundation PCC M15 | cum | 78.00 | 9,529.61 | 743,310 |
| 3 | 14.03/g | Foundation RCC M30 | cum | 218.00 | 12,248.16 | 2,670,099 |
| 4 | 14.08 | Foundation Steel (HYSO) | MT | 26.00 | 78,912.78 | 2,051,732 |
| End of Sub Total Foundation | | | | | | 5,749,280 |
| | | Sub Structure | | | | |
| 5 | 13.03/a | Sub Structure Backfill Granular Material | cum | 65.00 | 1,825.18 | 118,637 |
| 6 | 13.03/b | Sub Structure Backfill Sandy Material | cum | 2,809.00 | 1,430.43 | 4,018,078 |
| 7 | 13.04 | Sub Structure Filter Media | cum | 239.00 | 2,094.64 | 500,619 |
| 8 | 15.03/g/i | Sub Structure RCC M30 (Upto 5m) | cum | 232.00 | 13,087.63 | 3,036,330 |
| 9 | 15.03/g/ii | Sub Structure RCC M30 (5m-10m) | cum | 30.00 | 14,234.55 | 427,037 |
| 10 | 15.05 | Sub Structure Steel (HYSO) | MT | 37.00 | 78,912.78 | 2,919,773 |
| 11 | 15.12 | Sub Structure Weepholes per Meter | Rm | 432.00 | 452.03 | 195,277 |
| End of Sub Total Sub Structure | | | | | | 11,215,750 |
| | | Super Structure | | | | |
| 12 | 06.02/i | Tack Coat(Bituminous Layer) | sqm | 535.00 | 15.92 | 8,517 |
| 13 | 06/Nsc2 | BC GR II | cum | 64.00 | 13,574.27 | 868,753 |
| 14 | 14/nsc1/i | Super Structure Filler (Copper Plate) | m | 72.00 | 2,080.60 | 149,803 |
| 15 | 14/nsc1/ii | Super Structure Filler (Fibre Board) | m | 72.00 | 704.98 | 50,759 |
| 16 | 14/nsc1/iii | Super Structure Filler (Premoulder Joint) | m | 72.00 | 225.23 | 16,217 |
| 17 | 14/nsc1/iv | Super Structure Filler (Sealing Compound) | m | 72.00 | 36.36 | 2,618 |
| 18 | 16.01/b/i/c2/i | Super Structure RCC M30 (T Beam & Slab) | cum | 233.00 | 13,420.02 | 3,126,865 |
| 19 | 16.03 | (Upto 5m) Super Structure Steel(HYSO) | MT | 42.00 | 86,746.56 | 3,643,356 |
| 20 | 16.11 | Super Structure Drainage Spout | each | 12.00 | 2,183.29 | 26,199 |
| 21 | 16.12/Nsc | Super Structure Approach Slab (M30) | cum | 87.00 | 17,492.61 | 1,521,857 |
| 22 | 16.13 | Super Structure PCC M15 Levelling Course | cum | 32.00 | 9,285.56 | 297,138 |
| 23 | 16.17 | Below Approach Slab Super Structure Mastic Asphalt | sqm | 535.00 | 550.87 | 294,715 |
| End of Sub Total Super Structure | | | | | | 10,006,797 |
| | | Protection Work | | | | |
| 24 | 08/nsc/5 | Crash Barrier RCC M40 | m | 97.00 | 6,996.27 | 678,638 |
| 25 | 16/nsc | Protection Work Curtain Wall- PCC (M-15) | cum | 20.00 | 10,299.04 | 205,981 |
| 26 | 17.01/a | Protection Work Boulder Apron Laid in Wire | cum | 72.00 | 4,996.01 | 359,713 |
| 27 | 17.02 | Crates Protection Work Filter material underneath | cum | 54.00 | 3,258.46 | 175,957 |
| 28 | 17.03/a | pitching in slopes Protection Work Pitching on slopes laid over | cum | 17.00 | 4,365.16 | 74,208 |
| | | prepared filter media(Stone) | | | | |

Summary of Bill of Quantity

Bill No : 14. Minor Bridge

| Sl No | SOR Ref No | Description | Unit | Quantity | Rate | Cost |
|-------------------------------------|------------|--|------|----------|-----------|------------|
| End of Sub Total Protection Work | | | | | | 1,494,496 |
| Miscellaneous Work | | | | | | |
| 29 | 02.04/i/c | Dismantling Structure RCC | cum | 791.00 | 1,756.40 | 1,389,312 |
| 30 | 08.05 | Paint on Concrete Surface(2 Coat) | sqm | 304.00 | 94.34 | 28,679 |
| 31 | 08.12 | Direction Sign(<.0.9 sqm) | sqm | 6.00 | 12,505.62 | 75,034 |
| 32 | 13/nsc1 | Confirmatory Boring in soil | cum | 18.00 | 2,020.00 | 36,360 |
| 33 | 13/nsc2 | Confirmatory Boring in Hard Rock | cum | 30.00 | 4,040.00 | 121,200 |
| End of Sub Total Miscellaneous Work | | | | | | 1,650,585 |
| Diversion Work | | | | | | |
| 34 | 03.13 | Embankment fill from Roadway Cutting | cum | 9,600.00 | 161.80 | 1,553,280 |
| 35 | 03.31 | Excavation in Hill in Soil For Roadway | cum | 7,680.00 | 213.50 | 1,639,680 |
| 36 | 04.01/Nsc1 | GSB Close Graded GR V | Cum | 384.00 | 3,986.49 | 1,530,812 |
| 37 | 05.02 | WMM | Cum | 640.00 | 3,992.57 | 2,555,245 |
| 38 | 06/Nsc1 | DBM GR II | cum | 128.00 | 12,431.87 | 1,591,279 |
| 39 | 06/Nsc2 | BC GR II | cum | 64.00 | 13,574.27 | 868,753 |
| 40 | 09.01/nsc1 | Hume Pipe(NP4 1200 dia Single ROW) | Rm | 120.00 | 12,034.09 | 1,444,091 |
| End of Sub Total Diversion Work | | | | | | 11,183,140 |
| Total | | | | | | 41,300,049 |

Item Rate Analysis has been done considering

Bill No : 13. Culvert

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|--------------------------------|------------|---|------|----------|----------|----------------------|
| Foundation | | | | | | |
| 1 | 10.20 | Plain cement concrete M-15 mix with stone aggregate 20mm. Nominal size mechanically mixed and vibrated in foundation depth of 1.5m. below ground / bed level and or 1.5m. above ground/bed level i/c formwork. | cum | 1,064.00 | 8669.23 | 9,224,060.72 |
| 2 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | cum | 7,806.00 | 221.12 | 1,726,062.72 |
| Sub Total of Foundation | | | | | | 10,950,123.44 |
| Sub Structure | | | | | | |
| 3 | 10.06/a | Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Sub-Structure | Ton | 412.00 | 74424.28 | 30,662,803.36 |
| 4 | 10.20/b | Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting b)Selected Granular Material in Filling | cum | 3,161.00 | 1993.30 | 6,300,821.30 |
| 5 | 10.20/c | Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting c)Filler Media behind abutment ,wing and return wall | cum | 3,935.00 | 1976.10 | 7,775,953.50 |
| 6 | 15.03/f/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M25 Grade upto 5m height | cum | 5,144.00 | 11218.61 | 57,708,529.84 |

Bill No : 13. Culvert

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-----------------------------------|------------|---|------|----------|----------|-----------------------|
| 7 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | Rm | 1,962.00 | 452.03 | 886,882.86 |
| Sub Total of Sub Structure | | | | | | 103,334,990.86 |
| Super Structure | | | | | | |
| 8 | 06.02/i | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm | sqm | 1,847.00 | 15.92 | 29,404.24 |
| 9 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | cum | 72.00 | 13574.27 | 977,347.44 |
| 10 | 08.05 | Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface. | sqm | 935.00 | 94.34 | 88,207.90 |

Item Rate Analysis has been done considering

Bill No : 13. Culvert

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|----------|----------|---------------|
| 11 | 08/nsc/5 | Reinforced Cement Concrete Crash Barrier-Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-40 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified | m | 366.00 | 6996.27 | 2,560,634.82 |
| 12 | 10.06/b | Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Super-Structure | Ton | 75.00 | 74424.28 | 5,581,821.00 |
| 13 | 16.01/a/i | cement concrete Reinforced concrete in super-structure as per drawing and Technical Specification i/c form work complete as per drawing and technical specification RCC Grade M25 For solid slab super-structure Upto 5m Upto 5m | cum | 943.00 | 11856.24 | 11,180,434.32 |
| 14 | 16.11 | Drainage Spouts complete as per drawing and Technical specification | each | 128.00 | 2183.29 | 279,461.12 |

Bill No : 13. Culvert

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|--|---------------|---|------|----------|----------|-----------------------|
| 15 | 16.17 | Mastic asphalt (providing and laying 12mm thick mastic asphalt wearing courses on top of deck slab excluding prime coat with paving grade bitumen meeting the requirement given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10cm centre in both direction ,pressed into surface not less than 100 deg. C. protruding 1mm to 4mm over mastic surface ,all complete as per clause 515) using Bitumen VG-40 (3/40) | sqm | 1,847.00 | 550.87 | 1,017,456.89 |
| Sub Total of Super Structure | | | | | | 21,714,767.73 |
| | | Protection Work | | | | |
| 16 | 10.19 | Dry Boulder pitching | cum | 489.00 | 4411.72 | 2,157,331.08 |
| 17 | 13.01/a/i/Nsc | Earth work in excavation Ordinary soil For Protection Work | cum | 2,995.00 | 221.12 | 662,254.40 |
| 18 | 16/nsc | For Protection Work - cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade upto 5m height | cum | 1,651.00 | 10299.04 | 17,003,715.04 |
| Sub Total of Protection Work | | | | | | 19,823,300.52 |
| | | Miscellaneous Work | | | | |
| 19 | 08.05 | Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface. | sqm | 935.00 | 94.34 | 88,207.90 |
| Sub Total of Miscellaneous Work | | | | | | 88,207.90 |
| Total of Bill 13. Culvert | | | | | | 155,911,390.45 |

Item Rate Analysis has been done considering

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|--------------------------------|------------|---|------|----------|----------|---------------------|
| Foundation | | | | | | |
| 1 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | cum | 1,285.00 | 221.12 | 284,139.20 |
| 2 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | cum | 78.00 | 9529.61 | 743,309.58 |
| 3 | 14.03/g | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M30 Grade | cum | 218.00 | 12248.16 | 2,670,098.88 |
| 4 | 14.08 | HYSD bar reinforcement in foundation complete as per drawing and technical specification | MT | 26.00 | 78912.78 | 2,051,732.28 |
| Sub Total of Foundation | | | | | | 5,749,279.94 |
| Sub Structure | | | | | | |
| 5 | 13.03/a | Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials | cum | 65.00 | 1825.18 | 118,636.70 |
| 6 | 13.03/b | Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Good Sandy Soil free from organic material | cum | 2,809.00 | 1430.43 | 4,018,077.87 |
| 7 | 13.04 | Filter medium behind abutment,wing wall and return wall complete as per drawing and technical specification . | cum | 239.00 | 2094.64 | 500,618.96 |
| 8 | 15.03/g/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M30 Grade upto 5m height | cum | 232.00 | 13087.63 | 3,036,330.16 |

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|--------------|------------|---|---------------|----------|----------|---------------|
| 9 | 15.03/g/ii | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M30 Grade Between 5 to 10 m height | cum | 30.00 | 14234.55 | 427,036.50 |
| 10 | 15.05 | HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification | MT | 37.00 | 78912.78 | 2,919,772.86 |
| 11 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | Rm | 432.00 | 452.03 | 195,276.96 |
| Sub Total of | | | Sub Structure | | | 11,215,750.01 |
| | | Super Structure | | | | |
| 12 | 06.02/i | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20- 0.30 kg/sqm | sqm | 535.00 | 15.92 | 8,517.20 |
| 13 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | cum | 64.00 | 13574.27 | 868,753.28 |

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|-----------------|---|------|----------|----------|--------------|
| 14 | 14/nsc1/i | Filler joint i)Providing & fixing 2 mm thick corrugated copper plate in expansion joint complete as per drawing & Technical Specification. | m | 72.00 | 2080.60 | 149,803.20 |
| 15 | 14/nsc1/ii | Filler joint Providing & fixing 20 mm thick compressible fibre board in expansion joint complete as per drawing & Technical Specification. | m | 72.00 | 704.98 | 50,758.56 |
| 16 | 14/nsc1/iii | Filler joint iii)Providing and fixing in position 20 mm thick premoulded joint filler in expansion joint for fixed ends of simply supported spans not exceeding 10 m to cater for a horizontal movement upto 20 mm, covered with sealant complete as per drawing and technical specifications. | m | 72.00 | 225.23 | 16,216.56 |
| 17 | 14/nsc1/iv | Filler joint iv)Providing and filling joint sealing compound as per drawings and technical specifications with coarse sand and 6 per cent bitumen by weight. | m | 72.00 | 36.36 | 2,617.92 |
| 18 | 16.01/b/i/c2/ii | RCC Grade M30 For solid slab super-structure Approach Slab | cum | 233.00 | 13420.02 | 3,126,864.66 |
| 19 | 16.03 | HYSD bar reinforcement in super-structure complete as per drawing and technical specifications | MT | 42.00 | 86746.56 | 3,643,355.52 |
| 20 | 16.11 | Drainage Spouts complete as per drawing and Technical specification | each | 12.00 | 2183.29 | 26,199.48 |
| 21 | 16.12/Nsc | Reinforced cement concrete approach slab M-30 including reinforcement and formwork complete as per drawing and Technical specification | cum | 87.00 | 17492.61 | 1,521,857.07 |

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------------------------------------|------------|--|------|----------|----------|----------------------|
| 22 | 16.13 | PCC M15 ordinary Grade leveling course below approach slab complete as per drawing and Technical specification Below Approach Slab | cum | 32.00 | 9285.56 | 297,137.92 |
| 23 | 16.17 | Mastic asphalt (providing and laying 12mm thik mastic asphalt wearing coures on top of deck slab excluding prime coat with paving grade bitumem meeting the requirement given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10 sqm and at an aproximate spacing of 10cm centre in both direction ,pressed into surface not less than 100 deg. C. protruding 1mm to 4mm over mastic surface ,all complete as per clause 515) using Bitumen VG-40 (3/40) | sqm | 535.00 | 550.87 | 294,715.45 |
| Sub Total of Super Structure | | | | | | 10,006,796.82 |
| | | Protection Work | | | | |
| 24 | 08/nsc/5 | Reinforced Cement Concrete Crash Barrier-Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-40 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified | m | 97.00 | 6996.27 | 678,638.19 |

Item Rate Analysis has been done considering

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------------------------------------|------------|---|------|----------|----------|---------------------|
| 25 | 16/nsc | For Protection Work - cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade upto 5m height | cum | 20.00 | 10299.04 | 205,980.80 |
| 26 | 17.01/a | laying apron complete as per drawing and Technical specification. Boulder | cum | 72.00 | 4996.01 | 359,712.72 |
| 27 | 17.02 | Filter material underneath pitching in slopes complete as per drawing and Technical specification | cum | 54.00 | 3258.46 | 175,956.84 |
| 28 | 17.03/a | Pitching on slopes complete as per drawing and Technical specifications Stone | cum | 17.00 | 4365.16 | 74,207.72 |
| Sub Total of Protection Work | | | | | | 1,494,496.27 |
| Miscellaneous Work | | | | | | |
| 29 | 02.04/i/c | Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. c)Pre- stressed/ Reinforced Cement Concrete grade M20 & above | cum | 791.00 | 1756.40 | 1,389,312.40 |
| 30 | 08.05 | Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface. | sqm | 304.00 | 94.34 | 28,679.36 |

Item Rate Analysis has been done considering

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|--|------------|--|------|----------|----------|---------------------|
| 31 | 08.12 | Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign as per IRC:67 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area not exceeding 0.9 sqm supported on a mild steel single angle iron post 75 x 75 x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing) | sqm | 6.00 | 12505.62 | 75,033.72 |
| 32 | 13/nsc1 | Confirmatory Boring in Soil | cum | 18.00 | 2020.00 | 36,360.00 |
| 33 | 13/nsc2 | Confirmatory Boring in Hard Rock | cum | 30.00 | 4040.00 | 121,200.00 |
| Sub Total of Miscellaneous Work | | | | | | 1,650,585.48 |
| | | Diversion Work | | | | |
| 34 | 03.13 | Construction of Embankment with Material Deposited from Roadway Cutting Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2 | cum | 9,600.00 | 161.80 | 1,553,280.00 |
| 35 | 03.31 | Excavation in Hill Area in Soil by Mechanical Means Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres | cum | 7,680.00 | 213.50 | 1,639,680.00 |

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|--------------|
| 36 | 04.01/Nsc1 | Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material | Cum | 384.00 | 3986.49 | 1,530,812.16 |
| 37 | 05.02 | Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.) | Cum | 640.00 | 3992.57 | 2,555,244.80 |
| 38 | 06/Nsc1 | Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40 | cum | 128.00 | 12431.87 | 1,591,279.36 |

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|---------------------------------------|-------------|---|------|----------|----------|----------------------|
| 39 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | cum | 64.00 | 13574.27 | 868,753.28 |
| 40 | 09.01/ns c1 | Laying Reinforced Cement Concrete Pipe NP4 / Prestressed Concrete Pipe on First Class Bedding in Single Row . B)1200 mm dia | Rm | 120.00 | 12034.09 | 1,444,090.80 |
| Sub Total of Diversion Work | | | | | | 11,183,140.40 |
| Total of Bill 14. Minor Bridge | | | | | | 41,300,048.92 |

Item Rate Analysis has been done considering

**VARIABLE NOTATION
&
CHAINAGE DETAILS
(ROAD PART)**





Typical Cross Section

List of TCS

| Design Chainage (m) | | Length of CD (m) | Net Length (m) | TCS No. |
|-----------------------|-------|---------------------|-------------------|---------|
| From | To | | | |
| 33000 | 33600 | 5.2 | 594.8 | TCS-3 |
| 33600 | 33875 | | 275 | TCS-12 |
| 33875 | 33965 | | 90 | TCS-9A |
| 33965 | 34470 | 2.6 | 502.4 | TCS-12 |
| 34470 | 34510 | | 40 | TCS-9A |
| 34510 | 34560 | | 50 | TCS-12 |
| 34560 | 35000 | 10.6 | 429.4 | TCS-5 |
| 35000 | 35080 | | 80 | TCS-4A |
| 35080 | 35130 | | 50 | TCS-3A |
| 35130 | 35730 | 3.96 | 596.04 | TCS-3 |
| 35730 | 36030 | 2.6 | 297.4 | TCS-7 |
| 36030 | 36230 | 2.7 | 197.3 | TCS-3 |
| 36230 | 36380 | | 150 | TCS-5 |
| 36380 | 36480 | 3.96 | 96.04 | TCS-3 |
| 36480 | 36580 | | 100 | TCS-3A |
| 36580 | 36830 | 2.6 | 247.4 | TCS-3 |
| 36830 | 37010 | 8 | 172 | TCS-3A |
| 37010 | 37060 | 2.7 | 47.3 | TCS-3 |
| 37060 | 37160 | 2.6 | 97.4 | TCS-3A |
| 37160 | 38405 | 20.72 | 1224.28 | TCS-3 |
| 38405 | 38755 | 2.7 | 347.3 | TCS-3A |
| 38755 | 38840 | 3.84 | 81.16 | TCS-3 |
| 38840 | 38910 | | 70 | TCS-3A |
| 38910 | 40580 | 32.8 | 1637.2 | TCS-3 |
| 40580 | 40680 | | 100 | TCS-4 |
| 40680 | 40780 | | 100 | TCS-3A |
| 40780 | 41155 | 5.2 | 369.8 | TCS-3 |
| 41155 | 41205 | | 50 | TCS-4 |
| 41205 | 41500 | 2.6 | 292.4 | TCS-3 |
| 41500 | 41555 | 2.6 | 52.4 | TCS-4 |
| 41555 | 41680 | | 125 | TCS-3 |
| 41680 | 41780 | | 100 | TCS-3A |
| 41780 | 42130 | 2.6 | 347.4 | TCS-3 |
| 42130 | 42350 | 2.6 | 217.4 | TCS-6 |
| 42350 | 42690 | 10.6 | 329.4 | TCS-3 |
| 42690 | 42745 | | 55 | TCS-3A |
| 42745 | 43720 | 10.6 | 964.4 | TCS-3 |
| 43720 | 43855 | 2.7 | 132.3 | TCS-7 |
| 43855 | 43905 | | 50 | TCS-4 |
| 43905 | 44245 | 2.6 | 337.4 | TCS-3 |
| 44245 | 44295 | | 50 | TCS-4 |
| 44295 | 45165 | 10.5 | 859.5 | TCS-3 |
| 45165 | 45215 | | 50 | TCS-3A |
| 45215 | 46990 | 22.44 | 1752.56 | TCS-3 |
| 46990 | 47040 | | 50 | TCS-3A |
| 47040 | 48955 | 26.2 | 1888.8 | TCS-3 |
| 48955 | 49250 | 5.2 | 289.8 | TCS-4 |
| Total Length = | | 214 | 16036 | |

| Design Chainage (m) | | Length of CD (m) | Net Length (m) | TCS No. |
|---------------------|----|---------------------|-------------------|---------|
| From | To | | | |

Summary of TCS Length :

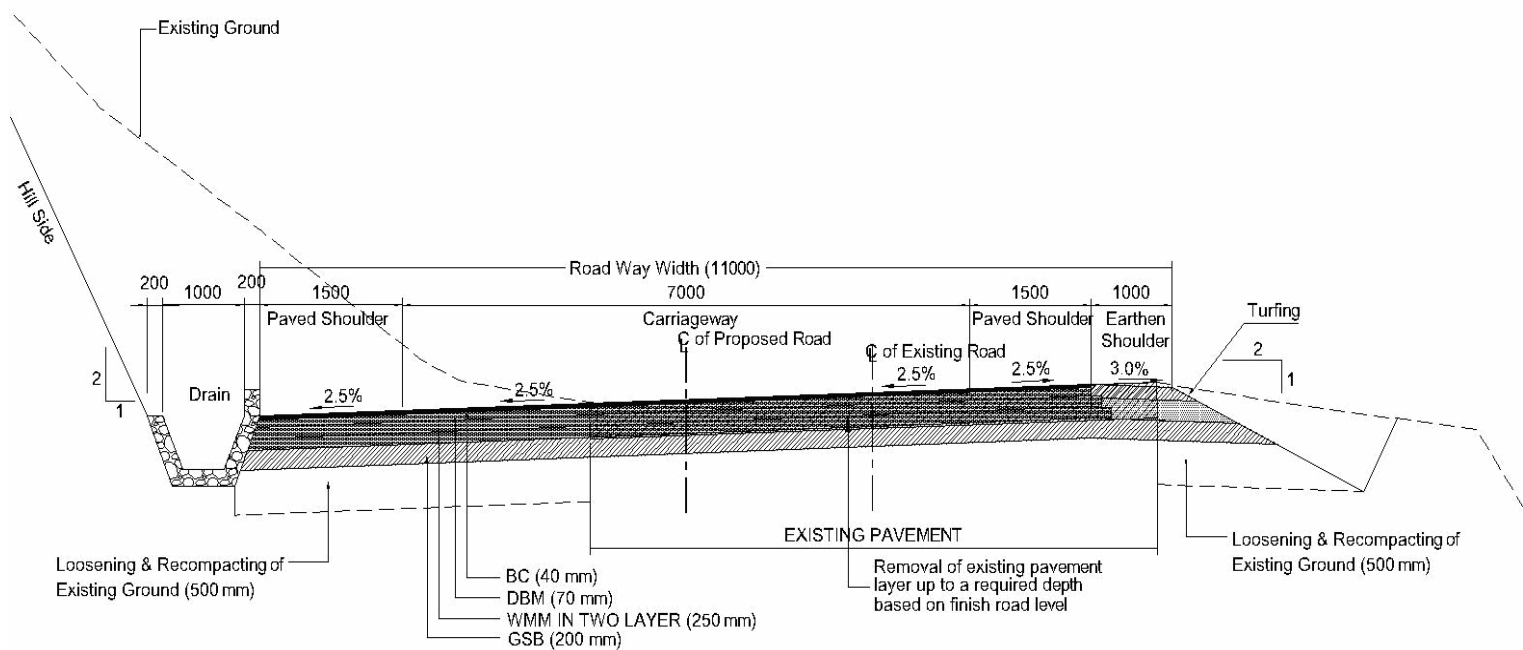
| TCS No. | Net Length (m) | CD Length (m) | Total Length (m) |
|----------------|----------------|---------------|------------------|
| TCS-1 | 0.0 | 0.0 | 0.0 |
| TCS-2 | 0.0 | 0.0 | 0.0 |
| TCS-2A | 0.0 | 0.0 | 0.0 |
| TCS-3 | 11988.2 | 171.8 | 12160.0 |
| TCS-3A | 1191.7 | 13.3 | 1205.0 |
| TCS-4 | 592.2 | 7.8 | 600.0 |
| TCS-4A | 80.0 | 0.0 | 80.0 |
| TCS-5 | 579.4 | 10.6 | 590.0 |
| TCS-6 | 217.4 | 2.6 | 220.0 |
| TCS-7 | 429.7 | 5.3 | 435.0 |
| TCS-8 | 0.0 | 0.0 | 0.0 |
| TCS-9A | 130.0 | 0.0 | 130.0 |
| TCS-10 | 0.0 | 0.0 | 0.0 |
| TCS-11 | 0.0 | 0.0 | 0.0 |
| TCS-12 | 827.4 | 2.6 | 830.0 |
| Total = | 16036 | 214 | 16250 |

Variable Declaration

TCS-03

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|--|----------|-----------|------|
| 1 | Width of Carriageway | cw | 7.000 | m |
| 2 | Paved Shoulder | ps | 1.500 | m |
| 3 | BC Thickness | bc | 0.040 | m |
| 4 | DBM Thickness | dbm | 0.070 | m |
| 5 | WMM Layer-I Thickness | wmm1 | 0.125 | m |
| 6 | GSB Thickness | gsb | 0.200 | m |
| 7 | Subgrade Thickness | sg | 0.500 | m |
| 8 | Length | l | 11988.000 | m |
| 9 | Existing Pavement Width | ext_pav | 6.700 | m |
| 10 | Length of each centreline marking | lc | 3.000 | m |
| 11 | Width of each centreline marking | wc | 0.100 | m |
| 12 | No of Lines for Carriageway Marking for 2 Lane | nc | 2.000 | nos. |
| 13 | Width of Carriageway Marking | wid_mar | 0.150 | m |
| 14 | WMM Layer-II Thickness | wmm2 | 0.125 | m |
| 15 | Earthen Shoulder | es | 1.000 | m |
| 16 | GSB Reuse | gsb_per | 36.630 | |
| 17 | Hard Shoulder | hs | 1.000 | m |
| 18 | 150mm GSB at Earthen Shoulder Portion area | es_gsb | 0.171 | sqm |
| 19 | Earthen Shoulder Portion area | es_area | 0.315 | sqm |

Variable Declaration



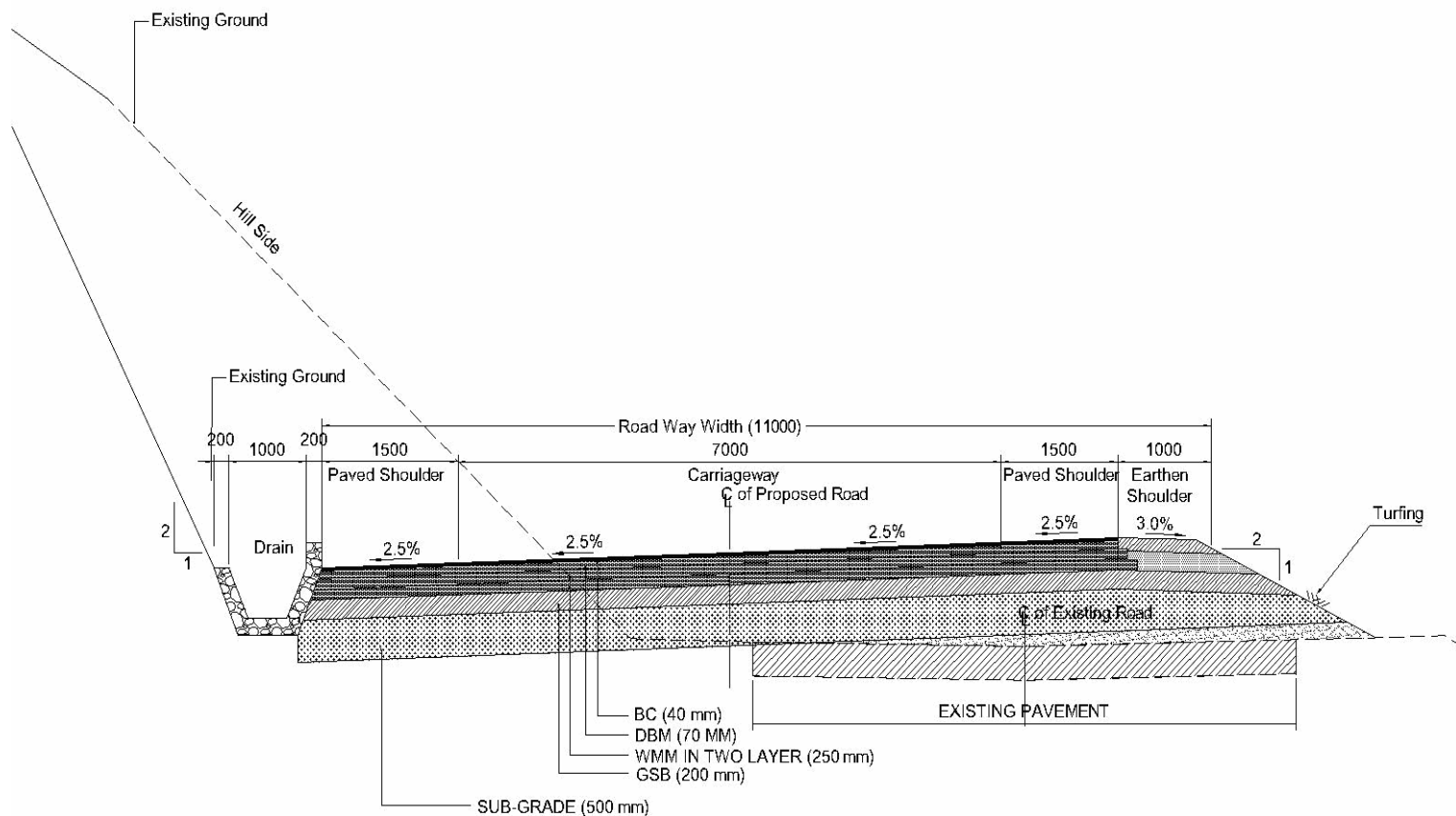
TCS-3 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN RURAL AREA WITH TRAPEZOIDAL OPEN DRAIN ON HILL SIDE AND EARTHEN SHOULDER ON VALLEY SIDE (RECONSTRUCTION)

Variable Declaration

TCS-03A

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|--|----------|-----------|------|
| 1 | Width of Carriageway | cw | 7.000 | m |
| 2 | Paved Shoulder | ps | 1.500 | m |
| 3 | BC Thickness | bc | 0.040 | m |
| 4 | DBM Thickness | dbm | 0.070 | m |
| 5 | WMM Layer-I Thickness | wmm1 | 0.125 | m |
| 6 | GSB Thickness | gsb | 0.200 | m |
| 7 | Subgrade Thickness | sg | 0.500 | m |
| 8 | Length | l | 1192.000 | m |
| 9 | Existing Pavement Width | ext_pav | 0.000 | m |
| 10 | Length of each centreline marking | lc | 3.000 | m |
| 11 | Width of each centreline marking | wc | 0.100 | m |
| 12 | No of Lines for Carriageway Marking for 2 Lane | nc | 2.000 | nos. |
| 13 | Width of Carriageway Marking | wid_mar | 0.150 | m |
| 14 | WMM Layer-II Thickness | wmm2 | 0.125 | m |
| 15 | Earthen Shoulder | es | 1.000 | m |
| 16 | GSB Reuse | gsb_per | 36.630 | |
| 17 | Hard Shoulder | hs | 1.000 | m |
| 18 | 150mm GSB at Earthen Shoulder Portion area | es_gsb | 0.171 | sqm |
| 19 | Earthen Shoulder Portion area | es_area | 0.315 | sqm |

Variable Declaration



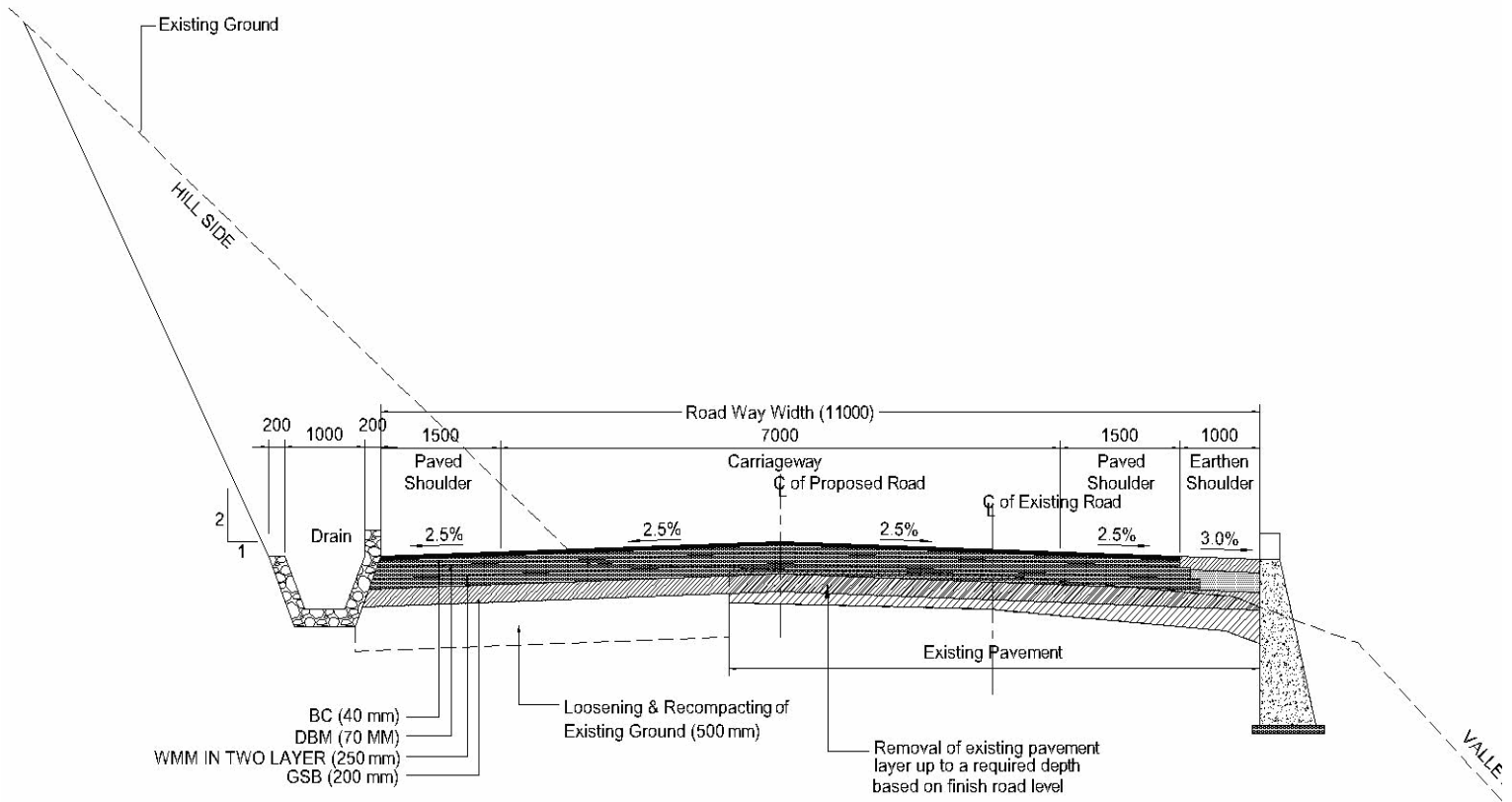
TCS-3A : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN RURAL AREA WITH TRAPEZOIDAL OPEN DRAIN ON HILL SIDE AND EARTHEN SHOULDER ON VALLEY SIDE (NEW CONSTRUCTION)

Variable Declaration

TCS-04

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|--|----------|-----------|------|
| 1 | Width of Carriageway | cw | 7.000 | m |
| 2 | Paved Shoulder | ps | 1.500 | m |
| 3 | BC Thickness | bc | 0.040 | m |
| 4 | DBM Thickness | dbm | 0.070 | m |
| 5 | WMM Layer-I Thickness | wmm1 | 0.125 | m |
| 6 | GSB Thickness | gsb | 0.200 | m |
| 7 | Subgrade Thickness | sg | 0.500 | m |
| 8 | Length | l | 592.000 | m |
| 9 | Existing Pavement Width | ext_pav | 6.700 | m |
| 10 | Length of each centreline marking | lc | 3.000 | m |
| 11 | Width of each centreline marking | wc | 0.100 | m |
| 12 | No of Lines for Carriageway Marking for 2 Lane | nc | 2.000 | nos. |
| 13 | Width of Carriageway Marking | wid_mar | 0.150 | m |
| 14 | WMM Layer-II Thickness | wmm2 | 0.125 | m |
| 15 | Earthen Shoulder | es | 1.000 | m |
| 16 | GSB Reuse | gsb_per | 36.630 | |
| 17 | Hard Shoulder | hs | 1.000 | m |
| 18 | 150mm GSB at Earthen Shoulder Portion area | es_gsb | 0.171 | sqm |
| 19 | Earthen Shoulder Portion area | es_area | 0.315 | sqm |

Variable Declaration



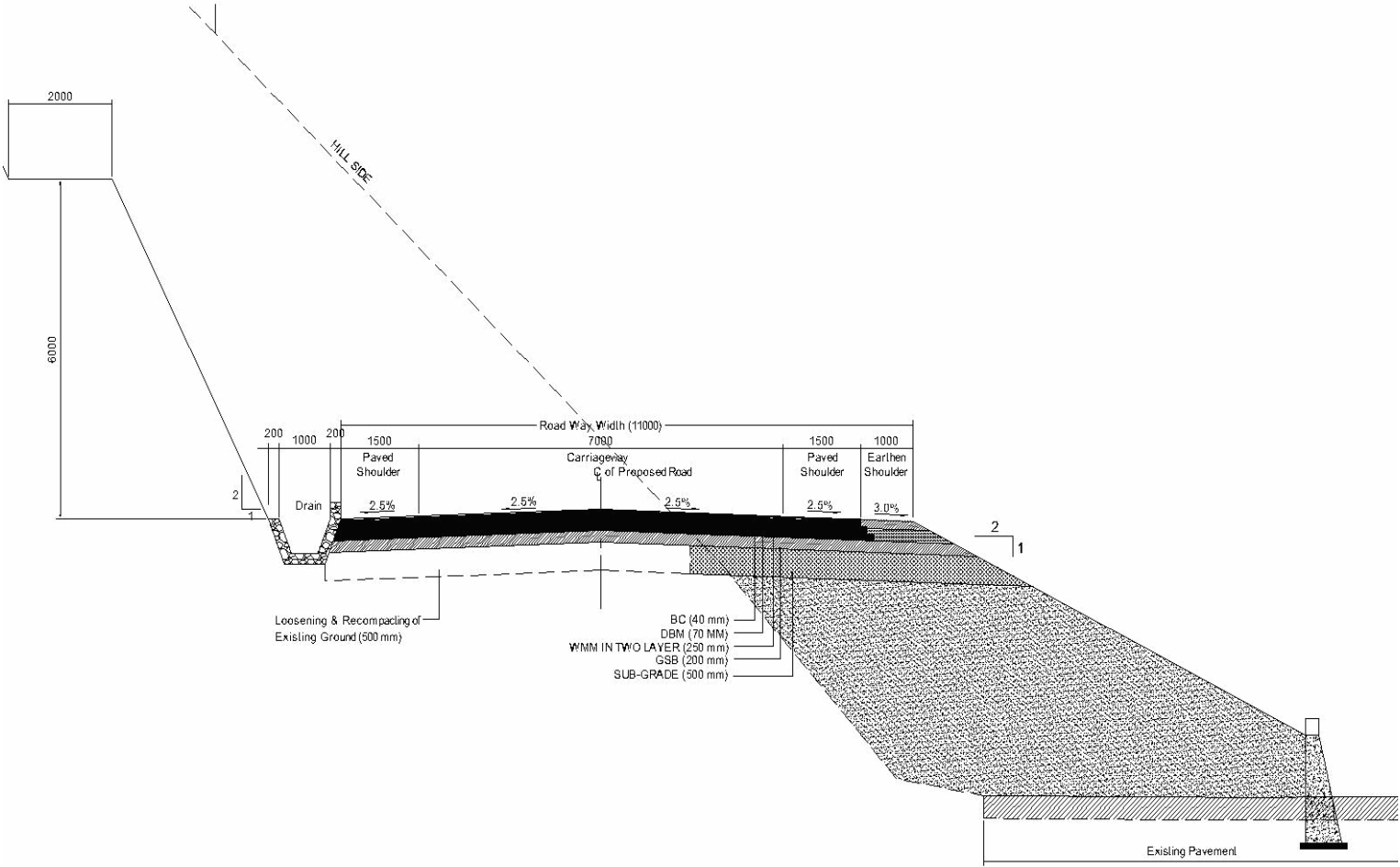
TCS-4 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN RURAL AREA WITH RETAINING WALL ON VALLEY SIDE AND TRAPEZOIDAL OPEN DRAIN ON HILL SIDE (RECONSTRUCTION)

Variable Declaration

TCS-04A

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|--|----------|-----------|------|
| 1 | Width of Carriageway | cw | 7.000 | m |
| 2 | Paved Shoulder | ps | 1.500 | m |
| 3 | BC Thickness | bc | 0.040 | m |
| 4 | DBM Thickness | dbm | 0.070 | m |
| 5 | WMM Layer-I Thickness | wmm1 | 0.125 | m |
| 6 | GSB Thickness | gsb | 0.200 | m |
| 7 | Subgrade Thickness | sg | 0.500 | m |
| 8 | Length | l | 80.000 | m |
| 9 | Existing Pavement Width | ext_pav | 6.700 | m |
| 10 | Length of each centreline marking | lc | 3.000 | m |
| 11 | Width of each centreline marking | wc | 0.100 | m |
| 12 | No of Lines for Carriageway Marking for 2 Lane | nc | 2.000 | nos. |
| 13 | Width of Carriageway Marking | wid_mar | 0.150 | m |
| 14 | WMM Layer-II Thickness | wmm2 | 0.125 | m |
| 15 | Earthen Shoulder | es | 1.000 | m |
| 16 | GSB Reuse | gsb_per | 36.630 | |
| 17 | Hard Shoulder | hs | 1.000 | m |
| 18 | 150mm GSB at Earthen Shoulder Portion area | es_gsb | 0.171 | sqm |
| 19 | Earthen Shoulder Portion area | es_area | 0.315 | sqm |

Variable Declaration



TCS-4A : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN RURAL AREA WITH RETAINING WALL ON VALLEY SIDE AND TRAPEZOIDAL OPEN DRAIN ON HILL SIDE (NEW CONSTRUCTION)

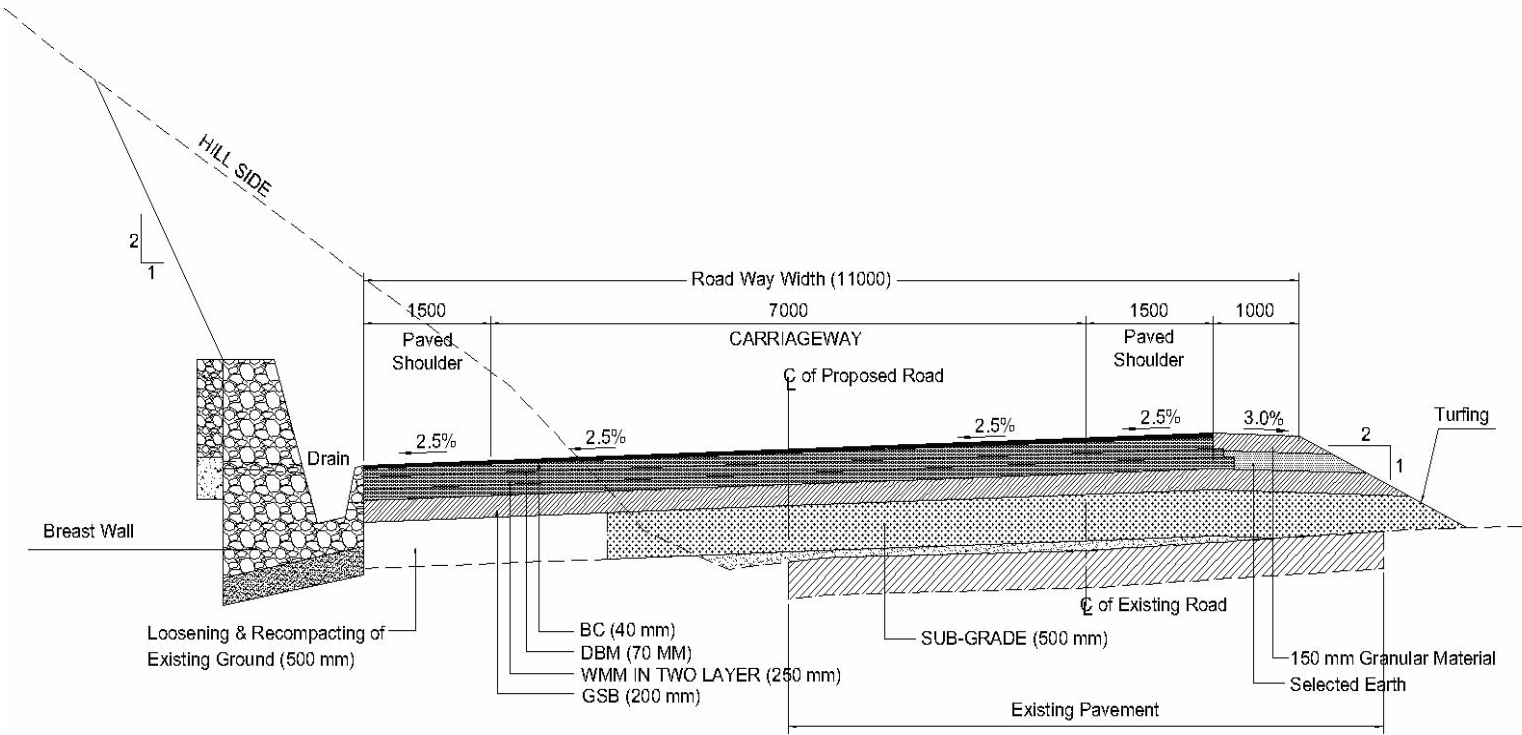
Variable Declaration

TCS-05

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|--|----------|-----------|------|
| 1 | Width of Carriageway | cw | 7.000 | m |
| 2 | Paved Shoulder | ps | 1.500 | m |
| 3 | BC Thickness | bc | 0.040 | m |
| 4 | DBM Thickness | dbm | 0.070 | m |
| 5 | WMM Layer-I Thickness | wmm1 | 0.125 | m |
| 6 | GSB Thickness | gsb | 0.200 | m |
| 7 | Subgrade Thickness | sg | 0.500 | m |
| 8 | Length | l | 579.000 | m |
| 9 | Existing Pavement Width | ext_pav | 6.700 | m |
| 10 | Length of each centreline marking | lc | 3.000 | m |
| 11 | Width of each centreline marking | wc | 0.100 | m |
| 12 | No of Lines for Carriageway Marking for 2 Lane | nc | 2.000 | nos. |
| 13 | Width of Carriageway Marking | wid_mar | 0.150 | m |
| 14 | WMM Layer-II Thickness | wmm2 | 0.125 | m |
| 15 | Earthen Shoulder | es | 1.000 | m |
| 16 | GSB Reuse | gsb_per | 36.630 | |
| 17 | Hard Shoulder | hs | 1.000 | m |
| 18 | 150mm GSB at Earthen Shoulder Portion area | es_gsb | 0.171 | sqm |
| 19 | Earthen Shoulder Portion area | es_area | 0.315 | sqm |

Variable Declaration

—Existing Ground



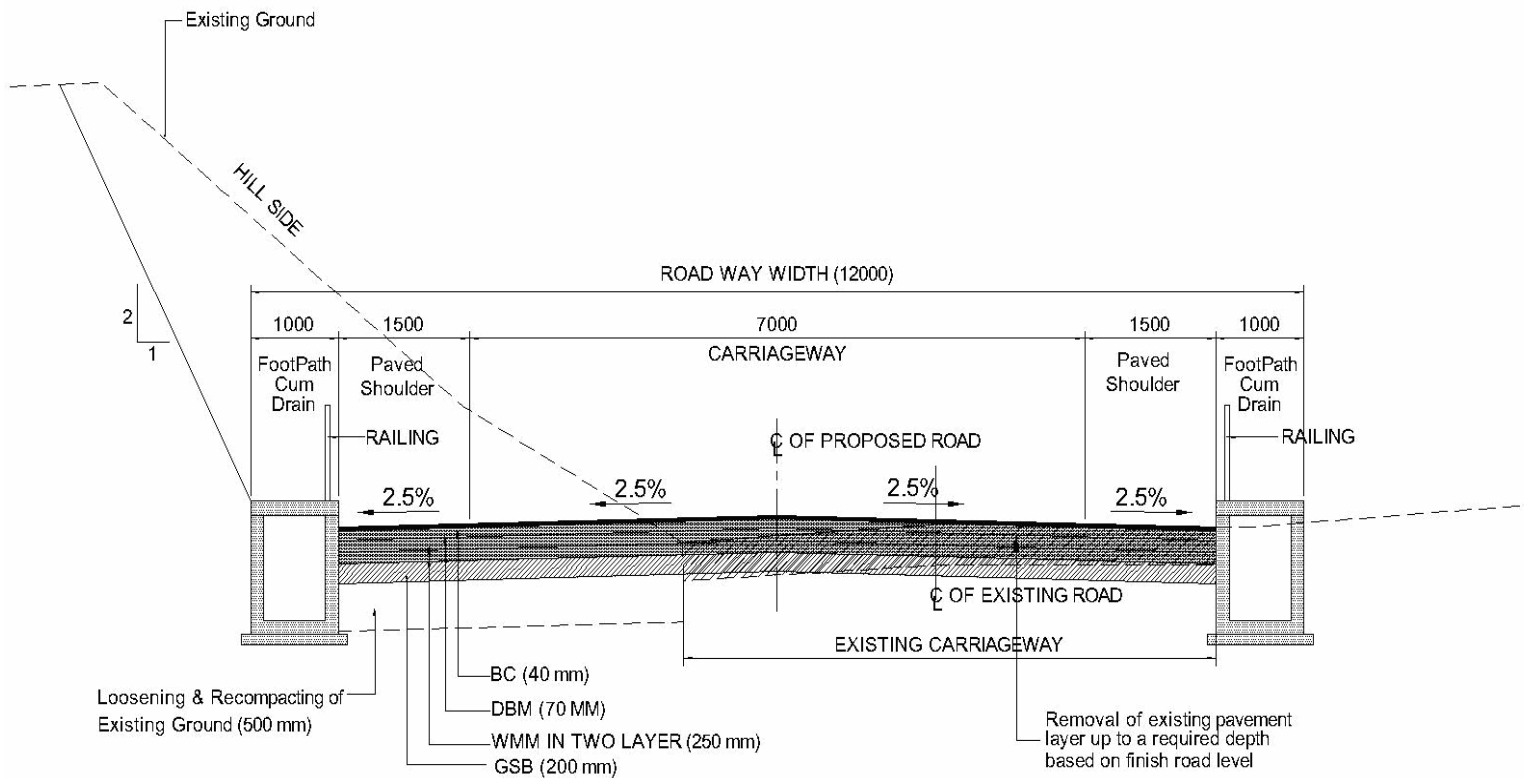
TCS-5 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN RURAL AREA WITH BREAST WALL ON HILL SIDE AND EARTHEN SHOULDER ON VALLEY SIDE (RECONSTRUCTION)

Variable Declaration

TCS-06

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|--|----------|-----------|------|
| 1 | Width of Carriageway | cw | 7.000 | m |
| 2 | Paved Shoulder | ps | 1.500 | m |
| 3 | BC Thickness | bc | 0.040 | m |
| 4 | DBM Thickness | dbm | 0.070 | m |
| 5 | WMM Layer-I Thickness | wmm1 | 0.125 | m |
| 6 | GSB Thickness | gsb | 0.200 | m |
| 7 | Subgrade Thickness | sg | 0.500 | m |
| 8 | Length | l | 217.000 | m |
| 9 | Existing Pavement Width | ext_pav | 6.700 | m |
| 10 | Length of each centreline marking | lc | 3.000 | m |
| 11 | Width of each centreline marking | wc | 0.100 | m |
| 12 | No of Lines for Carriageway Marking for 2 Lane | nc | 2.000 | nos. |
| 13 | Width of Carriageway Marking | wid_mar | 0.150 | m |
| 14 | WMM Layer-II Thickness | wmm2 | 0.125 | m |
| 15 | Earthen Shoulder | es | 0.000 | m |
| 16 | GSB Reuse | gsb_per | 36.630 | |

Variable Declaration



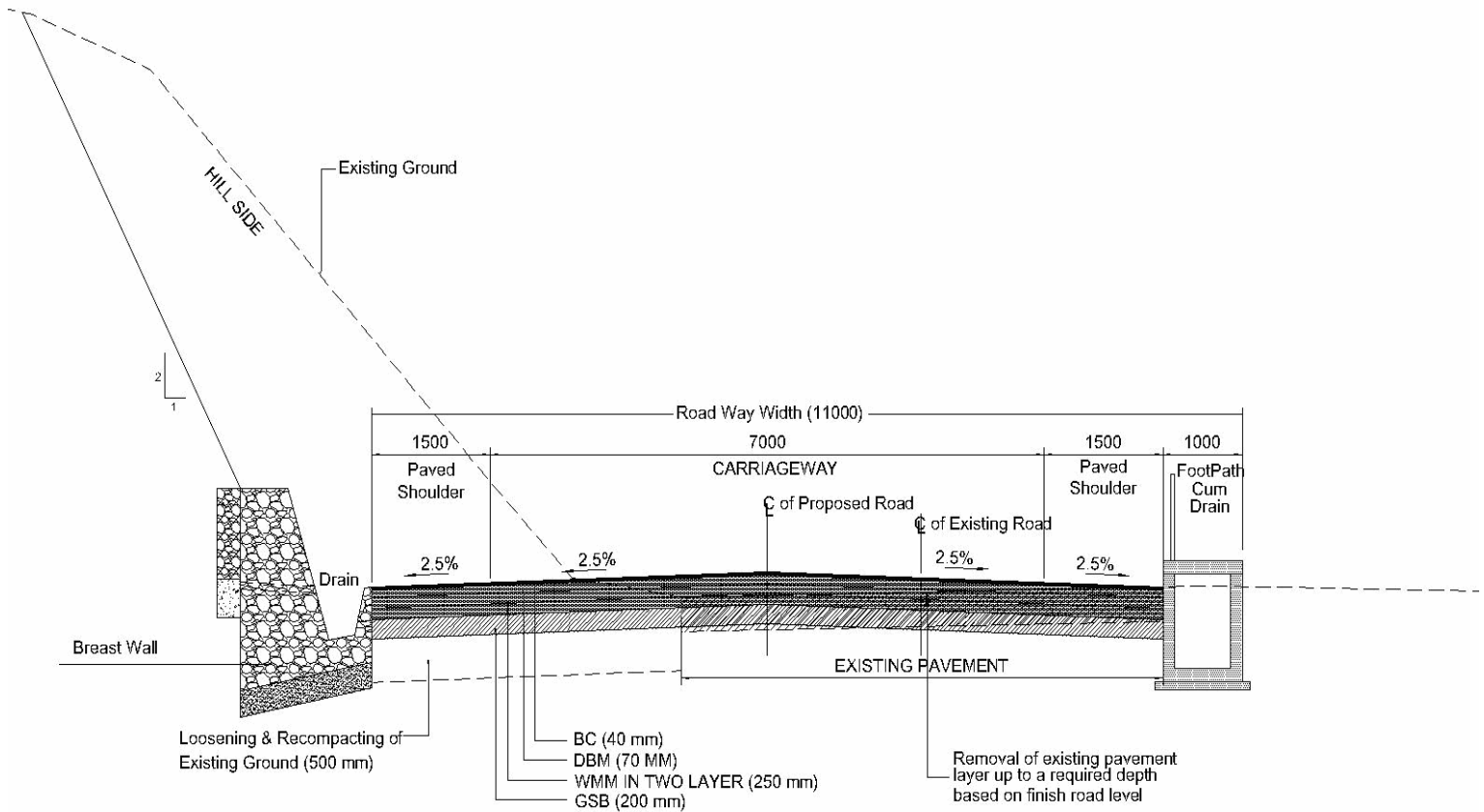
**TCS-6 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN BUILT UP AREA
WITH BOTH SIDE FOOTPATH CUM RCC RECTANGULAR COVERED DRAIN IN HILLY TERRAIN (RECONSTRUCTION)**

Variable Declaration

TCS-07

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|--|----------|-----------|------|
| 1 | Width of Carriageway | cw | 7.000 | m |
| 2 | Paved Shoulder | ps | 1.500 | m |
| 3 | BC Thickness | bc | 0.040 | m |
| 4 | DBM Thickness | dbm | 0.070 | m |
| 5 | WMM Layer-I Thickness | wmm1 | 0.125 | m |
| 6 | GSB Thickness | gsb | 0.200 | m |
| 7 | Subgrade Thickness | sg | 0.500 | m |
| 8 | Length | l | 430.000 | m |
| 9 | Existing Pavement Width | ext_pav | 6.700 | m |
| 10 | Length of each centreline marking | lc | 3.000 | m |
| 11 | Width of each centreline marking | wc | 0.100 | m |
| 12 | No of Lines for Carriageway Marking for 2 Lane | nc | 2.000 | nos. |
| 13 | Width of Carriageway Marking | wid_mar | 0.150 | m |
| 14 | WMM Layer-II Thickness | wmm2 | 0.125 | m |
| 15 | Earthen Shoulder | es | 0.000 | m |
| 16 | GSB Reuse | gsb_per | 36.630 | |

Variable Declaration



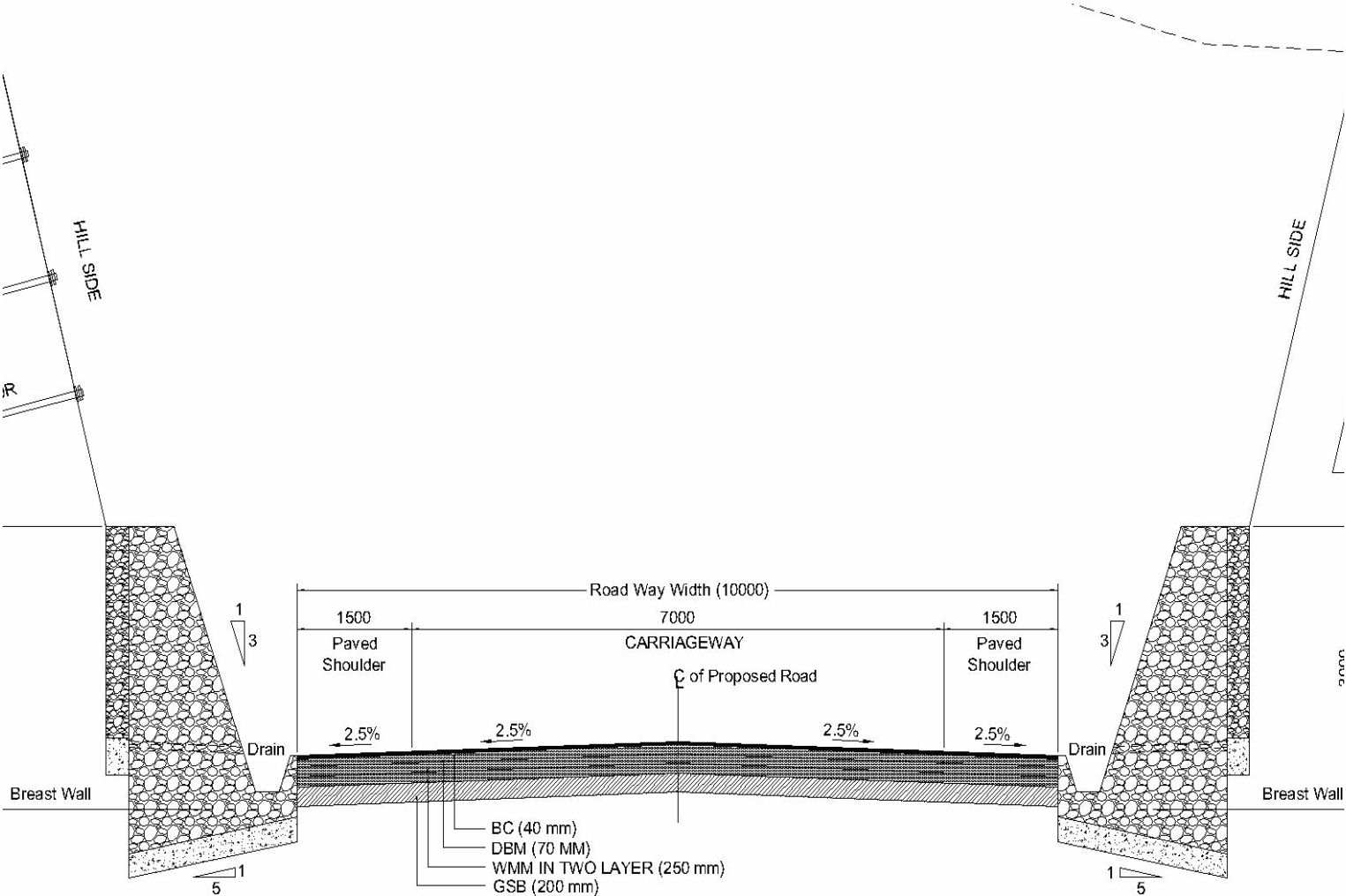
TCS-7 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN BUILT-UP AREA WITH BREAST WALL ON HILL SIDE AND FOOTPATH CUM RCC RECTANGULAR COVERED DRAIN ON VALLEY SIDE (RECONSTRUCTION)

Variable Declaration

TCS-09A

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|--|----------|-----------|------|
| 1 | Width of Carriageway | cw | 7.000 | m |
| 2 | Paved Shoulder | ps | 1.500 | m |
| 3 | BC Thickness | bc | 0.040 | m |
| 4 | DBM Thickness | dbm | 0.070 | m |
| 5 | WMM Layer-I Thickness | wmm1 | 0.125 | m |
| 6 | GSB Thickness | gsb | 0.200 | m |
| 7 | Subgrade Thickness | sg | 0.500 | m |
| 8 | Length | l | 130.000 | m |
| 9 | Existing Pavement Width | ext_pav | 6.700 | m |
| 10 | Length of each centreline marking | lc | 3.000 | m |
| 11 | Width of each centreline marking | wc | 0.100 | m |
| 12 | No of Lines for Carriageway Marking for 2 Lane | nc | 2.000 | nos. |
| 13 | Width of Carriageway Marking | wid_mar | 0.150 | m |
| 14 | WMM Layer-II Thickness | wmm2 | 0.125 | m |
| 15 | Earthen Shoulder | es | 0.000 | m |
| 16 | GSB Reuse | gsb_per | 36.630 | |

Variable Declaration



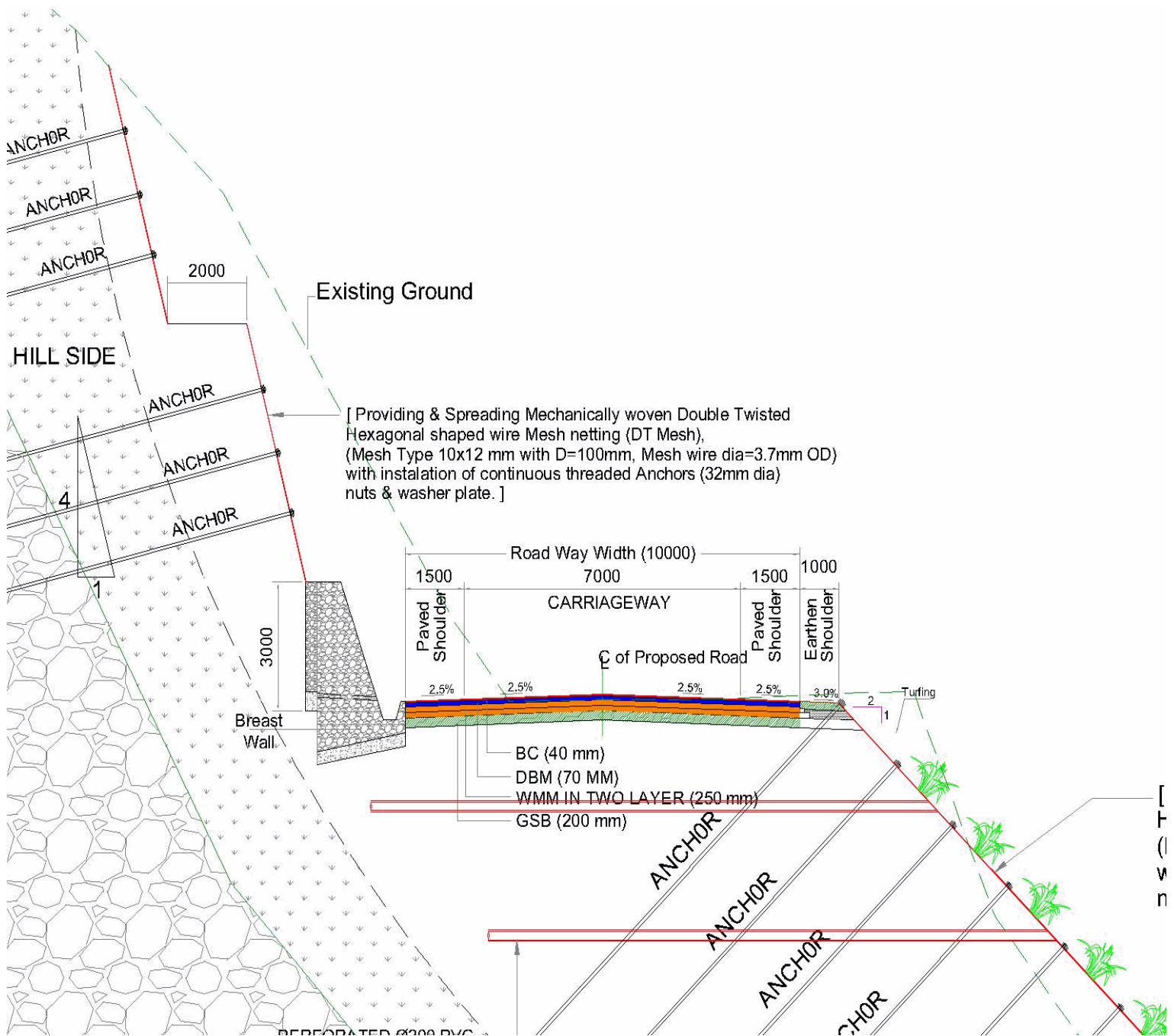
TCS-9A : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN RURAL AREA WITH BREAST WALL ON BOTH SIDES (NEW CONSTRUCTION)

Variable Declaration

TCS-12

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|--|----------|-----------|------|
| 1 | Width of Carriageway | cw | 7.000 | m |
| 2 | Paved Shoulder | ps | 1.500 | m |
| 3 | BC Thickness | bc | 0.040 | m |
| 4 | DBM Thickness | dbm | 0.070 | m |
| 5 | WMM Layer-I Thickness | wmm1 | 0.125 | m |
| 6 | GSB Thickness | gsb | 0.200 | m |
| 7 | Subgrade Thickness | sg | 0.500 | m |
| 8 | Length | l | 827.000 | m |
| 9 | Existing Pavement Width | ext_pav | 6.700 | m |
| 10 | Length of each centreline marking | lc | 3.000 | m |
| 11 | Width of each centreline marking | wc | 0.100 | m |
| 12 | No of Lines for Carriageway Marking for 2 Lane | nc | 2.000 | nos. |
| 13 | Width of Carriageway Marking | wid_mar | 0.150 | m |
| 14 | WMM Layer-II Thickness | wmm2 | 0.125 | m |
| 15 | Earthen Shoulder | es | 0.000 | m |
| 16 | GSB Reuse | gsb_per | 36.630 | |

Variable Declaration



Site Clearance and Dismantling

A.Tree Cutting

| SI No | Girth Details | | |
|-------|-------------------------------|----|------|
| 1 | Girth from 300 mm to 600 mm | 10 | Each |
| 1 | Girth from 600 mm to 900 mm | 30 | Each |
| 2 | Girth from 900 mm to 1800 mm | 46 | Each |
| 4 | Girth from 1800 mm to 2700 mm | 3 | Each |

..... Bill No- 01, Sl. No- 1
 Bill No- 01, Sl. No- 2
 Bill No- 01, Sl. No- 3
 Bill No- 01, Sl. No- 4

B.Clearing and grubbing

Clearing and Grubbing Area 27.17 Ha

..... Bill No- 01, Sl. No-6

C. Dismantling

SI No A.Rubble stone masonry in cement mortar

| | | | | |
|---|---------|--------|-----|-----|
| 1 | Culvert | = | 866 | Cum |
| | | Total= | 866 | cum |

..... Bill No- 01, Sl. No- 8

SI No B.Total Dismantling of Reinforced cement concrete

| | | | | |
|---|---------|--------|----|-----|
| 1 | Culvert | = | 38 | Cum |
| | | Total= | 38 | cum |

..... Bill No- 01, Sl. No- 7

SI No C.Total Dismantling Hume Pipe Culvert

| | | | |
|---|-------------------|-----|---|
| 1 | up to 600 mm dia= | 30 | m |
| 2 | 600-900 mm dia= | 60 | m |
| 3 | above 900 mm dia= | 180 | m |
| | | | |

..... Bill No- 01, Sl. No- 9
 Bill No- 01, Sl. No-10
 Bill No- 01, Sl. No- 11

SI No D.Total Dismantling of Bituminous layer

| | | | | |
|---|------|--------|--------|-----|
| 1 | Road | = | 171814 | sqm |
| | | Total= | 171814 | sqm |

..... Bill No- 01, Sl. No- 12

SI No E.Total Dismantling of Granular Layer

| | | | | |
|---|--------------------------------|--------|--------|-----|
| 1 | Road | = | 168284 | sqm |
| | Refer backup calculation sheet | | | |
| | | Total= | 168284 | sqm |

..... Bill No- 01, Sl. No- 13



**Site Clearance and Dismantling
(Tree Cutting List)**

| SI No | Design Ch | EASTING(M) | NORTHING | Side | GIRTH (M) |
|-------|-----------|------------|-------------|------|-----------|
| 1 | 35.960 | 573971.923 | 2741778.856 | RHS | 1.7 |
| 2 | 36.406 | 573770.236 | 2741961.448 | RHS | 1.4 |
| 3 | 36.416 | 573767.433 | 2741953.237 | RHS | 1 |
| 4 | 36.425 | 573782.662 | 2741939.909 | LHS | 0.9 |
| 5 | 36.426 | 573781.716 | 2741938.91 | LHS | 0.8 |
| 6 | 36.437 | 573763.305 | 2741939.352 | RHS | 2.8 |
| 7 | 36.528 | 573697.277 | 2741876.413 | LHS | 1 |
| 8 | 36.548 | 573672.004 | 2741871.294 | LHS | 2 |
| 9 | 36.552 | 573662.3 | 2741871.242 | LHS | 1.6 |
| 10 | 36.618 | 573619.662 | 2741927.023 | RHS | 1.8 |
| 11 | 36.643 | 573604.844 | 2741945.417 | RHS | 0.5 |
| 12 | 36.653 | 573600.435 | 2741953.637 | RHS | 0.9 |
| 13 | 36.658 | 573598.582 | 2741958.014 | RHS | 0.8 |
| 14 | 36.737 | 573557.853 | 2742026.17 | RHS | 1.6 |
| 15 | 36.763 | 573553.552 | 2742048.986 | RHS | 1.5 |
| 16 | 36.865 | 573493.499 | 2742037.777 | LHS | 0.8 |
| 17 | 40.117 | 571651.072 | 2743147.203 | LHS | 0.7 |
| 18 | 40.117 | 571650.877 | 2743146.651 | LHS | 0.7 |
| 19 | 40.791 | 571312.488 | 2743023.374 | RHS | 0.9 |
| 20 | 41.473 | 570880.967 | 2742878.041 | RHS | 1 |
| 21 | 41.596 | 570912.831 | 2742758.607 | RHS | 2 |
| 22 | 42.236 | 570622.94 | 2742245.283 | LHS | 0.7 |
| 23 | 42.759 | 570458.668 | 2741816.29 | LHS | 1.6 |
| 24 | 42.761 | 570462.337 | 2741817.136 | LHS | 1.5 |
| 25 | 42.781 | 570478.05 | 2741800.263 | LHS | 1.2 |
| 26 | 42.820 | 570484.875 | 2741756.699 | RHS | 1.5 |
| 27 | 42.835 | 570488.835 | 2741738.284 | RHS | 1.3 |
| 28 | 44.096 | 570280.213 | 2742032.999 | LHS | 1.2 |
| 29 | 44.218 | 570266.842 | 2742114.845 | RHS | 1.1 |
| 30 | 44.351 | 570317.939 | 2742240.838 | LHS | 1.5 |
| 31 | 44.385 | 570337.307 | 2742268.458 | LHS | 0.8 |
| 32 | 47.333 | 569070.841 | 2743261.806 | RHS | 0.9 |
| 33 | 47.831 | 568817.285 | 2742921.005 | RHS | 0.5 |
| 34 | 48.649 | 568481.491 | 2742405.304 | RHS | 0.6 |
| 35 | 48.651 | 568483.565 | 2742410.416 | RHS | 0.7 |
| 36 | 48.797 | 568389.325 | 2742515.871 | RHS | 0.8 |
| 37 | 49.096 | 568251.526 | 2742459.412 | RHS | 1.6 |
| 38 | 49.255 | 568092.72 | 2742440.42 | RHS | 2.9 |
| 39 | 49.268 | 568089.094 | 2742425.118 | RHS | 0.5 |
| 40 | 49.274 | 568086.041 | 2742420.174 | RHS | 0.6 |
| 41 | 49.377 | 567997.263 | 2742388.062 | RHS | 1.5 |
| 42 | 49.405 | 567969.292 | 2742379.294 | RHS | 0.9 |
| 43 | 49.483 | 567927.123 | 2742309.98 | RHS | 0.8 |
| 44 | 50.000 | 567585.331 | 2742088.857 | RHS | 1.6 |
| 45 | 50.018 | 567568.411 | 2742080.929 | RHS | 1.5 |
| 46 | 50.019 | 567566.657 | 2742083.027 | RHS | 1.5 |
| 47 | 50.024 | 567560.247 | 2742080.254 | RHS | 0.8 |
| 48 | 50.026 | 567559.036 | 2742078.536 | RHS | 1.3 |
| 49 | 50.087 | 567515.874 | 2742033.672 | RHS | 0.5 |
| 50 | 50.087 | 567525.702 | 2742022.153 | LHS | 0.6 |
| 51 | 50.091 | 567513.241 | 2742031.142 | RHS | 0.5 |
| 52 | 50.094 | 567521.556 | 2742016.768 | LHS | 0.6 |
| 53 | 50.094 | 567519.618 | 2742018.98 | LHS | 0.6 |
| 54 | 50.095 | 567518.004 | 2742019.946 | LHS | 0.5 |
| 55 | 50.097 | 567508.84 | 2742027.277 | RHS | 0.7 |
| 56 | 50.333 | 567303.601 | 2741944.787 | RHS | 0.8 |
| 57 | 50.340 | 567297.102 | 2741940.841 | RHS | 0.9 |



**Site Clearance and Dismantling
(Tree Cutting List)**

| SI No | Design Ch | EASTING(M) | NORTHING | Side | GIRTH (M) |
|-------|-----------|------------|-------------|------|-----------|
| 58 | 50.343 | 567294.16 | 2741938.71 | LHS | 0.8 |
| 59 | 50.348 | 567290.393 | 2741936.281 | LHS | 0.9 |
| 60 | 50.399 | 567240.473 | 2741924.306 | RHS | 0.7 |
| 61 | 50.413 | 567226.042 | 2741923.935 | RHS | 0.8 |
| 62 | 50.453 | 567205.436 | 2741848.045 | LHS | 1.2 |
| 63 | 50.480 | 567172.159 | 2741867.404 | LHS | 1.7 |
| 64 | 50.484 | 567171.1 | 2741857.403 | LHS | 1.6 |
| 65 | 50.506 | 567152.659 | 2741840.078 | LHS | 1.6 |
| 66 | 50.526 | 567134.083 | 2741830.561 | LHS | 0.7 |
| 67 | 50.537 | 567124.494 | 2741826.622 | LHS | 1.3 |
| 68 | 50.553 | 567108.088 | 2741824.946 | LHS | 1.5 |
| 69 | 50.731 | 567051.061 | 2741358.269 | LHS | 0.9 |
| 70 | 50.735 | 567045.078 | 2741363.456 | LHS | 1.2 |
| 71 | 50.740 | 567039.912 | 2741364.974 | LHS | 1.6 |
| 72 | 50.743 | 567036.31 | 2741367.41 | LHS | 3.5 |
| 73 | 50.748 | 567087.398 | 2741158.067 | LHS | 0.8 |
| 74 | 50.750 | 567090.734 | 2741141.047 | LHS | 0.6 |
| 75 | 50.878 | 566945.088 | 2741187.011 | LHS | 1.6 |
| 76 | 50.884 | 566938.601 | 2741189.332 | LHS | 1.6 |
| 77 | 50.946 | 566858.336 | 2741245.976 | LHS | 1.4 |
| 78 | 50.947 | 566856.516 | 2741247.788 | LHS | 1.3 |
| 79 | 50.981 | 566743.384 | 2741535.776 | LHS | 1.3 |
| 80 | 51.010 | 566741.294 | 2741430.644 | LHS | 0.8 |
| 81 | 51.254 | 566285.052 | 2742177.583 | RHS | 0.5 |
| 82 | 51.502 | 565979.029 | 2742358.849 | RHS | 0.5 |
| 83 | 51.504 | 565976.445 | 2742359.223 | RHS | 0.5 |
| 84 | 51.506 | 565974.134 | 2742359.759 | RHS | 0.7 |
| 85 | 51.509 | 565960.58 | 2742397.476 | RHS | 0.8 |
| 86 | 51.511 | 565963.794 | 2742379.476 | RHS | 0.8 |
| 87 | 51.512 | 565964.061 | 2742375.191 | RHS | 1.4 |
| 88 | 51.512 | 565954.996 | 2742407.384 | RHS | 0.8 |
| 89 | 51.513 | 565953.593 | 2742409.641 | RHS | 0.5 |
| 90 | 51.513 | 565952.31 | 2742411.587 | RHS | 0.8 |
| 91 | 51.515 | 565950.056 | 2742415.371 | RHS | 1.3 |
| 92 | 51.516 | 565947.806 | 2742419.65 | RHS | 1.4 |

Summary:

| | | |
|--------------------------------------|-----------|------------|
| Girth from 300 mm to 600 mm | 10 | Nos |
| Girth from 600 mm to 900 mm | 30 | Nos |
| Girth from 900 mm to 1800 mm | 46 | Nos |
| Girth from 1800 mm to 2700 mm | 3 | Nos |
| Above 2700 mm | 3 | Nos |



Site Clearance and Dismantling
Clearing and Grubbing Road Land

| TCS Type | Net Length (m) | Existing Road Width (m) | Width to be cleared and grubbed (m) | Area to be cleared and grubbed (Ha) |
|----------|----------------|-------------------------|-------------------------------------|-------------------------------------|
| TCS-1 | 0 | 6.7 | 24.0 | 0.00 |
| TCS-2 | 0 | 6.8 | 24.0 | 0.00 |
| TCS-2A | 0 | 6.7 | 24.0 | 0.00 |
| TCS-3 | 12453 | 6.7 | 24.0 | 21.54 |
| TCS-3A | 1192 | 6.7 | 24.0 | 2.06 |
| TCS-4 | 352 | 6.7 | 24.0 | 0.61 |
| TCS-4A | 100 | 6.8 | 24.0 | 0.17 |
| TCS-5 | 150 | 6.7 | 24.0 | 0.26 |
| TCS-6 | 217 | 6.7 | 24.0 | 0.38 |
| TCS-7 | 430 | 6.7 | 24.0 | 0.74 |
| TCS-8 | 0 | 6.7 | 24.0 | 0.00 |
| TCS-9A | 535 | 6.8 | 24.0 | 0.92 |
| TCS-10 | 280 | 6.7 | 24.0 | 0.48 |
| | | | | |

Total= 27.17

Total area of clearing & grubbing=

27.17 ha



Site Clearance and Dismantling
Calculation of Quantities for Dismantling

| Sl. No. | Brief Description | Unit | Survey ch. | No. | L | B / H | T | Quantity | Total Quantity |
|------------------|---|------|------------|-----|-----|-------|-----|----------|----------------|
| A) Stone Masonry | Head wall for existing pipe culvert H=h, Length=L, and thickness=t | Cum | 33.225 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 33.763 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 33.823 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 35.249 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 35.764 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 36.189 | 2 | 5.5 | 2.5 | 0.8 | 22.00 | |
| | | | 37.714 | 2 | 5.8 | 2.8 | 0.8 | 25.98 | |
| | | | 37.764 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 38.264 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 38.642 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 38.938 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 39.132 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 39.257 | 2 | 5.8 | 2.8 | 0.8 | 25.98 | |
| | | | 39.653 | 2 | 5.8 | 2.8 | 0.8 | 25.98 | |
| | | | 41.010 | 2 | 5.8 | 2.8 | 0.8 | 25.98 | |
| | | | 42.907 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 43.342 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 43.451 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 43.663 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 44.644 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 45.058 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 45.833 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 46.444 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 46.993 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 47.455 | 2 | 6.6 | 2.6 | 0.8 | 27.46 | |
| | | | 48.617 | 2 | 5.6 | 2.6 | 0.8 | 23.30 | |
| | | | 48.987 | 2 | 5.5 | 2.5 | 0.8 | 22.00 | |



Site Clearance and Dismantling
Calculation of Quantities for Dismantling

| Sl. No. | Brief Description | Unit | Survey ch. | No. | L | B / H | T | Quantity | Total Quantity |
|------------------|--|------|------------|-----|------|-------|------|----------------|----------------|
| A) Stone Masonry | Abutments for existing slab culvert H=h, Length=L, and thickness=t. | cum | 36.772 | 2 | 10.5 | 3.00 | 0.50 | 31.50 | |
| | | | 36.860 | 2 | 12.3 | 3.00 | 0.50 | 36.90 | |
| | | | 37.076 | 2 | 12.7 | 3.00 | 0.50 | 38.10 | |
| | | | 38.529 | 2 | 9.8 | 3.00 | 0.50 | 29.40 | |
| | | | 45.161 | 2 | 9.5 | 3.00 | 0.50 | 28.50 | |
| | | | 45.261 | 2 | 9.7 | 3.00 | 0.50 | 29.10 | |
| | | | 47.658 | 2 | 10.5 | 3.00 | 0.50 | 31.50 | |
| | | | | | | | | Total = | 866.31 |



Site Clearance and Dismantling
Calculation of Quantities for Dismantling

| Sl. No. | Brief Description | Unit | Survey ch. | No. | L | B / H | T | Quantity | Total Quantity |
|--------------|-----------------------|------|------------|-----|-------|-------|-----|---------------|----------------|
| B) RCC | For Slab culvert | Cum | 36.417 | 1 | 12.5 | 1.20 | 0.3 | 4.50 | |
| | | | 36.772 | 1 | 12.7 | 1.50 | 0.3 | 5.72 | |
| | | | 36.860 | 1 | 12.5 | 1.00 | 0.3 | 3.75 | |
| | | | 37.076 | 1 | 12.2 | 1.00 | 0.3 | 3.66 | |
| | | | 38.529 | 1 | 12.5 | 1.50 | 0.3 | 5.63 | |
| | | | 45.161 | 1 | 12.5 | 1.00 | 0.3 | 3.75 | |
| | | | 45.261 | 1 | 10.5 | 1.50 | 0.3 | 4.73 | |
| | | | 47.658 | 1 | 10.6 | 2.00 | 0.3 | 6.36 | |
| | | | | | | | | Total= | 38.09 |
| | Hume Pipe | | | | | | | | |
| C) Hume Pipe | Dia upto 600 mm = | m | | 3 | 10.00 | | | | 30.00 |
| | Dia from 600-900 mm = | m | | 6 | 10.00 | | | | 60.00 |
| | Dia above 900mm= | m | | 18 | 10.00 | | | | 180.00 |

Quantity Summary of Dismantling of Existing Culvert::

| | |
|---|----------------|
| Total Dismantling of Rubble stone masonry in cement mortar= | 866 cum |
| Total Dismantling of Reinforced cement concrete= | 38 cum |
| Total Dismantling of up to 600 mm dia Hume Pipe= | 30 cum |
| Total Dismantling of above 600 mm to 900 mm dia Hume Pipe= | 60 cum |
| Total Dismantling of above 900 mm dia Hume Pipe= | 180 cum |



Site Clearance and Dismantling
Quantity calculation for dismentling of Flexible Pavement

| From | To | Avg. Width (m) | Thickness of Bituminous Layer (m) | Quantity of Bituminous Layer to be dismanteled (cum) | Thickness of Base Layer/Sub Base Layer to be dismanteled (m) | Quantity of Base Layer for reuse (cum) |
|----------------|-------|----------------|-----------------------------------|--|--|--|
| 33000 | 33500 | 6.7 | 0.150 | 503 | 0.140 | 469 |
| 33500 | 34000 | 6.8 | 0.130 | 442 | 0.300 | 1020 |
| 34000 | 34500 | 6.7 | 0.120 | 402 | 0.080 | 268 |
| 34500 | 35000 | 6.7 | 0.100 | 335 | 0.300 | 1005 |
| 35000 | 35500 | 6.7 | 0.120 | 402 | 0.140 | 469 |
| 35500 | 36000 | 6.7 | 0.100 | 335 | 0.300 | 1005 |
| 36000 | 36500 | 6.8 | 0.130 | 442 | 0.150 | 510 |
| 36500 | 37000 | 6.7 | 0.110 | 369 | 0.360 | 1206 |
| 37000 | 37500 | 6.7 | 0.100 | 335 | 0.080 | 268 |
| 37500 | 38000 | 6.7 | 0.110 | 369 | 0.050 | 167.5 |
| 38000 | 38500 | 6.8 | 0.100 | 340 | 0.280 | 952 |
| 38500 | 39000 | 6.7 | 0.800 | 2680 | 0.450 | 1507.5 |
| 39000 | 39500 | 6.7 | 0.130 | 436 | 0.025 | 83.75 |
| 39500 | 40000 | 6.7 | 0.080 | 268 | 0.340 | 1139 |
| 40000 | 40500 | 6.8 | 0.130 | 442 | 0.300 | 1020 |
| 40500 | 41000 | 6.7 | 0.070 | 235 | 0.300 | 1005 |
| 41000 | 41500 | 6.7 | 0.080 | 268 | 0.080 | 268 |
| 41500 | 42000 | 6.7 | 0.090 | 302 | 0.400 | 1340 |
| 42000 | 42500 | 6.7 | 0.040 | 134 | 0.260 | 871 |
| 42500 | 43000 | 6.8 | 0.090 | 306 | 0.400 | 1360 |
| 43000 | 43500 | 6.7 | 0.060 | 201 | 0.200 | 670 |
| 43500 | 44000 | 6.7 | 0.070 | 235 | 0.300 | 1005 |
| 44000 | 44500 | 6.7 | 0.100 | 335 | 0.140 | 469 |
| 44500 | 45000 | 6.8 | 0.110 | 374 | 0.090 | 306 |
| 45000 | 45500 | 6.7 | 0.070 | 235 | 0.260 | 871 |
| 45500 | 46000 | 6.7 | 0.040 | 134 | 0.200 | 670 |
| 46000 | 46500 | 6.7 | 0.060 | 201 | 0.440 | 1474 |
| 46500 | 47000 | 6.7 | 0.090 | 302 | 0.180 | 603 |
| 47000 | 47500 | 6.8 | 0.100 | 340 | 0.230 | 782 |
| 47500 | 48000 | 6.7 | 0.100 | 335 | 0.200 | 670 |
| 48000 | 48500 | 6.7 | 0.110 | 369 | 0.300 | 1005 |
| 48500 | 49000 | 6.7 | 0.100 | 335 | 0.150 | 502.5 |
| 49000 | 49140 | 6.7 | 0.160 | 150 | 0.300 | 281.4 |
| Total = | | | | 12886 | | 25243 |

| | | |
|--|--------|-----|
| Total quantity for dismantling (Bituminous layer)= | 12886 | cum |
| Quantity of Dismantelled Bituminous Material(sqm) (Assume avg thickness 75mm) | 171814 | sqm |
| Total quantity for dismantling (Granular Layer)= | 25243 | cum |
| Quantity of Granular Material(sqm) (Assume avg thickness 150mm) | 168284 | sqm |

Quantity of stone material for reuse (@ 60%) = **15146 cum**



QUANTITY CALCULATION OF CUTFILL**For Soil & Ordinary Rock:-**

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 33125 | 42.39 | 0 | 540.79 | 0 |
| 33150 | 30.01 | 1.55 | 904.97 | 19.32 |
| 33175 | 90.24 | 0 | 1524.45 | 19.2 |
| 33200 | 181.54 | 0 | 3725.22 | 0 |
| 33225 | 50.39 | 1 | 3152.95 | 12.31 |
| 33250 | 67.1 | 0 | 1539.56 | 12.33 |
| 33275 | 178.34 | 0 | 3012.27 | 0 |
| 33300 | 198.33 | 0 | 4032.51 | 0 |
| 33325 | 54 | 0 | 2602.02 | 0 |
| 33350 | 26.92 | 0 | 959.09 | 0 |
| 33375 | 29.09 | 0 | 679.9 | 0 |
| 33400 | 40.72 | 0 | 830.8 | 0 |
| 33425 | 45.52 | 0 | 1106.64 | 0 |
| 33450 | 94.83 | 0 | 1879.37 | 0 |
| 33475 | 30.78 | 0 | 1501.59 | 0 |
| 33500 | 27.02 | 0 | 647.25 | 0 |
| 33525 | 10.58 | 0 | 446.93 | 0 |
| 33550 | 8.32 | 0 | 236.23 | 0 |
| 33575 | 12.99 | 0 | 266.35 | 0 |
| 33600 | 33.85 | 0 | 423.14 | 0 |
| 33625 | 27.19 | 0 | 788.07 | 0 |
| 33650 | 11.04 | 0 | 505.99 | 0 |
| 33675 | 58.82 | 0 | 986.41 | 0 |
| 33700 | 212.51 | 0 | 3681.69 | 0 |
| 33725 | 140.61 | 1.8 | 4413.99 | 22.5 |
| 33750 | 222.3 | 3.56 | 4536.34 | 67.05 |
| 33775 | 134.54 | 2.62 | 4460.5 | 77.32 |
| 33800 | 352.03 | 4.73 | 6082.21 | 91.86 |
| 33825 | 72.81 | 64.47 | 5310.5 | 864.95 |
| 33850 | 182.28 | 7.58 | 3548.24 | 1195.98 |
| 33875 | 182.95 | 0 | 4803.32 | 131.08 |
| 33900 | 290.34 | 0 | 5718.73 | 0 |
| 33925 | 431.32 | 0 | 8803.38 | 0 |
| 33950 | 316.88 | 0 | 9180.47 | 0 |
| 33975 | 84.3 | 281.4 | 4913.65 | 4376.47 |
| 34000 | 57.5 | 398.08 | 1772.52 | 8493.56 |
| 34025 | 54.7 | 366.74 | 1402.48 | 9560.27 |
| 34050 | 47.1 | 448.57 | 1272.45 | 10191.37 |

QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 34075 | 74.55 | 0 | 1520.51 | 5607.12 |
| 34100 | 96.3 | 0 | 2171.97 | 0 |
| 34125 | 151.22 | 0 | 3157.46 | 0 |
| 34150 | 44.23 | 0 | 2491.36 | 0 |
| 34175 | 67.73 | 0 | 1417.33 | 0 |
| 34200 | 21.56 | 0 | 1126.4 | 0 |
| 34225 | 42.99 | 0 | 806.9 | 0 |
| 34250 | 48.35 | 0.05 | 1141.79 | 0.6 |
| 34275 | 60.61 | 0 | 1362.03 | 0.62 |
| 34300 | 72.74 | 0.36 | 1756.84 | 4.25 |
| 34325 | 78.83 | 0 | 1929.79 | 4.4 |
| 34350 | 248.33 | 0 | 4009 | 0 |
| 34375 | 77.24 | 0 | 3992.31 | 0 |
| 34400 | 16.08 | 9.97 | 1166.47 | 124.57 |
| 34425 | 4.26 | 11.74 | 254.26 | 271.32 |
| 34450 | 43.59 | 0 | 598.16 | 146.75 |
| 34475 | 298.4 | 0 | 4274.97 | 0 |
| 34500 | 211.68 | 0 | 6376.12 | 0 |
| 34525 | 119.69 | 0 | 4361.57 | 0 |
| 34550 | 2.68 | 1.08 | 1741.62 | 15.87 |
| 34575 | 207.82 | 0 | 4026.46 | 0 |
| 34600 | 265.38 | 0 | 7224.63 | 0 |
| 34625 | 251.28 | 0.97 | 6458.29 | 12.18 |
| 34650 | 394.12 | 1.52 | 8067.49 | 31.22 |
| 34675 | 346.62 | 0 | 9259.14 | 19.03 |
| 34700 | 307.37 | 0 | 8174.79 | 0 |
| 34725 | 247.18 | 0 | 6931.83 | 0 |
| 34750 | 111.73 | 0 | 4486.41 | 0 |
| 34775 | 120.65 | 0 | 2808.81 | 0 |
| 34800 | 227.43 | 0 | 3538.58 | 0 |
| 34825 | 221.19 | 0 | 4370.62 | 0 |
| 34850 | 120.45 | 5.98 | 3878.47 | 77.35 |
| 34875 | 44.23 | 4.22 | 2058.46 | 127.47 |
| 34900 | 49.26 | 0 | 1313.82 | 50.29 |
| 34925 | 14.08 | 0 | 1013.46 | 0 |
| 34950 | 55.56 | 0 | 981.95 | 0 |
| 34975 | 444.37 | 0 | 7368.54 | 0 |
| 35000 | 392.73 | 0 | 10463.68 | 0 |
| 35025 | 126.09 | 0 | 1476.44 | 0 |
| 35050 | 101.36 | 0 | 2244.21 | 0 |
| 35075 | 141.98 | 76.21 | 2418.55 | 1525.71 |
| 35100 | 75.19 | 0 | 2546.5 | 1147.76 |

QUANTITY CALCULATION OF CUTFILL**For Soil & Ordinary Rock:-**

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 35125 | 38.34 | 0 | 1419.12 | 0 |
| 35150 | 181.09 | 0 | 2742.85 | 0 |
| 35175 | 296.06 | 0 | 5470.12 | 0 |
| 35200 | 171.97 | 0.01 | 4637.83 | 0.15 |
| 35225 | 213.73 | 0 | 4889.85 | 0.14 |
| 35250 | 16.12 | 0 | 4097.98 | 0 |
| 35275 | 170 | 0 | 3417.48 | 0 |
| 35300 | 89.13 | 0 | 3471.41 | 0 |
| 35325 | 84.98 | 0 | 1916.95 | 0 |
| 35350 | 52.89 | 34.97 | 523.68 | 642.97 |
| 35375 | 143.56 | 0.05 | 2360.74 | 469.01 |
| 35400 | 43.46 | 0.79 | 2337.76 | 10.56 |
| 35425 | 43.46 | 0.79 | 2337.76 | 10.56 |
| 35450 | 26.04 | 1.34 | 381.16 | 16.26 |
| 35475 | 45.29 | 119.83 | 931.32 | 1361.74 |
| 35500 | 52.59 | 32.5 | 1223.48 | 1904.13 |
| 35525 | 93.16 | 0 | 1821.84 | 406.21 |
| 35550 | 176.76 | 0 | 2753.08 | 0 |
| 35575 | 69.28 | 55.96 | 2048.55 | 1320.35 |
| 35600 | 117.77 | 0.12 | 1391.73 | 1233.34 |
| 35625 | 9.07 | 0.89 | 1530.22 | 12.59 |
| 35650 | 2.01 | 0.89 | 160.63 | 22.05 |
| 35675 | 9.42 | 0 | 158.46 | 11.07 |
| 35700 | 76.53 | 0 | 1103.14 | 0 |
| 35725 | 128.66 | 0 | 2564.89 | 0 |
| 35750 | 64.54 | 0 | 2473.62 | 0 |
| 35775 | 14.08 | 0 | 1128.92 | 0 |
| 35800 | 113.54 | 0 | 2014.56 | 0 |
| 35825 | 89.3 | 0 | 2656.06 | 0 |
| 35850 | 87.25 | 0 | 2486.03 | 0 |
| 35875 | 67.34 | 0 | 2136.88 | 0 |
| 35900 | 79.25 | 0 | 1864.37 | 0 |
| 35925 | 136.06 | 0 | 2691.45 | 0 |
| 35950 | 92.98 | 0 | 2863.01 | 0 |

QUANTITY CALCULATION OF CUTFILL**For Soil & Ordinary Rock:-**

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 35975 | 30.26 | 0 | 1576.74 | 0 |
| 36000 | 43.23 | 0 | 941.21 | 0 |
| 36025 | 18 | 3.46 | 633.9 | 47.86 |
| 36050 | 20.63 | 195.42 | 331.68 | 5082.72 |
| 36075 | 39.53 | 2.85 | 631.84 | 3640.88 |
| 36100 | 30.2 | 0.31 | 871.64 | 39.5 |
| 36125 | 24.32 | 0 | 718.61 | 3.69 |
| 36150 | 90.49 | 0 | 1682.08 | 0 |
| 36175 | 68.09 | 0 | 2365.15 | 0 |
| 36200 | 59.72 | 0.18 | 1931.97 | 3.36 |
| 36225 | 262.76 | 0 | 4495.88 | 2.88 |
| 36250 | 191.46 | 0 | 5750.21 | 0 |
| 36275 | 101.86 | 0 | 4087.86 | 0 |
| 36300 | 230.29 | 0 | 4241.53 | 0 |
| 36325 | 138.88 | 0 | 1555.5 | 0.07 |
| 36350 | 106.26 | 0.95 | 3002.49 | 12.21 |
| 36375 | 114.34 | 2.06 | 2757.43 | 37.57 |
| 36400 | 168.8 | 1.52 | 3749.14 | 45.25 |
| 36425 | 121.52 | 0 | 3871.64 | 19.88 |
| 36450 | 157.54 | 0 | 2425.41 | 0 |
| 36475 | 168.58 | 0 | 4021.75 | 0 |
| 36500 | 44.98 | 0 | 2669.43 | 0 |
| 36525 | 231.14 | 0 | 3797.16 | 0 |
| 36550 | 34.73 | 0 | 4738.24 | 0 |
| 36575 | 0.98 | 14.57 | 495.13 | 228.88 |
| 36600 | 23.78 | 20.16 | 387.76 | 447.26 |
| 36625 | 71.61 | 26.37 | 1119.04 | 589.67 |
| 36650 | 143.75 | 17.8 | 2042.04 | 585.19 |
| 36675 | 95.28 | 15.58 | 2815.76 | 423.32 |
| 36700 | 162.57 | 5.47 | 2623.14 | 274.29 |
| 36725 | 121.2 | 0 | 3547.21 | 68.32 |
| 36750 | 326.64 | 0 | 7115.5 | 0 |
| 36775 | 25.67 | 0.15 | 6590.23 | 1.49 |
| 36800 | 237.09 | 0 | 4036.88 | 1.61 |
| 36825 | 231.79 | 0 | 5962.74 | 0 |
| 36850 | 193.04 | 0 | 5310.34 | 0 |
| 36875 | 80.03 | 0 | 3413.26 | 0 |
| 36900 | 100.34 | 0 | 2219.81 | 0 |
| 36925 | 161 | 0 | 2855.37 | 0 |
| 36950 | 94.67 | 71.17 | 953.8 | 1198.6 |
| 36975 | 101.17 | 90.96 | 2084.1 | 2555.07 |
| 37000 | 137.4 | 9.85 | 2918.41 | 1314.24 |

QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 37025 | 231.54 | 0 | 3936.87 | 168.91 |
| 37050 | 235.6 | 0 | 5438.47 | 0 |
| 37075 | 12.07 | 1.7 | 4058.1 | 17.28 |
| 37100 | 280.48 | 0 | 5668.52 | 14.35 |
| 37125 | 211.91 | 0 | 6373.5 | 0 |
| 37150 | 131.8 | 0 | 4239.87 | 0 |
| 37175 | 69.34 | 0 | 2254.97 | 0 |
| 37200 | 79.84 | 0 | 1793.56 | 0 |
| 37225 | 199.53 | 0 | 3492.09 | 0 |
| 37250 | 77.28 | 0.29 | 3494.03 | 3.59 |
| 37275 | 102.4 | 0.02 | 1318.5 | 0.23 |
| 37300 | 155.52 | 0 | 3224 | 0.23 |
| 37325 | 200.12 | 0 | 3752.07 | 0 |
| 37350 | 82.73 | 0 | 2720.32 | 0 |
| 37375 | 14.09 | 0 | 1096.14 | 0 |
| 37400 | 64.26 | 0 | 998.9 | 0 |
| 37425 | 92.89 | 0 | 2131.17 | 0 |
| 37450 | 74.04 | 0 | 2102.03 | 0 |
| 37475 | 199.93 | 0 | 3424.59 | 0 |
| 37500 | 191.57 | 0 | 3996.95 | 0 |
| 37525 | 189.17 | 54.21 | 3681.37 | 1026.87 |
| 37550 | 15.41 | 0 | 2610.81 | 644.52 |
| 37575 | 42.25 | 0 | 819.32 | 0 |
| 37600 | 76.58 | 0 | 1539.75 | 0 |
| 37625 | 25.72 | 0 | 1122.98 | 0 |
| 37650 | 23.12 | 0 | 559.05 | 0.02 |
| 37675 | 35.03 | 0 | 726.91 | 0.02 |
| 37700 | 65.38 | 0 | 1255.11 | 0 |
| 37725 | 42.55 | 0 | 1364.77 | 0 |
| 37750 | 34.68 | 0 | 1072.98 | 0 |
| 37775 | 94.32 | 0 | 2159.44 | 0 |
| 37800 | 64.73 | 0 | 2185.6 | 0 |
| 37825 | 49.99 | 1.13 | 1376.54 | 14.34 |
| 37850 | 48.2 | 0 | 1084.32 | 14.72 |
| 37875 | 105.46 | 0.01 | 1738.45 | 0.14 |
| 37900 | 90.78 | 0 | 2412.28 | 0.13 |
| 37925 | 25.38 | 0 | 1452.04 | 0 |
| 37950 | 40.93 | 0 | 828.81 | 0 |
| 37975 | 15.05 | 0 | 704.2 | 0 |
| 38000 | 80.9 | 0 | 1046.25 | 0 |
| 38025 | 10.34 | 0 | 1193.25 | 0 |
| 38050 | 32.1 | 0.13 | 462.51 | 1.82 |
| 38075 | 11.91 | 0 | 528.94 | 1.68 |

QUANTITY CALCULATION OF CUTFILL**For Soil & Ordinary Rock:-**

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 38100 | 30 | 0 | 556.29 | 0 |
| 38125 | 80.51 | 0 | 1388.88 | 0 |
| 38150 | 137.04 | 0 | 2719.4 | 0 |
| 38175 | 136.7 | 0 | 3106.43 | 0 |
| 38200 | 244.21 | 0 | 4147.91 | 0 |
| 38225 | 174.56 | 0 | 4910.5 | 0 |
| 38250 | 169.76 | 0 | 4772.79 | 0 |
| 38275 | 103.11 | 0 | 4012.46 | 0 |
| 38300 | 197.24 | 0 | 3665.98 | 0 |
| 38325 | 224.22 | 0 | 4698.06 | 0 |
| 38350 | 332.52 | 0 | 7359.74 | 0 |
| 38375 | 369.29 | 0 | 9785.44 | 0 |
| 38400 | 489.88 | 0 | 10327.15 | 0 |
| 38425 | 732.84 | 0 | 13220.04 | 0 |
| 38450 | 784.37 | 0 | 18673.71 | 0 |
| 38475 | 386.17 | 0 | 14631.68 | 0 |
| 38500 | 219.39 | 2.58 | 8579.96 | 31.61 |
| 38525 | 23.77 | 0 | 342.39 | 0 |
| 38550 | 154.03 | 0.42 | 2190.89 | 5.27 |
| 38575 | 128.47 | 1.33 | 2241.17 | 24.57 |
| 38600 | 333.85 | 0 | 4679.01 | 18.64 |
| 38625 | 87.04 | 0 | 5261.09 | 0 |
| 38650 | 324.37 | 0.36 | 6741.24 | 3.86 |
| 38675 | 189.2 | 0 | 8019.4 | 4.04 |
| 38700 | 232.73 | 0.05 | 5274.12 | 0.63 |
| 38725 | 141.75 | 0.32 | 4680.99 | 4.58 |
| 38750 | 23.92 | 0 | 2070.9 | 3.95 |
| 38775 | 53.15 | 0 | 942.84 | 0 |
| 38800 | 56.26 | 0 | 1323.68 | 0 |
| 38825 | 33.16 | 0 | 1079.84 | 0 |
| 38850 | 36.37 | 0 | 840.88 | 0 |
| 38875 | 87.96 | 0 | 1503.48 | 0 |
| 38900 | 44.65 | 0 | 1620.36 | 0 |
| 38925 | 16.29 | 0 | 780.34 | 0 |
| 38950 | 11.62 | 0 | 371.86 | 0 |
| 38975 | 13.17 | 0 | 319.28 | 0 |
| 39000 | 16 | 0 | 364.64 | 0 |
| 39025 | 9 | 0.01 | 307.13 | 0.14 |
| 39050 | 30.97 | 0.49 | 449.49 | 6.71 |
| 39075 | 15.49 | 0 | 542.13 | 6.43 |
| 39100 | 25.54 | 0 | 518.6 | 0 |
| 39125 | 7.71 | 0 | 453.86 | 0 |
| 39150 | 13.58 | 0 | 271.01 | 0 |

QUANTITY CALCULATION OF CUTFILL**For Soil & Ordinary Rock:-**

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 39175 | 47.08 | 0 | 710.26 | 0 |
| 39200 | 15.89 | 1.14 | 543.52 | 14.97 |
| 39225 | 9.1 | 0 | 279.57 | 14.49 |
| 39250 | 18.92 | 0 | 350.25 | 0 |
| 39275 | 45.96 | 0 | 798.63 | 0 |
| 39300 | 42.79 | 0 | 1047.44 | 0 |
| 39325 | 36.56 | 0 | 985.46 | 0 |
| 39350 | 15.69 | 233.83 | 653.18 | 2922.84 |
| 39375 | 32.97 | 0 | 608.27 | 2922.84 |
| 39400 | 13.41 | 177.35 | 589.12 | 2080.18 |
| 39425 | 31.22 | 0 | 566.98 | 2062.6 |
| 39450 | 65.98 | 0 | 1215.07 | 0 |
| 39475 | 18.04 | 0 | 1079.82 | 0 |
| 39500 | 22.77 | 0 | 542.6 | 0 |
| 39525 | 17.82 | 0.01 | 543.89 | 0.14 |
| 39550 | 17 | 0 | 443.97 | 0.14 |
| 39575 | 13.07 | 42.91 | 375.9 | 536.32 |
| 39600 | 16.51 | 2.17 | 356.57 | 624.61 |
| 39625 | 23.68 | 0 | 489.41 | 27.7 |
| 39650 | 11.09 | 0.21 | 456.32 | 2.81 |
| 39675 | 34.59 | 0 | 593.57 | 3.09 |
| 39700 | 137.23 | 0 | 2653.87 | 0 |
| 39725 | 88.29 | 0 | 2872.14 | 0 |
| 39750 | 17.92 | 0.01 | 1327.69 | 0.14 |
| 39775 | 49.93 | 0 | 798.45 | 0.14 |
| 39800 | 24.5 | 0 | 915.33 | 0 |
| 39825 | 22.74 | 0 | 597.05 | 0 |
| 39850 | 83.94 | 0 | 1450.96 | 0 |
| 39875 | 50.57 | 0 | 1662.02 | 0 |
| 39900 | 60.51 | 0 | 1244.91 | 0 |
| 39925 | 59.69 | 0 | 1380.29 | 0 |
| 39950 | 40.74 | 0 | 1283.68 | 0 |
| 39975 | 141.81 | 0 | 2448.24 | 0 |
| 40000 | 183.04 | 0 | 4093.71 | 0 |
| 40025 | 69.71 | 0 | 3159.31 | 0 |
| 40050 | 27.91 | 0 | 1277.24 | 0 |
| 40075 | 37.24 | 0 | 814.47 | 0 |
| 40100 | 36.52 | 0 | 866.53 | 0 |
| 40125 | 42.14 | 0 | 922.36 | 0 |
| 40150 | 39.34 | 70.49 | 1018.5 | 881.08 |
| 40175 | 18.58 | 0 | 724.03 | 881.08 |
| 40200 | 33.72 | 0 | 653.77 | 0 |
| 40225 | 82.99 | 0 | 1406.88 | 0 |
| 40250 | 17.19 | 0.04 | 1236.87 | 0.49 |
| 40275 | 18.81 | 0.41 | 447.75 | 5.65 |
| 40300 | 102.74 | 0.3 | 1265.4 | 9.75 |

QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 40325 | 93.7 | 174.16 | 1746.25 | 3889.5 |
| 40350 | 11.17 | 156.87 | 1031.7 | 6364.1 |
| 40375 | 16.1 | 122.75 | 340.9 | 3495.26 |
| 40400 | 56.32 | 60.01 | 970.73 | 1519.05 |
| 40425 | 177.68 | 0 | 3379.32 | 471.32 |
| 40450 | 56.72 | 0 | 727.53 | 0 |
| 40475 | 33.88 | 0 | 1132.43 | 0 |
| 40500 | 73.49 | 0 | 1305.64 | 0 |
| 40525 | 46.33 | 0 | 1306.62 | 0 |
| 40550 | 9.71 | 0 | 693.71 | 0 |
| 40575 | 11.97 | 0.05 | 162.02 | 0.67 |
| 40600 | 29.95 | 0 | 517.32 | 0.66 |
| 40625 | 80.37 | 0 | 1266.02 | 0 |
| 40650 | 32.24 | 0 | 1293.48 | 0 |
| 40675 | 34.42 | 0 | 823.13 | 0 |
| 40700 | 53.06 | 0 | 1093.57 | 0 |
| 40725 | 37.58 | 0 | 1133.08 | 0 |
| 40750 | 40.14 | 0 | 971.49 | 0 |
| 40775 | 39.61 | 0 | 1028.6 | 0 |
| 40800 | 39.41 | 0 | 1029.21 | 0 |
| 40825 | 34.44 | 0 | 932.67 | 0 |
| 40850 | 38.06 | 0 | 906.16 | 0 |
| 40875 | 57.84 | 0 | 1235.55 | 0 |
| 40900 | 13.65 | 78.47 | 974.49 | 755.5 |
| 40925 | 32.44 | 34.57 | 584.23 | 1341.19 |
| 40950 | 51.09 | 0 | 979.99 | 526.14 |
| 40975 | 135.81 | 0 | 2164.71 | 0 |
| 41000 | 21.96 | 0 | 2099.4 | 0 |
| 41025 | 39.17 | 0 | 776.31 | 0 |
| 41050 | 93.33 | 0 | 1474.28 | 0 |
| 41075 | 22 | 0 | 1373.04 | 0 |
| 41100 | 52.65 | 0 | 1027.29 | 0 |
| 41125 | 155.41 | 0 | 3078.64 | 0 |
| 41150 | 60.16 | 0 | 2749.24 | 0 |
| 41175 | 35.15 | 0 | 1110.63 | 0 |
| 41200 | 46.15 | 0 | 968.92 | 0 |
| 41225 | 28.87 | 99.34 | 937.74 | 1241.77 |
| 41250 | 31.69 | 0 | 773.76 | 1162.16 |
| 41275 | 97.49 | 0 | 1633.94 | 0 |
| 41300 | 84.29 | 0 | 2334.99 | 0 |
| 41325 | 11.64 | 0 | 1305 | 0 |
| 41350 | 16.48 | 0 | 355.67 | 0 |
| 41375 | 30.3 | 0 | 561.94 | 0 |
| 41400 | 51.79 | 104.47 | 922.46 | 1870.86 |
| 41425 | 180.15 | 0 | 2485.63 | 1808.55 |
| 41450 | 270.22 | 0 | 5313.74 | 0 |
| 41475 | 296.35 | 0 | 7988.03 | 0 |
| 41500 | 300.75 | 0 | 9067.94 | 0 |
| 41525 | 207.32 | 0 | 6721.65 | 0 |
| 41550 | 201.68 | 0 | 5112.52 | 0 |
| 41575 | 139.87 | 0 | 4269.37 | 0 |

QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 41600 | 138.51 | 0 | 3479.76 | 0 |
| 41625 | 60.24 | 0 | 2484.4 | 0 |
| 41650 | 46.6 | 0 | 1293.16 | 0 |
| 41675 | 55.41 | 0 | 1199.98 | 0 |
| 41700 | 148.02 | 81.03 | 2374.42 | 1139.61 |
| 41725 | 156.75 | 0 | 3809.58 | 1012.85 |
| 41750 | 136.01 | 0 | 3823.5 | 0 |
| 41775 | 79.03 | 0 | 2723.88 | 0 |
| 41800 | 25.55 | 0 | 1307.22 | 0 |
| 41825 | 51.22 | 0 | 944.19 | 0 |
| 41850 | 59.8 | 0 | 1133.23 | 0 |
| 41875 | 62.78 | 0 | 1218.06 | 0 |
| 41900 | 7.99 | 0 | 814.32 | 0 |
| 41925 | 7.71 | 0.01 | 208.01 | 0.16 |
| 41950 | 24.42 | 0 | 421.18 | 0.16 |
| 41975 | 55.4 | 0 | 923.87 | 0 |
| 42000 | 19.12 | 0 | 907.34 | 0 |
| 42025 | 18 | 0 | 463.93 | 0 |
| 42050 | 40.8 | 0 | 765.11 | 0 |
| 42075 | 15.22 | 0 | 780.5 | 0 |
| 42100 | 76.88 | 0.06 | 1211.57 | 0.81 |
| 42125 | 155.35 | 0.9 | 2579.34 | 12.46 |
| 42150 | 53.02 | 0 | 2467.15 | 11.46 |
| 42175 | 47.56 | 39.93 | 1257.3 | 499.15 |
| 42200 | 104.08 | 0 | 1932.48 | 476.48 |
| 42225 | 64.43 | 0 | 2421.25 | 0 |
| 42250 | 46.55 | 0 | 1509.48 | 0 |
| 42275 | 116.38 | 0 | 2036.66 | 0 |
| 42300 | 70.79 | 0 | 2221.07 | 0 |
| 42325 | 62.29 | 0 | 1634.03 | 0 |
| 42350 | 87.88 | 0 | 1877.18 | 0 |
| 42375 | 6.72 | 0.13 | 1295.54 | 1.74 |
| 42400 | 129.63 | 0 | 2135.11 | 1.91 |
| 42425 | 595.72 | 0 | 12552.78 | 0 |
| 42450 | 565.54 | 0 | 20651.85 | 0 |
| 42475 | 359.52 | 0 | 16307.29 | 0 |
| 42500 | 74.03 | 0 | 5860.09 | 0 |
| 42525 | 54.62 | 0 | 1608.05 | 0 |
| 42550 | 54.87 | 0 | 1368.55 | 0 |

QUANTITY CALCULATION OF CUTFILL**For Soil & Ordinary Rock:-**

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 42575 | 108.83 | 0 | 1888.28 | 0 |
| 42600 | 95.12 | 0 | 2160.28 | 0 |
| 42625 | 70.35 | 0 | 1819.34 | 0 |
| 42650 | 129.94 | 0 | 2425.1 | 0 |
| 42675 | 50.99 | 0.31 | 2261.59 | 3.84 |
| 42700 | 56.58 | 0 | 1452.39 | 3.92 |
| 42725 | 48.59 | 0 | 1512.33 | 0.09 |
| 42750 | 83.11 | 0 | 1742.75 | 0 |
| 42775 | 184.08 | 0 | 3339.86 | 0 |
| 42800 | 87.01 | 0 | 3255.96 | 0 |
| 42825 | 125.25 | 0 | 2372.61 | 0 |
| 42850 | 138.94 | 0.11 | 2861.64 | 1.41 |
| 42875 | 46.05 | 0 | 2134.75 | 1.37 |
| 42900 | 8.04 | 0 | 773.87 | 0 |
| 42925 | 42.11 | 0 | 719.48 | 0 |
| 42950 | 101.52 | 0 | 1611.33 | 0 |
| 42975 | 76.99 | 0 | 1740.96 | 0 |
| 43000 | 38.55 | 0.08 | 1736.96 | 0.88 |
| 43025 | 92.52 | 0 | 1774.08 | 0.92 |
| 43050 | 164.34 | 0 | 3210.71 | 0 |
| 43075 | 173.48 | 0 | 4222.74 | 0 |
| 43100 | 125.58 | 0 | 4103.8 | 0 |
| 43125 | 99.45 | 0 | 3378.16 | 0 |
| 43150 | 45.55 | 0 | 1999.85 | 0 |
| 43175 | 74.48 | 0 | 1411.22 | 0 |
| 43200 | 10.45 | 2.99 | 962.74 | 41.11 |
| 43225 | 77.76 | 0 | 1035.7 | 39.83 |
| 43250 | 11.01 | 0.73 | 885.09 | 10.3 |
| 43275 | 16.42 | 0.17 | 323.72 | 11.8 |
| 43300 | 119.57 | 0 | 1699.9 | 2.07 |
| 43325 | 203.48 | 0 | 4743.45 | 0 |
| 43350 | 30.61 | 0 | 466.58 | 0 |
| 43375 | 63.1 | 0 | 1261.04 | 0 |
| 43400 | 20.31 | 0 | 856.8 | 0 |
| 43425 | 36.85 | 0 | 659.3 | 0 |
| 43450 | 1.9 | 1.02 | 540.52 | 13.92 |
| 43475 | 15.22 | 0 | 220.35 | 13.72 |
| 43500 | 23.94 | 0 | 470.16 | 0 |
| 43525 | 7.65 | 1.97 | 389.72 | 25.11 |
| 43550 | 33.76 | 0 | 507.26 | 25.18 |
| 43575 | 38.01 | 75.29 | 835.54 | 1120.78 |
| 43600 | 12.8 | 3.22 | 592.82 | 1163.37 |
| 43625 | 35.97 | 0.63 | 576.8 | 49.14 |
| 43650 | 34.55 | 0 | 903.4 | 7.9 |
| 43675 | 66.88 | 0 | 1333.88 | 0 |
| 43700 | 34.23 | 0 | 1276.83 | 0 |
| 43725 | 43.84 | 0 | 975.84 | 0 |
| 43750 | 41.03 | 0 | 1034.22 | 0 |
| 43775 | 28.01 | 0 | 856.74 | 0 |
| 43800 | 46.4 | 0 | 955.12 | 0 |
| 43825 | 43.86 | 0 | 1162.61 | 0 |
| 43850 | 42.07 | 0 | 1074.15 | 0 |
| 43875 | 40.53 | 0 | 1032.45 | 0 |

QUANTITY CALCULATION OF CUTFILL**For Soil & Ordinary Rock:-**

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 43900 | 112.26 | 0 | 1909.88 | 0 |
| 43925 | 102.11 | 0 | 2637.07 | 0 |
| 43950 | 47.24 | 0 | 1777.72 | 0 |
| 43975 | 44.69 | 128.84 | 1103.01 | 1756.94 |
| 44000 | 165.25 | 0 | 2468.16 | 1756.94 |
| 44025 | 143.97 | 0 | 3752.88 | 0 |
| 44050 | 91 | 0 | 2937.11 | 0 |
| 44075 | 154.28 | 0 | 3065.95 | 0 |
| 44100 | 213.24 | 0.22 | 4593.96 | 2.78 |
| 44125 | 158.24 | 0 | 4643.51 | 2.78 |
| 44150 | 71.13 | 0.13 | 2867.11 | 1.64 |
| 44175 | 220.72 | 0 | 4218.8 | 1.53 |
| 44200 | 16.94 | 0 | 4067.99 | 0 |
| 44225 | 32.84 | 0 | 649.54 | 0 |
| 44250 | 16.1 | 0 | 578.73 | 0 |
| 44275 | 35.68 | 0 | 580.23 | 0 |
| 44300 | 6.51 | 2.48 | 533.68 | 31.14 |
| 44325 | 65.48 | 0 | 963.64 | 32.02 |
| 44350 | 14.63 | 0 | 1039.22 | 0.05 |
| 44375 | 58.86 | 4.11 | 898.9 | 53.9 |
| 44400 | 122.03 | 2.58 | 2173.63 | 91.18 |
| 44425 | 117.99 | 0 | 2880.92 | 32.93 |
| 44450 | 60.43 | 0 | 2333.48 | 0 |
| 44475 | 30.3 | 0 | 1198.63 | 0 |
| 44500 | 48.89 | 0 | 989.91 | 0 |
| 44525 | 24.83 | 0 | 883.62 | 0 |
| 44550 | 89.87 | 0.01 | 1247.84 | 0.18 |
| 44575 | 113.57 | 0 | 2175.97 | 0.18 |
| 44600 | 151.17 | 5.76 | 2830.71 | 98.51 |
| 44625 | 113.94 | 1.99 | 3081.63 | 118.64 |
| 44650 | 38.41 | 0 | 1914.76 | 24.57 |
| 44675 | 54.88 | 0 | 824.36 | 0 |
| 44700 | 67.87 | 0 | 1641.3 | 0 |
| 44725 | 93.03 | 0 | 1723.1 | 0 |
| 44750 | 84.54 | 0 | 1811.32 | 0 |
| 44775 | 62.23 | 0 | 1831.45 | 0 |
| 44800 | 15.38 | 0 | 937.13 | 0 |
| 44825 | 63.23 | 0 | 1099.3 | 0 |
| 44850 | 28.5 | 0 | 1254.03 | 0 |
| 44875 | 154.12 | 0 | 2166.96 | 0 |
| 44900 | 221.05 | 1.46 | 2094.6 | 21.46 |
| 44925 | 111.34 | 3.2 | 3143.35 | 66.98 |
| 44950 | 125.58 | 1.53 | 2784.33 | 61.34 |
| 44975 | 94.18 | 0 | 2747.04 | 19.14 |

QUANTITY CALCULATION OF CUTFILL**For Soil & Ordinary Rock:-**

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 45000 | 104.67 | 0 | 2485.65 | 0 |
| 45025 | 14.91 | 0 | 1599.56 | 0 |
| 45050 | 59.43 | 0 | 1146.35 | 0 |
| 45075 | 42.09 | 0.05 | 1379.52 | 0.7 |
| 45100 | 188.97 | 0.4 | 2444.63 | 5.24 |
| 45125 | 94.96 | 0 | 3527.68 | 5.42 |
| 45150 | 60.82 | 0 | 1929.32 | 0 |
| 45175 | 103.66 | 0 | 2191.04 | 0 |
| 45200 | 218.55 | 0 | 4462.59 | 0 |
| 45225 | 203.8 | 0 | 5831.92 | 0 |
| 45250 | 93.97 | 0 | 4049.31 | 0 |
| 45275 | 66.76 | 0 | 2009.14 | 0 |
| 45300 | 61.06 | 0 | 1597.75 | 0 |
| 45325 | 283.09 | 0 | 4301.86 | 0 |
| 45350 | 68.93 | 0 | 4489.08 | 0 |
| 45375 | 45.7 | 0 | 1566.3 | 0 |
| 45400 | 13.15 | 0 | 772.39 | 0 |
| 45425 | 12.29 | 0 | 317.23 | 0 |
| 45450 | 136.38 | 0 | 1644.11 | 0 |
| 45475 | 122.73 | 0.7 | 2798.3 | 9.64 |
| 45500 | 37.91 | 2.1 | 1798.84 | 37.47 |
| 45525 | 6.07 | 0.34 | 490.83 | 32.33 |
| 45550 | 27.5 | 0 | 398.72 | 4.42 |
| 45575 | 20.26 | 0 | 597 | 0 |
| 45600 | 47.86 | 0 | 851.5 | 0 |
| 45625 | 70.23 | 0 | 1427.89 | 0 |
| 45650 | 16.45 | 0 | 1048.52 | 0 |
| 45675 | 37.05 | 0 | 658.24 | 0 |
| 45700 | 22.69 | 0 | 739.8 | 0 |
| 45725 | 35.16 | 0 | 723.05 | 0 |
| 45750 | 203.96 | 0.07 | 2988.98 | 0.82 |
| 45775 | 187.35 | 0 | 4891.39 | 0.82 |
| 45800 | 176.86 | 0 | 4552.62 | 0 |
| 45825 | 16.19 | 0 | 2812.44 | 0 |
| 45850 | 81.59 | 0 | 1519.51 | 0 |
| 45875 | 170.25 | 0 | 3147.95 | 0 |
| 45900 | 33.79 | 0 | 2306.74 | 0 |
| 45925 | 29.16 | 0 | 796.63 | 0 |
| 45950 | 88.38 | 0 | 1566.25 | 0 |
| 45975 | 31.44 | 0.1 | 1556.16 | 1.29 |
| 46000 | 47.95 | 0 | 992.41 | 1.27 |
| 46025 | 40.25 | 0 | 1102.53 | 0 |
| 46050 | 20.84 | 0 | 754.06 | 0 |
| 46075 | 14.77 | 0 | 429.5 | 0 |
| 46100 | 10.99 | 0 | 307.55 | 0 |
| 46125 | 39.53 | 0 | 591.55 | 0 |

QUANTITY CALCULATION OF CUTFILL**For Soil & Ordinary Rock:-**

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 46150 | 21.83 | 0 | 773.17 | 0 |
| 46175 | 128.33 | 0 | 2061.22 | 0 |
| 46200 | 147.66 | 0 | 3842.73 | 0 |
| 46225 | 98.82 | 0.06 | 3471.71 | 0.78 |
| 46250 | 32.98 | 0 | 1842.93 | 0.78 |
| 46275 | 69.57 | 0 | 1305.25 | 0 |
| 46300 | 151.77 | 0 | 2605.32 | 0 |
| 46325 | 106.91 | 0.04 | 2791.47 | 0.58 |
| 46350 | 32.08 | 38.2 | 1619.76 | 573.43 |
| 46375 | 5.59 | 13.6 | 470.94 | 647.45 |
| 46400 | 17.26 | 0 | 285.59 | 170.01 |
| 46425 | 34.66 | 0 | 640.87 | 0.02 |
| 46450 | 92.81 | 0.16 | 1473.46 | 2.12 |
| 46475 | 43.43 | 0 | 1684.92 | 2.05 |
| 46500 | 15.3 | 0 | 691.47 | 0.02 |
| 46525 | 112.78 | 0.06 | 1421.48 | 0.76 |
| 46550 | 28.54 | 0 | 1593.77 | 0.75 |
| 46575 | 34.64 | 0 | 770.72 | 0 |
| 46600 | 57.64 | 0 | 1216.11 | 0 |
| 46625 | 80.58 | 0 | 2005.18 | 0 |
| 46650 | 158.82 | 0 | 3566.72 | 0 |
| 46675 | 181.66 | 0 | 5119.69 | 0 |
| 46700 | 52.57 | 0 | 3188.24 | 0 |
| 46725 | 272.12 | 0 | 3978.88 | 0 |
| 46750 | 205.28 | 1.34 | 2264.05 | 20.39 |
| 46775 | 121.9 | 21.19 | 3922.65 | 308.52 |
| 46800 | 68.33 | 40.22 | 2377.91 | 767.68 |
| 46825 | 133.48 | 0 | 2414.57 | 562.86 |
| 46850 | 152.33 | 0 | 3227.48 | 0 |
| 46875 | 147.62 | 0 | 3667.09 | 0 |
| 46900 | 53.96 | 0 | 2717.34 | 0 |
| 46925 | 61.58 | 0 | 1740.5 | 0 |
| 46950 | 28.36 | 0 | 1185.99 | 0 |
| 46975 | 10.69 | 0 | 464.54 | 0 |
| 47000 | 18.81 | 0 | 330.33 | 0 |
| 47025 | 36.49 | 0 | 615.16 | 0 |
| 47050 | 48.13 | 0 | 1075.96 | 0 |
| 47075 | 46.84 | 0 | 1345.44 | 0 |
| 47100 | 97.76 | 0 | 1825.62 | 0 |
| 47125 | 57.28 | 1.03 | 1938.01 | 12.89 |
| 47150 | 28.99 | 0 | 1078.32 | 12.89 |
| 47175 | 16.09 | 0 | 578.73 | 0.05 |
| 47200 | 29.2 | 0 | 577.78 | 0.05 |
| 47225 | 46.26 | 0 | 943.17 | 0 |
| 47250 | 35.76 | 0 | 1025.18 | 0 |

QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 47275 | 18.41 | 0 | 665.07 | 0 |
| 47300 | 37.99 | 0 | 646.47 | 0.12 |
| 47325 | 27.33 | 0.09 | 732.42 | 1.37 |
| 47350 | 116.5 | 0 | 1561.43 | 1.25 |
| 47375 | 74.31 | 0 | 2075.64 | 0 |
| 47400 | 135.1 | 0 | 2371.95 | 0 |
| 47425 | 90.49 | 0 | 2794.45 | 0 |
| 47450 | 9.6 | 0 | 1483.31 | 0 |
| 47475 | 97.47 | 0 | 1898.76 | 0 |
| 47500 | 115.52 | 0 | 2870.66 | 0 |
| 47525 | 92.76 | 0 | 2395.21 | 0 |
| 47550 | 122.03 | 0 | 2401.51 | 0 |
| 47575 | 28.74 | 0.28 | 1673.35 | 3.75 |
| 47600 | 63.07 | 0 | 1043.15 | 3.74 |
| 47625 | 57.87 | 0 | 1487.34 | 0 |
| 47650 | 5.33 | 0.39 | 880.42 | 4.21 |
| 47675 | 248.66 | 0 | 5911.57 | 3.19 |
| 47700 | 34.47 | 0 | 4920.37 | 0 |
| 47725 | 57.13 | 0 | 1144.99 | 0 |
| 47750 | 8.57 | 1.99 | 837.48 | 24.98 |
| 47775 | 2.07 | 1.54 | 139.19 | 44.86 |
| 47800 | 38.36 | 0.06 | 505.41 | 20.04 |
| 47825 | 34.35 | 0 | 841.64 | 0.72 |
| 47850 | 44.21 | 0.35 | 961.61 | 4.48 |
| 47875 | 30.63 | 0 | 991.85 | 4.1 |
| 47900 | 59.54 | 0 | 1184.95 | 0 |
| 47925 | 110.62 | 0 | 2084.84 | 0 |
| 47950 | 109.17 | 0 | 2220.34 | 0 |
| 47975 | 72.76 | 0 | 1781.69 | 0 |
| 48000 | 113.96 | 0.04 | 1953.83 | 0.58 |
| 48025 | 46.16 | 0 | 2001.54 | 0.54 |
| 48050 | 30.84 | 0 | 860.68 | 0 |
| 48075 | 72.65 | 0.23 | 950.02 | 2.94 |
| 48100 | 48.38 | 0 | 1265.66 | 2.93 |
| 48125 | 104.53 | 0 | 2046.09 | 0 |

QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

| Chainage (m) | Cut Area (sqm) | Fill Area (sqm) | Earthwork - Cut Volume (cum) | Earthwork - Fill Volume (cum) |
|--------------|----------------|-----------------|------------------------------|-------------------------------|
| 48150 | 30.08 | 0 | 2311.23 | 0 |
| 48175 | 42.3 | 0 | 1025.61 | 0 |
| 48200 | 29.24 | 0 | 905.16 | 0 |
| 48225 | 41.22 | 0 | 876.47 | 0 |
| 48250 | 41.26 | 0 | 925.84 | 0 |
| 48275 | 19.62 | 0 | 734.48 | 0 |
| 48300 | 32.06 | 0 | 633.18 | 0 |
| 48325 | 87.92 | 0 | 1336.47 | 0 |
| 48350 | 47.85 | 0 | 1735.94 | 0 |
| 48375 | 28.04 | 0 | 1089.27 | 0 |
| 48400 | 21.46 | 0 | 633.86 | 0 |
| 48425 | 12.75 | 0 | 427.56 | 0 |
| 48450 | 15.53 | 0 | 353.46 | 0 |
| 48475 | 16.71 | 0 | 391.13 | 0 |
| 48500 | 28.31 | 0 | 503.46 | 0 |
| 48525 | 27.45 | 90.55 | 630.71 | 1462.85 |
| 48550 | 32.24 | 0 | 736.49 | 1184.05 |
| 48575 | 42.87 | 0 | 938.9 | 0 |
| 48600 | 114.34 | 0 | 2472.15 | 0 |
| 48625 | 11.75 | 0 | 2657.31 | 0 |
| 48650 | 68.09 | 0 | 1241.44 | 0 |
| 48675 | 115.44 | 0 | 1914.98 | 0 |
| 48700 | 41.36 | 4.39 | 1435.28 | 60.69 |
| 48725 | 10.52 | 392.09 | 483.46 | 8261.19 |
| 48750 | 49.95 | 0.45 | 717.7 | 5463.37 |
| 48775 | 49.59 | 0 | 1244.27 | 5.62 |
| 48800 | 84.45 | 0 | 1675.54 | 0 |
| 48825 | 67.71 | 0 | 1902.06 | 0 |
| 48850 | 83 | 0 | 1883.84 | 0 |
| 48875 | 151.29 | 0 | 3103.61 | 0 |
| 48900 | 78.9 | 0 | 3245.1 | 0 |
| 48925 | 86.58 | 0 | 2108.37 | 0 |
| 48950 | 28.32 | 0 | 1436.28 | 0 |
| 48975 | 9.57 | 0 | 479.97 | 0 |
| 49000 | 29.78 | 0 | 517.96 | 0 |
| 49025 | 12.16 | 0 | 526.56 | 0 |
| 49050 | 26.96 | 0 | 488.96 | 0 |
| 49075 | 34.08 | 0 | 718.47 | 0 |
| 49100 | 22.75 | 0 | 667.2 | 0 |
| 49125 | 17.43 | 0 | 500.37 | 0 |
| | | Total = | 14,95,774 | 1,37,417 |

| | | |
|--|------------------|------------|
| Scarified Bituminous and Granular Material(A)= | 38129 | cum |
| Total Earthwork in cutting(B) = | 1495774 | cum |
| Actual earthwork in soil(B-A)= | 14,57,645 | cum |

| | | |
|--|------------------|------------|
| Assume 20% total cutting Volume for Ordinary Rock Cutting= | 2,91,529 | cum |
| Earthwork In soil = | 11,66,116 | cum |
| Earthwork in filling = | 1,37,417 | cum |
| Total Earthwork in filling = | 1,37,417 | cum |

Using 40% of cutting material for filling earthworks in embankment
 Earthwork used from Roadway Cutting Material= 583058 cum
 So no Earthwork required for embankment const from borrowpit ::

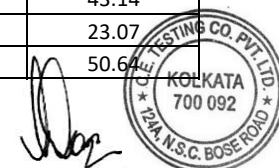
Variable Declaration

Earthwork

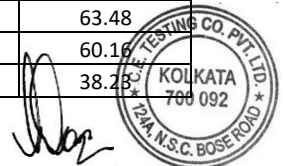
| Sl No | Variable Description | Variable | Dimension | Unit |
|-------|---|----------|-------------|---------|
| 1 | Total Earthwork In Cutting | tot_cut | 1457645.000 | cum |
| 2 | Total Earthwork In Filling (Consider Only Embankment) | tot_fill | 137417.000 | cum |
| 3 | Percentage of Rock | per_rock | 20.000 | percent |

Calculation of Extra Widening

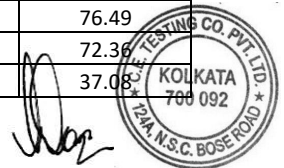
| | Start chainage of arc | End chainage of arc | Chord length (m) | Width | Transition length | Total area for extra-widening (in Arc Portion) (sqm.) | Total area for extra-widening (in Transition Portion) | Total area for extra-widening (Sqm.) |
|-----|-----------------------|---------------------|------------------|-------|-------------------|---|---|--------------------------------------|
| Arc | 33179.329m | 33242.990m | 62.975 | 0.6 | 15 | 37.79 | 9 | 46.79 |
| Arc | 33298.300m | 33310.902m | 12.569 | 1.2 | 40 | 15.08 | 48 | 63.08 |
| Arc | 33376.333m | 33381.052m | 4.719 | 0.9 | 25 | 4.25 | 22.5 | 26.75 |
| Arc | 33421.559m | 33439.373m | 17.777 | 0.9 | 15 | 16.00 | 13.5 | 29.50 |
| Arc | 33476.897m | 33504.064m | 26.834 | 1.2 | 20 | 32.20 | 24 | 56.20 |
| Arc | 33655.344m | 33672.701m | 17.323 | 0.9 | 25 | 15.59 | 22.5 | 38.09 |
| Arc | 33752.120m | 33785.079m | 31.326 | 1.5 | 30 | 46.99 | 45 | 91.99 |
| Arc | 33957.046m | 34070.777m | 107.7 | 0.9 | 20 | 96.93 | 18 | 114.93 |
| Arc | 34203.111m | 34312.421m | 108.706 | 0.6 | 20 | 65.22 | 12 | 77.22 |
| Arc | 34388.743m | 34472.936m | 81.729 | 0.9 | 20 | 73.56 | 18 | 91.56 |
| Arc | 34763.543m | 34787.737m | 23.543 | 1.5 | 30 | 35.31 | 45 | 80.31 |
| Arc | 34932.251m | 34981.814m | 49.058 | 0.9 | 15 | 44.15 | 13.5 | 57.65 |
| Arc | 35029.829m | 35070.458m | 38.905 | 1.5 | 25 | 58.36 | 37.5 | 95.86 |
| Arc | 35176.853m | 35183.720m | 6.861 | 1.2 | 20 | 8.23 | 24 | 32.23 |
| Arc | 35239.320m | 35266.671m | 26.007 | 1.5 | 20 | 39.01 | 30 | 69.01 |
| Arc | 35326.408m | 35337.929m | 11.482 | 1.5 | 25 | 17.22 | 37.5 | 54.72 |
| Arc | 35434.352m | 35441.017m | 6.657 | 1.5 | 25 | 9.99 | 37.5 | 47.49 |
| Arc | 35546.322m | 35588.043m | 34.557 | 1.5 | 20 | 51.84 | 30 | 81.84 |
| Arc | 35656.924m | 35659.920m | 2.995 | 1.5 | 30 | 4.49 | 45 | 49.49 |
| Arc | 35761.757m | 35780.953m | 19.012 | 1.5 | 25 | 28.52 | 37.5 | 66.02 |
| Arc | 35825.555m | 35872.890m | 47.052 | 0.6 | 15 | 28.23 | 9 | 37.23 |
| Arc | 35961.437m | 35997.102m | 35.606 | 0.6 | 15 | 21.36 | 9 | 30.36 |
| Arc | 36020.030m | 36051.192m | 28.104 | 1.5 | 20 | 42.16 | 30 | 72.16 |
| Arc | 36131.263m | 36196.475m | 62.049 | 1.2 | 35 | 74.46 | 42 | 116.46 |
| Arc | 36258.122m | 36275.266m | 17.131 | 0.6 | 15 | 10.28 | 9 | 19.28 |
| Arc | 36311.546m | 36329.715m | 18.144 | 0.9 | 20 | 16.33 | 18 | 34.33 |
| Arc | 36408.578m | 36435.907m | 25.988 | 1.5 | 20 | 38.98 | 30 | 68.98 |
| Arc | 36529.721m | 36577.429m | 39.604 | 1.5 | 20 | 59.41 | 30 | 89.41 |
| Arc | 36628.840m | 36640.047m | 11.184 | 1.2 | 20 | 13.42 | 24 | 37.42 |
| Arc | 36679.370m | 36690.790m | 11.407 | 0.9 | 15 | 10.27 | 13.5 | 23.77 |
| Arc | 36751.398m | 36779.369m | 26.969 | 1.5 | 30 | 40.45 | 45 | 85.45 |
| Arc | 36921.348m | 36953.778m | 32.037 | 1.2 | 35 | 38.44 | 42 | 80.44 |
| Arc | 37012.361m | 37025.618m | 13.23 | 1.2 | 15 | 15.88 | 18 | 33.88 |
| Arc | 37073.044m | 37087.065m | 13.736 | 1.5 | 20 | 20.60 | 30 | 50.60 |
| Arc | 37160.135m | 37173.638m | 13.492 | 0.9 | 20 | 12.14 | 18 | 30.14 |
| Arc | 37254.113m | 37259.932m | 5.819 | 0.6 | 15 | 3.49 | 9 | 12.49 |
| Arc | 37320.612m | 37348.389m | 27.222 | 1.5 | 25 | 40.83 | 37.5 | 78.33 |
| Arc | 37403.351m | 37414.279m | 10.922 | 0.9 | 20 | 9.83 | 18 | 27.83 |
| Arc | 37495.420m | 37509.632m | 14.137 | 1.5 | 25 | 21.21 | 37.5 | 58.71 |
| Arc | 37561.255m | 37566.976m | 5.717 | 1.5 | 25 | 8.58 | 37.5 | 46.08 |
| Arc | 37613.461m | 37631.751m | 18.188 | 1.2 | 20 | 21.83 | 24 | 45.83 |
| Arc | 37745.934m | 37765.516m | 19.236 | 1.5 | 30 | 28.85 | 45 | 73.85 |
| Arc | 37834.907m | 37857.204m | 22.169 | 1.2 | 35 | 26.60 | 42 | 68.60 |
| Arc | 37983.109m | 37990.053m | 6.943 | 0.9 | 20 | 6.25 | 18 | 24.25 |
| Arc | 38031.089m | 38047.105m | 15.947 | 1.2 | 20 | 19.14 | 24 | 43.14 |
| Arc | 38087.095m | 38091.324m | 4.229 | 1.2 | 15 | 5.07 | 18 | 23.07 |
| Arc | 38165.105m | 38206.996m | 41.269 | 0.9 | 15 | 37.14 | 13.5 | 50.64 |



| | | | | | | | | |
|-----|------------|------------|---------|-----|----|-------|------|--------|
| Arc | 38251.095m | 38255.735m | 4.637 | 1.5 | 25 | 6.96 | 37.5 | 44.46 |
| Arc | 38297.747m | 38314.942m | 17.151 | 0.9 | 15 | 15.44 | 13.5 | 28.94 |
| Arc | 38345.160m | 38361.819m | 16.639 | 0.9 | 15 | 14.98 | 13.5 | 28.48 |
| Arc | 38400.199m | 38419.049m | 18.832 | 0.6 | 15 | 11.30 | 9 | 20.30 |
| Arc | 38506.410m | 38510.850m | 4.437 | 1.5 | 25 | 6.66 | 37.5 | 44.16 |
| Arc | 38568.051m | 38579.465m | 11.345 | 1.5 | 30 | 17.02 | 45 | 62.02 |
| Arc | 38640.765m | 38651.840m | 11.039 | 1.5 | 25 | 16.56 | 37.5 | 54.06 |
| Arc | 38762.694m | 38884.476m | 119.472 | 0.6 | 15 | 71.68 | 9 | 80.68 |
| Arc | 38930.050m | 38958.109m | 27.915 | 0.9 | 25 | 25.12 | 22.5 | 47.62 |
| Arc | 39036.125m | 39050.706m | 14.545 | 1.2 | 35 | 17.45 | 42 | 59.45 |
| Arc | 39112.098m | 39128.215m | 16.008 | 1.5 | 25 | 24.01 | 37.5 | 61.51 |
| Arc | 39178.993m | 39197.858m | 18.173 | 1.5 | 20 | 27.26 | 30 | 57.26 |
| Arc | 39281.278m | 39285.111m | 3.832 | 0.9 | 25 | 3.45 | 22.5 | 25.95 |
| Arc | 39394.167m | 39407.548m | 13.378 | 0.6 | 15 | 8.03 | 9 | 17.03 |
| Arc | 39488.382m | 39509.644m | 21.151 | 1.2 | 35 | 25.38 | 42 | 67.38 |
| Arc | 39584.593m | 39608.562m | 23.944 | 0.6 | 15 | 14.37 | 9 | 23.37 |
| Arc | 39655.180m | 39677.665m | 21.963 | 1.5 | 30 | 32.94 | 45 | 77.94 |
| Arc | 39765.278m | 39772.019m | 6.74 | 0.6 | 15 | 4.04 | 9 | 13.04 |
| Arc | 39827.232m | 39839.529m | 12.292 | 0.6 | 15 | 7.38 | 9 | 16.38 |
| Arc | 39889.359m | 39905.748m | 16.36 | 0.9 | 25 | 14.72 | 22.5 | 37.22 |
| Arc | 39950.903m | 39964.189m | 13.276 | 0.9 | 20 | 11.95 | 18 | 29.95 |
| Arc | 40040.327m | 40042.182m | 1.855 | 0.9 | 20 | 1.67 | 18 | 19.67 |
| Arc | 40093.609m | 40101.378m | 7.765 | 0.9 | 30 | 6.99 | 27 | 33.99 |
| Arc | 40211.910m | 40224.263m | 12.351 | 0.6 | 15 | 7.41 | 9 | 16.41 |
| Arc | 40298.910m | 40329.730m | 29.482 | 1.5 | 30 | 44.22 | 45 | 89.22 |
| Arc | 40380.338m | 40428.192m | 46.596 | 1.2 | 15 | 55.92 | 18 | 73.92 |
| Arc | 40509.860m | 40513.287m | 3.426 | 1.5 | 25 | 5.14 | 37.5 | 42.64 |
| Arc | 40555.630m | 40564.089m | 8.451 | 1.2 | 15 | 10.14 | 18 | 28.14 |
| Arc | 40613.584m | 40634.415m | 20.755 | 0.9 | 30 | 18.68 | 27 | 45.68 |
| Arc | 40769.712m | 40794.371m | 24.597 | 0.9 | 20 | 22.14 | 18 | 40.14 |
| Arc | 40883.532m | 40887.641m | 4.108 | 0.9 | 30 | 3.70 | 27 | 30.70 |
| Arc | 40943.147m | 40954.422m | 11.266 | 0.9 | 25 | 10.14 | 22.5 | 32.64 |
| Arc | 40995.949m | 41001.063m | 5.113 | 1.2 | 15 | 6.14 | 18 | 24.14 |
| Arc | 41041.512m | 41044.563m | 3.05 | 1.5 | 25 | 4.58 | 37.5 | 42.08 |
| Arc | 41103.059m | 41106.171m | 3.111 | 1.5 | 30 | 4.67 | 45 | 49.67 |
| Arc | 41165.030m | 41178.404m | 13.354 | 0.9 | 15 | 12.02 | 13.5 | 25.52 |
| Arc | 41226.729m | 41261.497m | 34.749 | 0.6 | 15 | 20.85 | 9 | 29.85 |
| Arc | 41310.705m | 41317.863m | 7.155 | 0.9 | 30 | 6.44 | 27 | 33.44 |
| Arc | 41388.576m | 41405.390m | 16.735 | 1.2 | 40 | 20.08 | 48 | 68.08 |
| Arc | 41476.152m | 41489.946m | 13.772 | 0.9 | 30 | 12.39 | 27 | 39.39 |
| Arc | 41644.752m | 41685.230m | 40.301 | 0.6 | 15 | 24.18 | 9 | 33.18 |
| Arc | 41723.378m | 41760.050m | 36.649 | 0.6 | 15 | 21.99 | 9 | 30.99 |
| Arc | 41840.430m | 41872.856m | 31.546 | 1.5 | 25 | 47.32 | 37.5 | 84.82 |
| Arc | 41918.827m | 41928.186m | 9.346 | 1.2 | 20 | 11.22 | 24 | 35.22 |
| Arc | 41965.053m | 41973.935m | 8.874 | 1.2 | 15 | 10.65 | 18 | 28.65 |
| Arc | 42051.418m | 42071.570m | 20.016 | 1.2 | 20 | 24.02 | 24 | 48.02 |
| Arc | 42116.472m | 42125.721m | 9.241 | 1.2 | 15 | 11.09 | 18 | 29.09 |
| Arc | 42209.279m | 42230.260m | 20.827 | 1.2 | 20 | 24.99 | 24 | 48.99 |
| Arc | 42282.859m | 42302.589m | 19.71 | 0.6 | 15 | 11.83 | 9 | 20.83 |
| Arc | 42379.951m | 42460.865m | 64.926 | 1.5 | 30 | 97.39 | 45 | 142.39 |
| Arc | 42583.207m | 42603.629m | 20.281 | 1.2 | 40 | 24.34 | 48 | 72.34 |
| Arc | 42706.026m | 42717.788m | 11.743 | 1.2 | 35 | 14.09 | 42 | 56.09 |
| Arc | 42800.191m | 42856.908m | 55.537 | 0.9 | 15 | 49.98 | 13.5 | 63.48 |
| Arc | 42889.626m | 42915.530m | 25.107 | 1.5 | 15 | 37.66 | 22.5 | 60.16 |
| Arc | 42947.197m | 42957.738m | 10.487 | 1.5 | 15 | 15.73 | 22.5 | 38.25 |



| | | | | | | | | |
|-----|------------|------------|--------|-----|----|-------|------|--------|
| Arc | 42990.473m | 43001.327m | 10.821 | 1.5 | 15 | 16.23 | 22.5 | 38.73 |
| Arc | 43101.114m | 43127.522m | 26.103 | 1.2 | 20 | 31.32 | 24 | 55.32 |
| Arc | 43171.986m | 43183.998m | 11.992 | 1.2 | 15 | 14.39 | 18 | 32.39 |
| Arc | 43230.980m | 43247.495m | 16.398 | 1.5 | 25 | 24.60 | 37.5 | 62.10 |
| Arc | 43329.439m | 43347.051m | 17.049 | 1.5 | 20 | 25.57 | 30 | 55.57 |
| Arc | 43384.161m | 43402.190m | 17.759 | 1.5 | 15 | 26.64 | 22.5 | 49.14 |
| Arc | 43438.212m | 43457.104m | 18.78 | 1.2 | 20 | 22.54 | 24 | 46.54 |
| Arc | 43492.309m | 43496.142m | 3.833 | 1.2 | 15 | 4.60 | 18 | 22.60 |
| Arc | 43552.300m | 43606.635m | 53.67 | 0.9 | 20 | 48.30 | 18 | 66.30 |
| Arc | 43647.312m | 43672.253m | 24.9 | 0.6 | 15 | 14.94 | 9 | 23.94 |
| Arc | 43719.806m | 43762.826m | 42.983 | 0.6 | 15 | 25.79 | 9 | 34.79 |
| Arc | 43769.708m | 43825.131m | 55.344 | 0.6 | 15 | 33.21 | 9 | 42.21 |
| Arc | 43925.640m | 44002.732m | 76.615 | 0.6 | 15 | 45.97 | 9 | 54.97 |
| Arc | 44177.211m | 44200.003m | 22.485 | 1.5 | 25 | 33.73 | 37.5 | 71.23 |
| Arc | 44251.626m | 44254.621m | 2.995 | 1.5 | 25 | 4.49 | 37.5 | 41.99 |
| Arc | 44304.773m | 44328.268m | 23.441 | 0.9 | 20 | 21.10 | 18 | 39.10 |
| Arc | 44375.083m | 44403.516m | 28.337 | 0.9 | 20 | 25.50 | 18 | 43.50 |
| Arc | 44448.946m | 44462.488m | 13.531 | 0.9 | 20 | 12.18 | 18 | 30.18 |
| Arc | 44531.593m | 44606.439m | 71.332 | 0.9 | 30 | 64.20 | 27 | 91.20 |
| Arc | 44662.352m | 44669.759m | 7.396 | 1.5 | 25 | 11.09 | 37.5 | 48.59 |
| Arc | 44716.475m | 44738.033m | 21.391 | 1.2 | 20 | 25.67 | 24 | 49.67 |
| Arc | 44806.172m | 44835.233m | 28.654 | 1.2 | 20 | 34.38 | 24 | 58.38 |
| Arc | 44888.427m | 44912.477m | 23.41 | 1.5 | 30 | 35.12 | 45 | 80.12 |
| Arc | 45030.243m | 45045.842m | 15.501 | 1.5 | 25 | 23.25 | 37.5 | 60.75 |
| Arc | 45101.062m | 45107.726m | 6.657 | 1.5 | 25 | 9.99 | 37.5 | 47.49 |
| Arc | 45164.111m | 45241.470m | 76.131 | 0.6 | 15 | 45.68 | 9 | 54.68 |
| Arc | 45356.059m | 45385.552m | 29.386 | 0.9 | 20 | 26.45 | 18 | 44.45 |
| Arc | 45447.560m | 45511.304m | 59.513 | 1.2 | 40 | 71.42 | 48 | 119.42 |
| Arc | 45598.076m | 45687.815m | 89.405 | 0.6 | 40 | 53.64 | 24 | 77.64 |
| Arc | 45827.498m | 45829.940m | 2.441 | 1.5 | 30 | 3.66 | 45 | 48.66 |
| Arc | 45880.360m | 45884.971m | 4.61 | 1.2 | 15 | 5.53 | 18 | 23.53 |
| Arc | 45927.064m | 45955.754m | 28.627 | 0.6 | 15 | 17.18 | 9 | 26.18 |
| Arc | 46061.398m | 46107.570m | 45.534 | 0.9 | 25 | 40.98 | 22.5 | 63.48 |
| Arc | 46161.957m | 46241.476m | 76.286 | 0.9 | 25 | 68.66 | 22.5 | 91.16 |
| Arc | 46308.354m | 46320.280m | 11.906 | 1.2 | 35 | 14.29 | 42 | 56.29 |
| Arc | 46427.859m | 46443.467m | 15.598 | 0.6 | 15 | 9.36 | 9 | 18.36 |
| Arc | 46509.173m | 46529.410m | 20.099 | 1.2 | 40 | 24.12 | 48 | 72.12 |
| Arc | 46613.463m | 46663.064m | 47.592 | 1.2 | 40 | 57.11 | 48 | 105.11 |
| Arc | 46734.977m | 46746.083m | 11.083 | 1.2 | 20 | 13.30 | 24 | 37.30 |
| Arc | 46827.894m | 46840.829m | 12.921 | 0.9 | 25 | 11.63 | 22.5 | 34.13 |
| Arc | 46904.777m | 46918.760m | 13.912 | 1.5 | 25 | 20.87 | 37.5 | 58.37 |
| Arc | 46974.563m | 47015.107m | 39.442 | 1.2 | 20 | 47.33 | 24 | 71.33 |
| Arc | 47055.366m | 47062.680m | 7.307 | 1.2 | 20 | 8.77 | 24 | 32.77 |
| Arc | 47165.217m | 47175.972m | 10.753 | 0.6 | 25 | 6.45 | 15 | 21.45 |
| Arc | 47286.787m | 47380.650m | 86.987 | 0.9 | 30 | 78.29 | 27 | 105.29 |
| Arc | 47445.736m | 47468.098m | 21.215 | 1.5 | 20 | 31.82 | 30 | 61.82 |
| Arc | 47512.293m | 47596.747m | 80.587 | 0.9 | 15 | 72.53 | 13.5 | 86.03 |
| Arc | 47650.154m | 47677.130m | 24.977 | 1.5 | 20 | 37.47 | 30 | 67.47 |
| Arc | 47750.730m | 47771.777m | 21.022 | 0.6 | 15 | 12.61 | 9 | 21.61 |
| Arc | 47807.450m | 47822.217m | 14.753 | 0.9 | 20 | 13.28 | 18 | 31.28 |
| Arc | 47869.172m | 47881.084m | 11.901 | 0.9 | 25 | 10.71 | 22.5 | 33.21 |
| Arc | 47938.031m | 47979.660m | 39.776 | 1.5 | 25 | 59.66 | 37.5 | 97.16 |
| Arc | 48055.476m | 48076.923m | 20.993 | 1.5 | 30 | 31.49 | 45 | 76.49 |
| Arc | 48131.390m | 48162.748m | 28.243 | 1.5 | 20 | 42.36 | 30 | 72.36 |
| Arc | 48238.635m | 48249.554m | 10.897 | 1.2 | 20 | 13.08 | 24 | 37.08 |



| | | | | | | | | |
|-----|------------|------------|--------|-----|----|-------|------|-----------------|
| Arc | 48307.110m | 48309.120m | 2.01 | 1.5 | 25 | 3.02 | 37.5 | 40.52 |
| Arc | 48354.406m | 48368.524m | 14.071 | 1.2 | 20 | 16.89 | 24 | 40.89 |
| Arc | 48489.563m | 48499.620m | 10.04 | 1.2 | 40 | 12.05 | 48 | 60.05 |
| Arc | 48599.752m | 48628.903m | 26.639 | 1.5 | 20 | 39.96 | 30 | 69.96 |
| Arc | 48668.489m | 48721.135m | 46.146 | 1.5 | 15 | 69.22 | 22.5 | 91.72 |
| Arc | 48873.609m | 48895.341m | 21.689 | 0.9 | 20 | 19.52 | 18 | 37.52 |
| Arc | 48976.010m | 48983.449m | 7.437 | 0.9 | 25 | 6.69 | 22.5 | 29.19 |
| Arc | 49069.760m | 49083.851m | 14.072 | 0.9 | 25 | 12.66 | 22.5 | 35.16 |
| Arc | 49170.686m | 49176.496m | 5.807 | 1.2 | 20 | 6.97 | 24 | 30.97 |
| Arc | 49225.158m | 49235.233m | 10.059 | 1.2 | 20 | 12.07 | 24 | 36.07 |
| Arc | 49303.229m | 49315.953m | 12.671 | 1.5 | 25 | 19.01 | 37.5 | 56.51 |
| Arc | 49363.965m | 49378.267m | 14.253 | 1.2 | 20 | 17.10 | 24 | 41.10 |
| Arc | 49425.921m | 49435.031m | 9.097 | 1.2 | 20 | 10.92 | 24 | 34.92 |
| Arc | 49515.266m | 49529.911m | 14.321 | 1.5 | 20 | 21.48 | 30 | 51.48 |
| Arc | 49581.353m | 49586.655m | 5.286 | 1.5 | 20 | 7.93 | 30 | 37.93 |
| Arc | 49668.114m | 49683.895m | 15.679 | 1.5 | 25 | 23.52 | 37.5 | 61.02 |
| Arc | 49734.013m | 49773.959m | 39.212 | 1.2 | 15 | 47.05 | 18 | 65.05 |
| Arc | 49817.434m | 49856.223m | 38.117 | 1.2 | 15 | 45.74 | 18 | 63.74 |
| Arc | 49926.295m | 49987.085m | 60.686 | 0.6 | 15 | 36.41 | 9 | 45.41 |
| Arc | 50030.784m | 50051.736m | 20.529 | 1.5 | 15 | 30.79 | 22.5 | 53.29 |
| Arc | 50087.901m | 50102.449m | 14.468 | 1.5 | 15 | 21.70 | 22.5 | 44.20 |
| Arc | 50133.289m | 50152.097m | 18.635 | 1.5 | 15 | 27.95 | 22.5 | 50.45 |
| Arc | 50186.028m | 50197.992m | 11.935 | 1.2 | 15 | 14.32 | 18 | 32.32 |
| Arc | 50314.238m | 50324.117m | 9.863 | 1.2 | 20 | 11.84 | 24 | 35.84 |
| Arc | 50404.340m | 50409.270m | 4.927 | 1.5 | 25 | 7.39 | 37.5 | 44.89 |
| Arc | 50505.249m | 50528.646m | 22.552 | 1.5 | 20 | 33.83 | 30 | 63.83 |
| Arc | 50590.241m | 50618.334m | 27.949 | 0.9 | 25 | 25.15 | 22.5 | 47.65 |
| Arc | 50678.201m | 50776.849m | 97.419 | 0.6 | 25 | 58.45 | 15 | 73.45 |
| Arc | 50947.808m | 50963.688m | 15.869 | 0.6 | 35 | 9.52 | 21 | 30.52 |
| Arc | 51062.171m | 51067.254m | 5.083 | 0.6 | 25 | 3.05 | 15 | 18.05 |
| Arc | 51184.486m | 51205.852m | 21.302 | 0.9 | 25 | 19.17 | 22.5 | 41.67 |
| Arc | 51286.968m | 51310.882m | 23.897 | 0.6 | 25 | 14.34 | 15 | 29.34 |
| Arc | 51373.299m | 51387.908m | 14.572 | 1.2 | 35 | 17.49 | 42 | 59.49 |
| Arc | 51500.128m | 51514.428m | 14.281 | 0.9 | 25 | 12.85 | 22.5 | 35.35 |
| Arc | 51585.233m | 51651.519m | 65.912 | 0.6 | 25 | 39.55 | 15 | 54.55 |
| Arc | 51734.494m | 51765.878m | 31.37 | 0.6 | 25 | 18.82 | 15 | 33.82 |
| Arc | 51940.618m | 51964.495m | 23.84 | 0.6 | 35 | 14.30 | 21 | 35.30 |
| Arc | 52038.236m | 52045.544m | 7.306 | 0.9 | 25 | 6.58 | 22.5 | 29.08 |
| Arc | 52118.073m | 52142.345m | 24.034 | 1.2 | 20 | 28.84 | 24 | 52.84 |
| Arc | 52200.434m | 52226.891m | 25.607 | 1.5 | 30 | 38.41 | 45 | 83.41 |
| Arc | 52275.941m | 52310.839m | 34.408 | 1.2 | 15 | 41.29 | 18 | 59.29 |
| Arc | 52459.547m | 52466.845m | 7.293 | 1.2 | 35 | 8.75 | 42 | 50.75 |
| Arc | 52555.912m | 52562.948m | 7.036 | 0.6 | 15 | 4.22 | 9 | 13.22 |
| | | | | | | | | 10083.25 |

Total Area of Extra Widening=

10083 Sqm



Variable Declaration

Extra Widening on Flexible Pavement

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|------------------------------|----------|-----------|------------|
| 1 | Total Area of Extra Widening | ew_area | 10083.000 | m |
| 2 | BC | bc | 0.040 | m |
| 3 | DBM | dbm | 0.070 | m |
| 4 | WMM-I | wmm1 | 0.125 | m |
| 5 | WMM-II | wmm2 | 0.125 | m |
| 6 | GSB | gsb | 0.200 | m |
| 7 | Reuseble GSB percentage | gsb_per | 36.630 | percentage |



Quantity Calculation For Hydro Seeding

| Chainage (m) | | Side | Avg. Height (m) | Length (m) | Area (sqm) |
|--------------|-------|---------------------|-----------------|-------------|--------------|
| From | To | | | | |
| 33600 | 33875 | Hill | 8 | 275 | 2200 |
| 33875 | 33965 | Both | 15 | 180 | 2700 |
| 33965 | 34470 | Hill | 8 | 505 | 4040 |
| 34470 | 34510 | Both | 8 | 80 | 640 |
| 34510 | 34560 | Hill | 8 | 50 | 400 |
| 34560 | 35000 | Hill | 8 | 440 | 3520 |
| 35730 | 36030 | Hill | 8 | 300 | 2400 |
| 36230 | 36380 | Hill | 8 | 150 | 1200 |
| 43720 | 43855 | Hill | 8 | 135 | 1080 |
| | | Total Length | | 2115 | 18180 |

Total Area of Hydro Seeding=

18180 sqm

RCC Covered Drain

| Chainage (m) | | Length of CD | Net Length (m) | TCS No. | Side | Size |
|--------------|-------|--------------|----------------|---------|--------|-------|
| From | To | | | | | |
| 35450 | 35750 | 2.6 | 297.4 | TCS-7 | Valley | 1.75m |
| 41850 | 42070 | 2.6 | 434.8 | TCS-6 | Both | 1.0m |
| 43440 | 43575 | 2.7 | 132.3 | TCS-7 | Valley | 1.0m |
| Total = | | | 865 | | | |

RCC Cover Drain(1.0m)

865 m

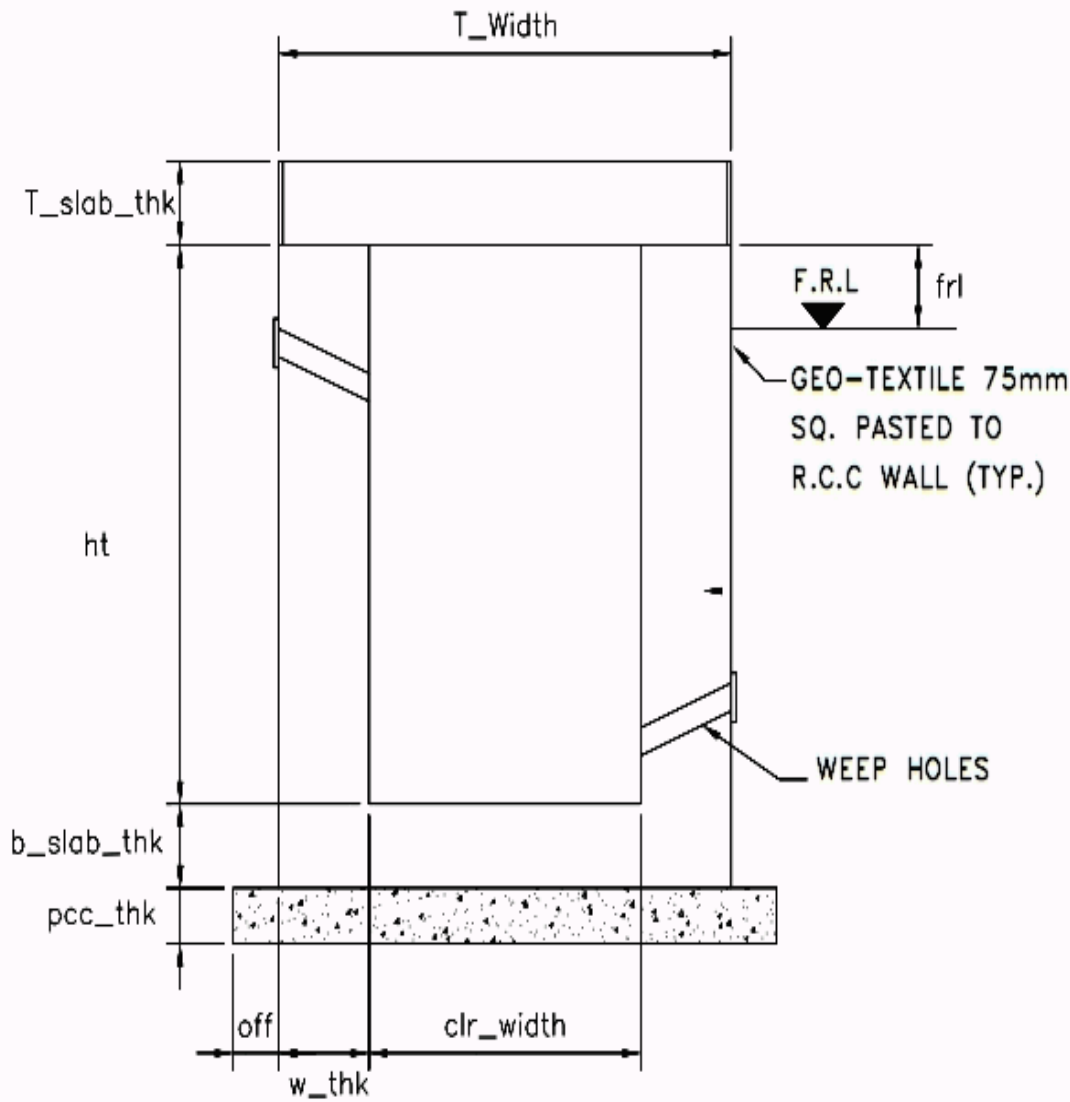


Variable Declaration

RCC Cover Drain 1.0m

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|---------------------------|------------|-----------|---------------|
| 1 | Top Width | t_width | 1.750 | m |
| 2 | Top Slab Thickness | t_slab_thk | 0.125 | m |
| 3 | Height of Drain | ht | 0.900 | m |
| 4 | Bottom Slab Thickness | b_slab_thk | 0.150 | m |
| 5 | Side Wall Thickness | w_thk | 0.200 | m |
| 6 | Foundation PCC thickness | pcc_thk | 0.100 | m |
| 7 | Foundation PCC Offset | off | 0.100 | m |
| 8 | Length | l | 865.000 | m |
| 9 | Reinforcement Per Cum RCC | s | 0.050 | MT/Cum RCC |
| 10 | Finished Road Level | frl | 0.300 | m |

Variable Declaration



Trapezoidal Drain

| Chainage (m) | | Length of CD | Net Length (m) | TCS No. | Side |
|----------------|-------|--------------|----------------|---------|------|
| From | To | | | | |
| 33000 | 33600 | 5.2 | 594.8 | TCS-3 | Hill |
| 35000 | 35080 | 0 | 80.0 | TCS-4A | Hill |
| 35080 | 35130 | 0 | 50.0 | TCS-3A | Hill |
| 35130 | 35730 | 3.96 | 596.0 | TCS-3 | Hill |
| 36030 | 36230 | 2.7 | 197.3 | TCS-3 | Hill |
| 36380 | 36480 | 3.96 | 96.0 | TCS-3 | Hill |
| 36480 | 36580 | 0 | 100.0 | TCS-3A | Hill |
| 36580 | 36830 | 2.6 | 247.4 | TCS-3 | Hill |
| 36830 | 37010 | 8 | 172.0 | TCS-3A | Hill |
| 37010 | 37060 | 2.7 | 47.3 | TCS-3 | Hill |
| 37060 | 37160 | 2.6 | 97.4 | TCS-3A | Hill |
| 37160 | 38405 | 20.72 | 1224.3 | TCS-3 | Hill |
| 38405 | 38755 | 2.7 | 347.3 | TCS-3A | Hill |
| 38755 | 38840 | 3.84 | 81.2 | TCS-3 | Hill |
| 38840 | 38910 | 0 | 70.0 | TCS-3A | Hill |
| 38910 | 40580 | 32.8 | 1637.2 | TCS-3 | Hill |
| 40580 | 40680 | 0 | 100.0 | TCS-4 | Hill |
| 40680 | 40780 | 0 | 100.0 | TCS-3A | Hill |
| 40780 | 41155 | 5.2 | 369.8 | TCS-3 | Hill |
| 41155 | 41205 | 0 | 50.0 | TCS-4 | Hill |
| 41205 | 41500 | 2.6 | 292.4 | TCS-3 | Hill |
| 41500 | 41555 | 2.6 | 52.4 | TCS-4 | Hill |
| 41555 | 41680 | 0 | 125.0 | TCS-3 | Hill |
| 41680 | 41780 | 0 | 100.0 | TCS-3A | Hill |
| 41780 | 42130 | 2.6 | 347.4 | TCS-3 | Hill |
| 42350 | 42690 | 10.6 | 329.4 | TCS-3 | Hill |
| 42690 | 42745 | 0 | 55.0 | TCS-3A | Hill |
| 42745 | 43720 | 10.6 | 964.4 | TCS-3 | Hill |
| 43855 | 43905 | 0 | 50.0 | TCS-4 | Hill |
| 43905 | 44245 | 2.6 | 337.4 | TCS-3 | Hill |
| 44245 | 44295 | 0 | 50.0 | TCS-4 | Hill |
| 44295 | 45165 | 10.5 | 859.5 | TCS-3 | Hill |
| 45165 | 45215 | 0 | 50.0 | TCS-3A | Hill |
| 45215 | 46990 | 22.44 | 1752.6 | TCS-3 | Hill |
| 46990 | 47040 | 0 | 50.0 | TCS-3A | Hill |
| 47040 | 48955 | 26.2 | 1888.8 | TCS-3 | Hill |
| 48955 | 49250 | 5.2 | 289.8 | TCS-4 | Hill |
| Total = | | | 13852 | | |

Catchwater Drain

| Chainage (m) | | Length of CD | Net Length (m) |
|--------------|-------|--------------|----------------|
| From | To | | |
| 33600 | 33875 | 0 | 275.0 |
| 33875 | 33965 | 0 | 90.0 |
| 33965 | 34470 | 0 | 505.0 |
| 34470 | 34510 | 0 | 40.0 |
| 34510 | 34560 | 0 | 50.0 |
| 34560 | 35000 | 8 | 432.0 |
| 35730 | 36030 | 2.6 | 297.4 |
| 36230 | 36380 | 0 | 150.0 |
| 43720 | 43855 | 2.7 | 132.3 |
| Total = | | | 1972 |

Total Length of Trapezoidal Drain = 15824 m
Chute Drain(of avg 8 m height @ 50m Interval) = 315 m

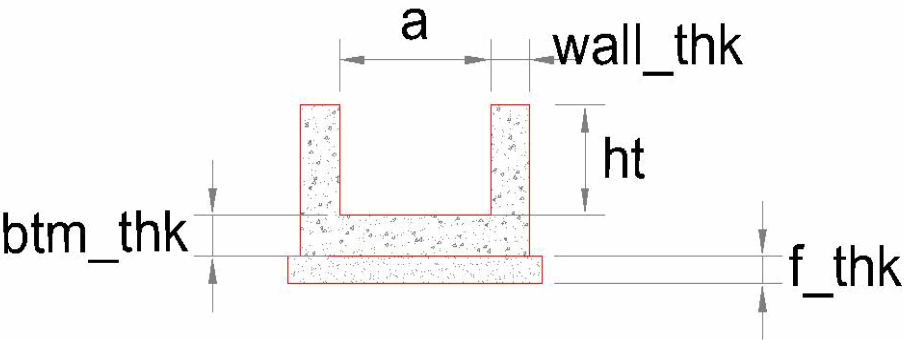
Variable Declaration

PCC Chut Drain

| Sl No | Variable Description | Variable | Dimension | Unit |
|-------|----------------------|----------|-----------|------|
| 1 | Ref Drawing | a | 0.600 | m |
| 2 | Ref Drawing | wall_thk | 0.150 | m |
| 3 | Ref Drawing | btm_thk | 0.150 | m |
| 4 | Ref Drawing | f_thk | 0.100 | m |
| 5 | Ref Drawing | ht | 0.400 | m |
| 6 | Length | l | 315.000 | m |



Variable Declaration



CHUT DRAIN




Trapezoidal Drain

| Chainage (m) | | Length of CD | Net Length (m) | TCS No. | Side |
|----------------|-------|--------------|----------------|---------|------|
| From | To | | | | |
| 33000 | 33600 | 5.2 | 594.8 | TCS-3 | Hill |
| 35000 | 35080 | 0 | 80.0 | TCS-4A | Hill |
| 35080 | 35130 | 0 | 50.0 | TCS-3A | Hill |
| 35130 | 35730 | 3.96 | 596.0 | TCS-3 | Hill |
| 36030 | 36230 | 2.7 | 197.3 | TCS-3 | Hill |
| 36380 | 36480 | 3.96 | 96.0 | TCS-3 | Hill |
| 36480 | 36580 | 0 | 100.0 | TCS-3A | Hill |
| 36580 | 36830 | 2.6 | 247.4 | TCS-3 | Hill |
| 36830 | 37010 | 8 | 172.0 | TCS-3A | Hill |
| 37010 | 37060 | 2.7 | 47.3 | TCS-3 | Hill |
| 37060 | 37160 | 2.6 | 97.4 | TCS-3A | Hill |
| 37160 | 38405 | 20.72 | 1224.3 | TCS-3 | Hill |
| 38405 | 38755 | 2.7 | 347.3 | TCS-3A | Hill |
| 38755 | 38840 | 3.84 | 81.2 | TCS-3 | Hill |
| 38840 | 38910 | 0 | 70.0 | TCS-3A | Hill |
| 38910 | 40580 | 32.8 | 1637.2 | TCS-3 | Hill |
| 40580 | 40680 | 0 | 100.0 | TCS-4 | Hill |
| 40680 | 40780 | 0 | 100.0 | TCS-3A | Hill |
| 40780 | 41155 | 5.2 | 369.8 | TCS-3 | Hill |
| 41155 | 41205 | 0 | 50.0 | TCS-4 | Hill |
| 41205 | 41500 | 2.6 | 292.4 | TCS-3 | Hill |
| 41500 | 41555 | 2.6 | 52.4 | TCS-4 | Hill |
| 41555 | 41680 | 0 | 125.0 | TCS-3 | Hill |
| 41680 | 41780 | 0 | 100.0 | TCS-3A | Hill |
| 41780 | 42130 | 2.6 | 347.4 | TCS-3 | Hill |
| 42350 | 42690 | 10.6 | 329.4 | TCS-3 | Hill |
| 42690 | 42745 | 0 | 55.0 | TCS-3A | Hill |
| 42745 | 43720 | 10.6 | 964.4 | TCS-3 | Hill |
| 43855 | 43905 | 0 | 50.0 | TCS-4 | Hill |
| 43905 | 44245 | 2.6 | 337.4 | TCS-3 | Hill |
| 44245 | 44295 | 0 | 50.0 | TCS-4 | Hill |
| 44295 | 45165 | 10.5 | 859.5 | TCS-3 | Hill |
| 45165 | 45215 | 0 | 50.0 | TCS-3A | Hill |
| 45215 | 46990 | 22.44 | 1752.6 | TCS-3 | Hill |
| 46990 | 47040 | 0 | 50.0 | TCS-3A | Hill |
| 47040 | 48955 | 26.2 | 1888.8 | TCS-3 | Hill |
| 48955 | 49250 | 5.2 | 289.8 | TCS-4 | Hill |
| Total = | | | 13852 | | |

Catchwater Drain

| Chainage (m) | | Length of CD | Net Length (m) |
|--------------|-------|--------------|----------------|
| From | To | | |
| 33600 | 33875 | 0 | 275.0 |
| 33875 | 33965 | 0 | 90.0 |
| 33965 | 34470 | 0 | 505.0 |
| 34470 | 34510 | 0 | 40.0 |
| 34510 | 34560 | 0 | 50.0 |
| 34560 | 35000 | 8 | 432.0 |
| 35730 | 36030 | 2.6 | 297.4 |
| 36230 | 36380 | 0 | 150.0 |
| 43720 | 43855 | 2.7 | 132.3 |
| Total = | | | 1972 |

Total Length of Trapezoidal Drain = 15824 m
Chute Drain(of avg 8 m height @ 50m Interval) = 315 m

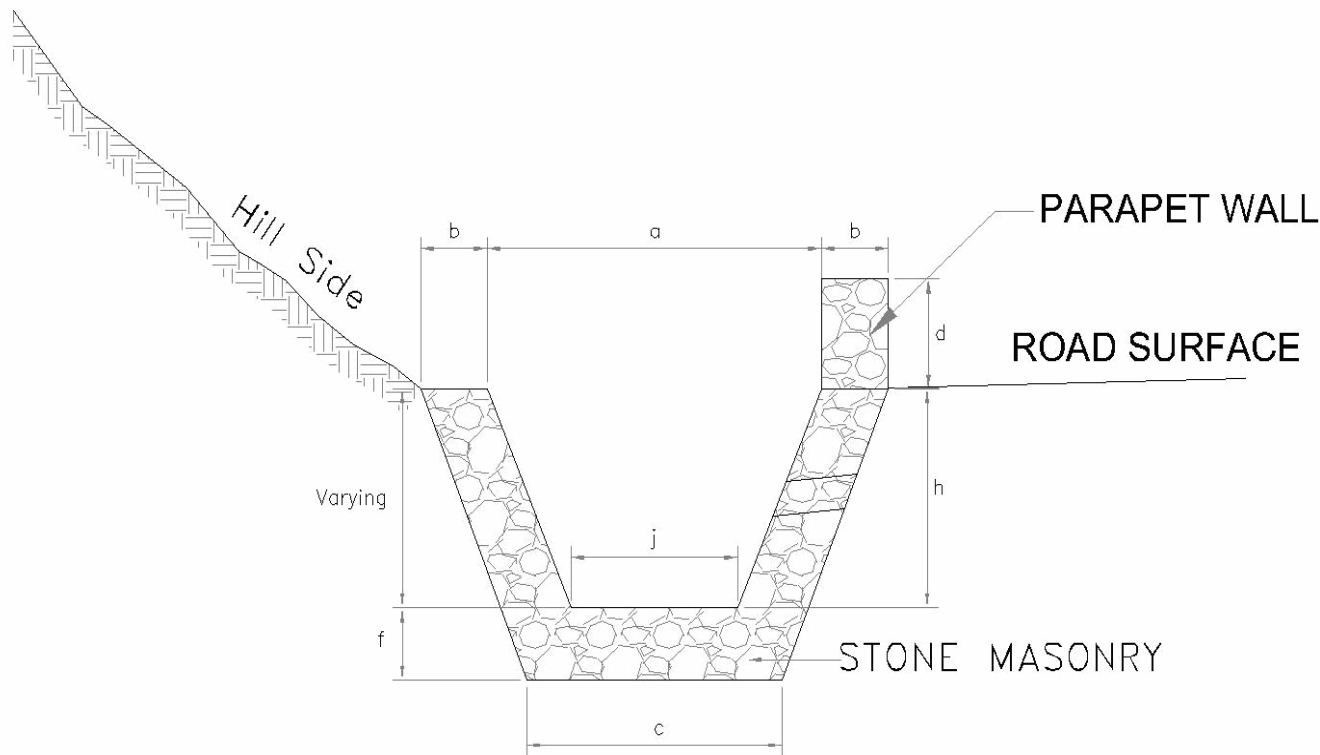
Variable Declaration

RR Masonry Trapezoidal Drain

| Sl No | Variable Description | Variable | Dimension | Unit |
|-------|----------------------|----------|-----------|------|
| 1 | Ref Drawing | a | 1.000 | m |
| 2 | Ref Drawing | b | 0.200 | m |
| 3 | Ref Drawing | d | 0.300 | m |
| 4 | Ref Drawing | h | 0.850 | m |
| 5 | Ref Drawing | c | 0.765 | m |
| 6 | Ref Drawing | j | 0.500 | m |
| 7 | Ref Drawing | f | 0.200 | m |
| 8 | Length | l | 15824.000 | m |



Variable Declaration



SECTION OF STONE MASONRY
TRAPEZOIDAL DRAIN

Minor Junction

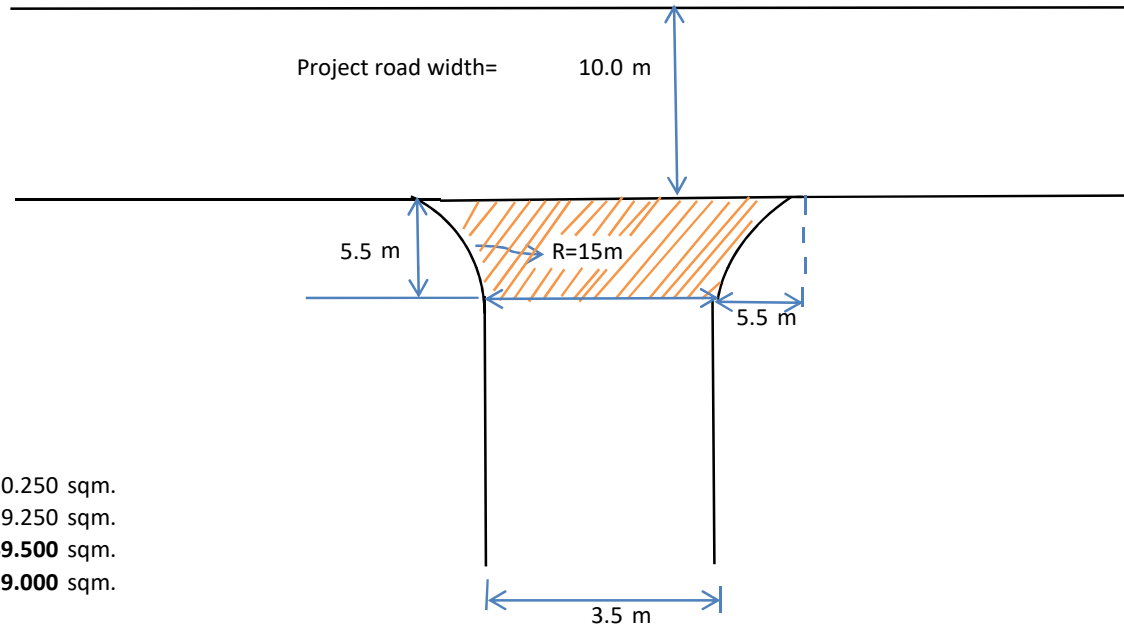
| Sl No | Design Ch | Type Of Junction |
|-------|-----------|------------------|
| 1 | 33+190 | Y |
| 2 | 46+070 | Y |

| Pavement Layer | Thickness (m) |
|----------------|---------------|
| GSB = | 0.200 |
| WMM-II = | 0.125 |
| WMM-I = | 0.125 |
| DBM= | 0.080 |
| BC = | 0.040 |

For triangular portion area = 30.250 sqm.
 For rectangular portion area = 19.250 sqm.
 Total area of 3 legged Junction = **49.500** sqm.
 Total area of 4 legged Junction = **99.000** sqm.

Quantity Calculation for Minor Junction

| Type | No | Each Avg. area | Total Area (sqm) |
|----------------|----|----------------|------------------|
| 3 legged | 2 | 49.50 | 99 |
| Total = | | | 99 |



Variable Declaration

Minor Junction

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|----------------------|----------|-----------|------|
| 1 | Total_area | tot_area | 99.000 | area |
| 2 | BC | bc | 0.040 | m |
| 3 | DBM | dbm | 0.070 | m |
| 4 | WMM1 | wmm1 | 0.125 | m |
| 5 | WMM2 | wmm2 | 0.125 | m |
| 6 | GSB Thickness | gsb | 0.200 | m |
| 7 | GSB Reuse | gsb_per | 36.630 | |



RR Masonry Retaining Wall

| Chainage (m) | | Length of CD | Net Length (m) | TCS No. | Side | Avg. Height (m) |
|----------------|-------|--------------|----------------|---------|--------|-----------------|
| From | To | | | | | |
| 35000 | 35080 | 0 | 80.0 | TCS-4A | Valley | 2 |
| 40580 | 40680 | 0 | 100.0 | TCS-4 | Valley | 3 |
| 41155 | 41205 | 0 | 50.0 | TCS-4 | Valley | 2 |
| 41500 | 41555 | 2.6 | 52.4 | TCS-4 | Valley | 2 |
| 43855 | 43905 | 0 | 50.0 | TCS-4 | Valley | 2 |
| 44245 | 44295 | 0 | 50.0 | TCS-4 | Valley | 2 |
| 48955 | 49250 | 5.2 | 289.8 | TCS-4 | Valley | 2 |
| Total = | | | 672 | | | |

Length of 2.0 m Retaining Wall = 572 m

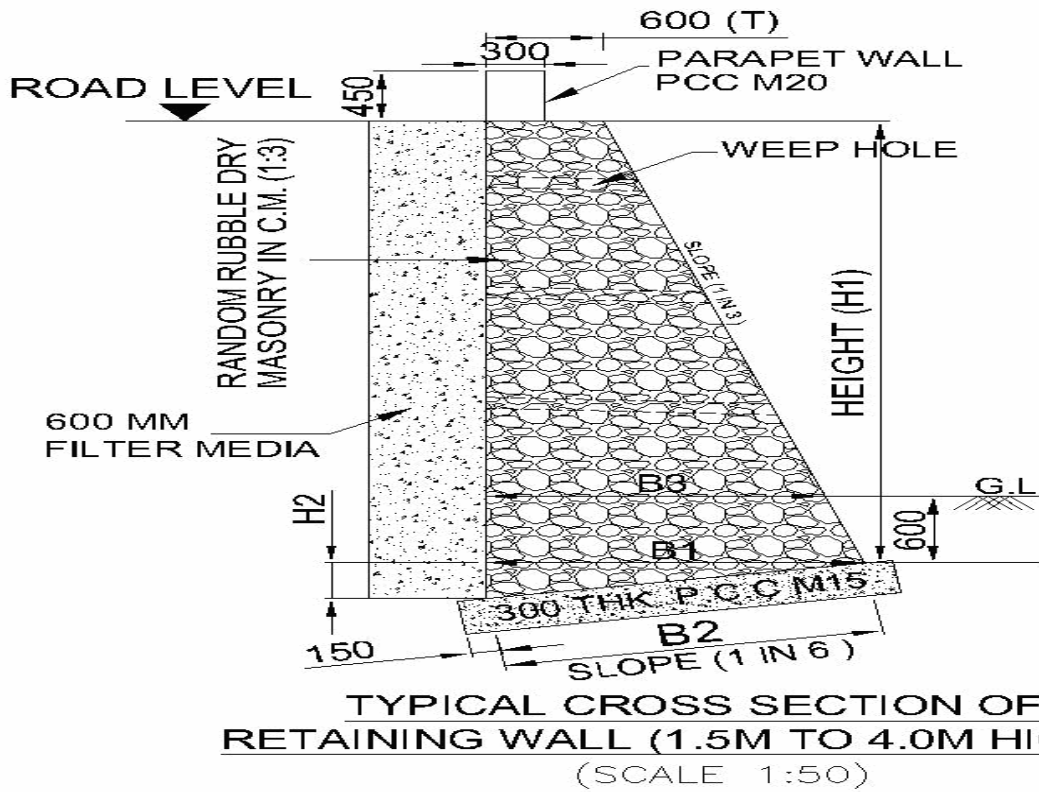
Length of 3.0 m Retaining Wall = 100 m

Variable Declaration

Retaining Wall 2.0m

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|--|----------|-----------|--------|
| 1 | Top Width (T) | T | 0.600 | m |
| 2 | Height | H1 | 2.000 | m |
| 3 | Slope at Base(1 In 6) | Z | 9.462 | degree |
| 4 | $B1 = (T+H1/3)$ | B1 | 1.270 | m |
| 5 | $B2 = B1/\cos Z$ | B2 | 1.284 | m |
| 6 | $H2 = B1.\tan Z$ | H2 | 0.211 | m |
| 7 | EGL to PCC top Height | d | 0.600 | m |
| 8 | Slope of Wall(1 in 3) | Y | 18.435 | degree |
| 9 | $B3 = T + (H1-d)\tan Y$ | e | 1.067 | m |
| 10 | Thickness PCC | pcc_thk | 0.300 | m |
| 11 | Offset at PCC | o | 0.150 | m |
| 12 | Filter Media Width | mw | 0.600 | m |
| 13 | length | l | 572.000 | m |
| 14 | No of weephole along slope of 1m gap $m = ((H1 - d) / \cos Y) / 1$ | n | 2.000 | nos |
| 15 | Avg Length of Weephole $q = (B3 + T) / 2$ | weep_len | 0.834 | m |
| 16 | percentage of rock cutting | p_c | 0.200 | |
| 17 | Taking gap every 10m length | gap | 0.300 | m |
| 18 | Width of parapet wall | para_w | 0.300 | m |
| 19 | height of parapet wall | para_ht | 0.450 | m |

Variable Declaration

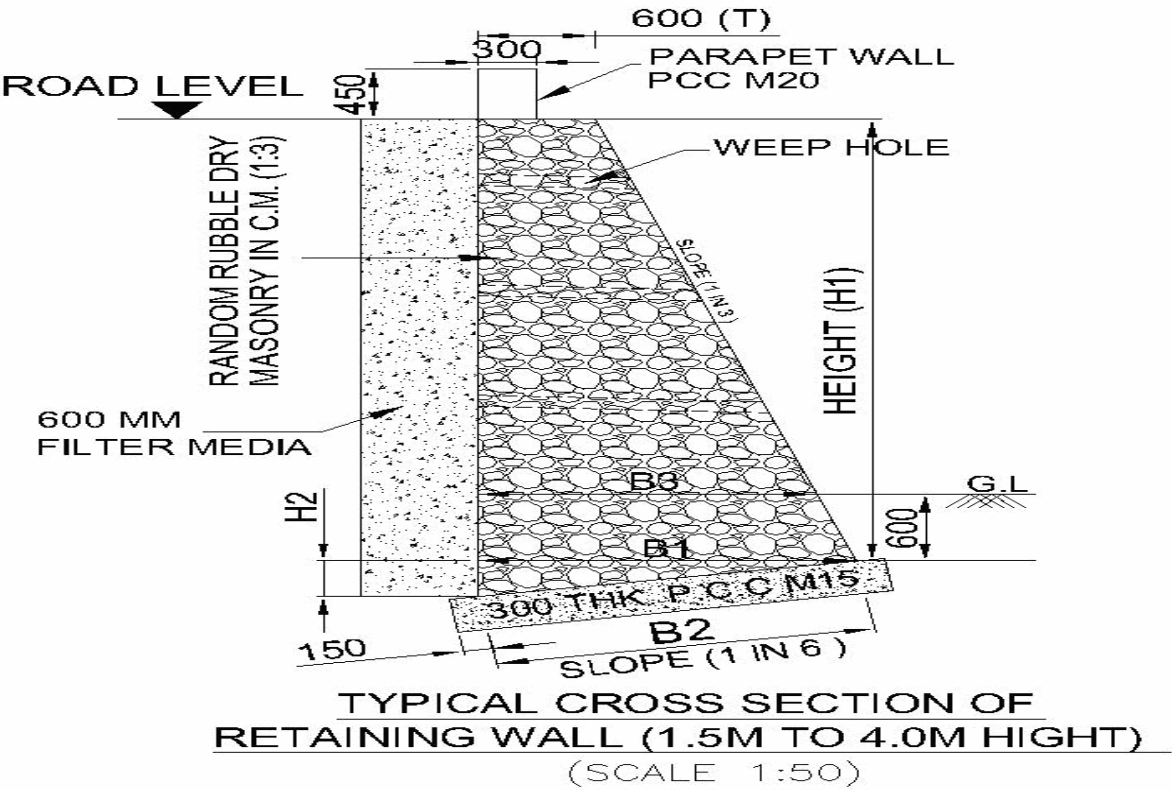


Variable Declaration

Retaining Wall 3.0m

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|--|----------|-----------|--------|
| 1 | Top Width (T) | T | 0.600 | m |
| 2 | Height (H1) | H1 | 3.000 | m |
| 3 | Slope at Base(1 In 6) | Z | 9.462 | degree |
| 4 | $B1 = (T+H1/3)$ | B1 | 1.600 | m |
| 5 | $B2 = B1/\cos Z$ | B2 | 1.622 | m |
| 6 | $H2 = B1.\tan Z$ | H2 | 0.267 | m |
| 7 | EGL to PCC top Height | d | 0.600 | m |
| 8 | Slope of Wall(1 in 3) | Y | 18.435 | degree |
| 9 | $B3 = T + (H1-d)\tan Y$ | B3 | 1.400 | m |
| 10 | Thickness PCC | pcc_th1k | 0.300 | m |
| 11 | Offset at PCC | o | 0.150 | m |
| 12 | Filter Media Width | mw | 0.600 | m |
| 13 | length | l | 100.000 | m |
| 14 | No of weephole along slope of 1m gap $m = ((H1 - d) / \cos Y) / 1$ | n | 3.000 | nos |
| 15 | Avg Length of Weephole $q = (B3 + T) / 2$ | weep_len | 1.000 | m |
| 16 | percentage of rock cutting | p_c | 0.200 | |
| 17 | height of parapet wall | para_ht | 0.450 | m |
| 18 | width of parapet wall | para_w | 0.300 | m |
| 19 | Taking gap every 10m length | gap | 0.300 | m |

Variable Declaration



[Signature]



| Breast Wall | | | | | | |
|--------------|-------|--------------|----------------|---------|------|-----------------|
| Chainage (m) | | Length of CD | Net Length (m) | TCS No. | Side | Avg. Height (m) |
| From | To | | | | | |
| 33600 | 33875 | 0 | 275.0 | TCS-12 | Hill | 3 |
| 33875 | 33965 | 0 | 180.0 | TCS-9A | Both | 3 |
| 33965 | 34470 | 0 | 505.0 | TCS-12 | Hill | 3 |
| 34470 | 34510 | 0 | 80.0 | TCS-9A | Both | 3 |
| 34510 | 34560 | 0 | 50.0 | TCS-12 | Hill | 3 |
| 34560 | 35000 | 8 | 432.0 | TCS-5 | Hill | 2 |
| 35730 | 36030 | 2.6 | 297.4 | TCS-7 | Hill | 2 |
| 36230 | 36380 | 0 | 150.0 | TCS-5 | Hill | 2 |
| 43720 | 43855 | 2.7 | 132.3 | TCS-7 | Hill | 2 |
| Total = | | | 2102 | | | |

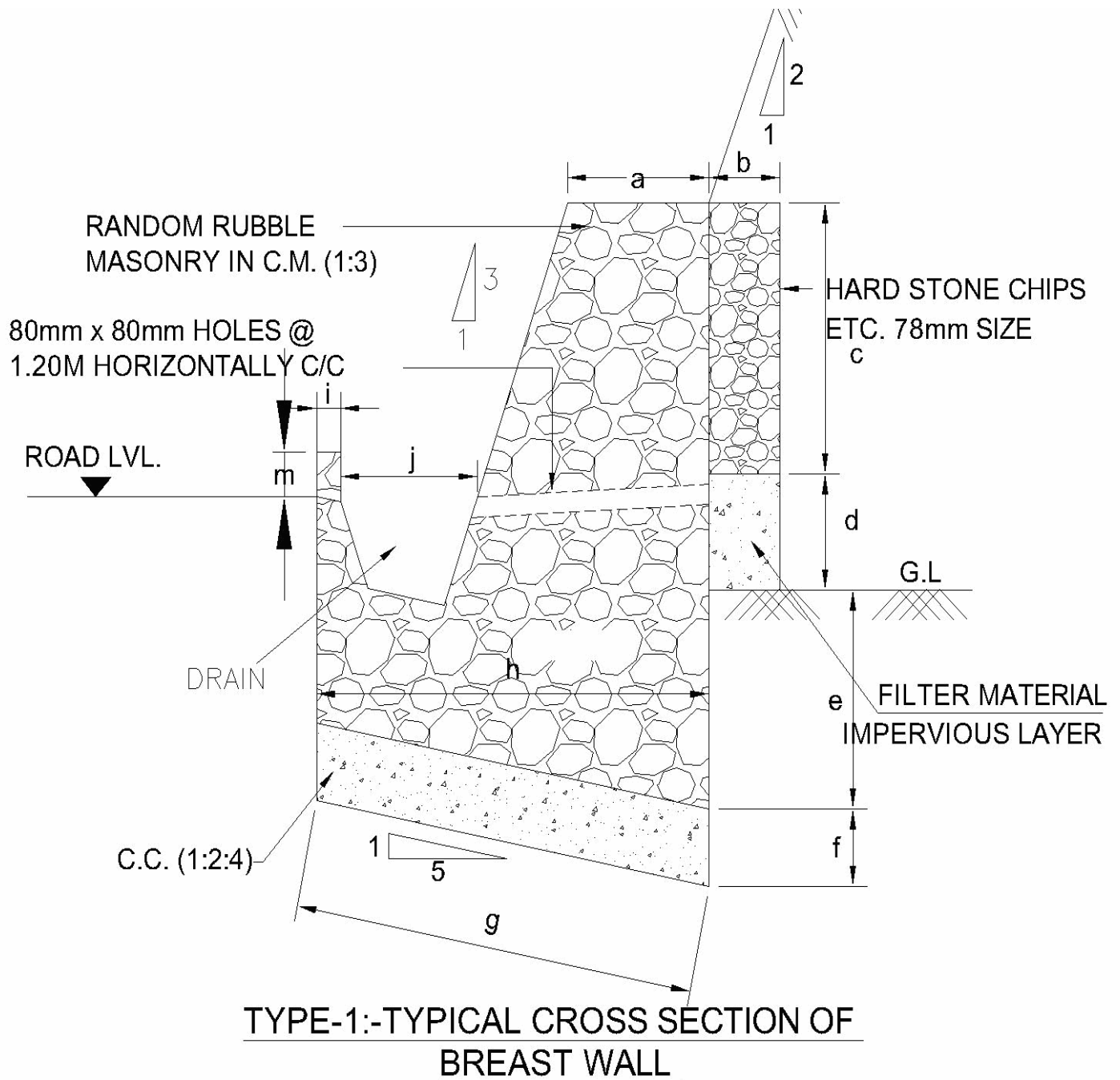
Variable Declaration

Breast Wall 2.0m Ht

| Sl No | Variable Description | Variable | Dimension | Unit |
|-------|---|----------|-----------|------|
| 1 | From Diagram | a | 0.600 | m |
| 2 | From Diagram | b | 0.300 | m |
| 3 | From Diagram | c | 1.550 | m |
| 4 | From Diagram | d | 0.450 | m |
| 5 | From Diagram | e | 0.850 | m |
| 6 | From Diagram | f | 0.300 | m |
| 7 | PCC Width $g = \sqrt{h^2 + (h/5)^5}$ | g | 1.933 | m |
| 8 | From Diagram | h | 1.890 | m |
| 9 | From Diagram | i | 0.100 | m |
| 10 | From Diagram | j | 0.600 | m |
| 11 | length | l | 1012.000 | m |
| 12 | Percentage of Earthwork in Ordinary Rock(20%) | p | 0.200 | |
| 13 | From Diagram | m | 0.000 | m |



Variable Declaration

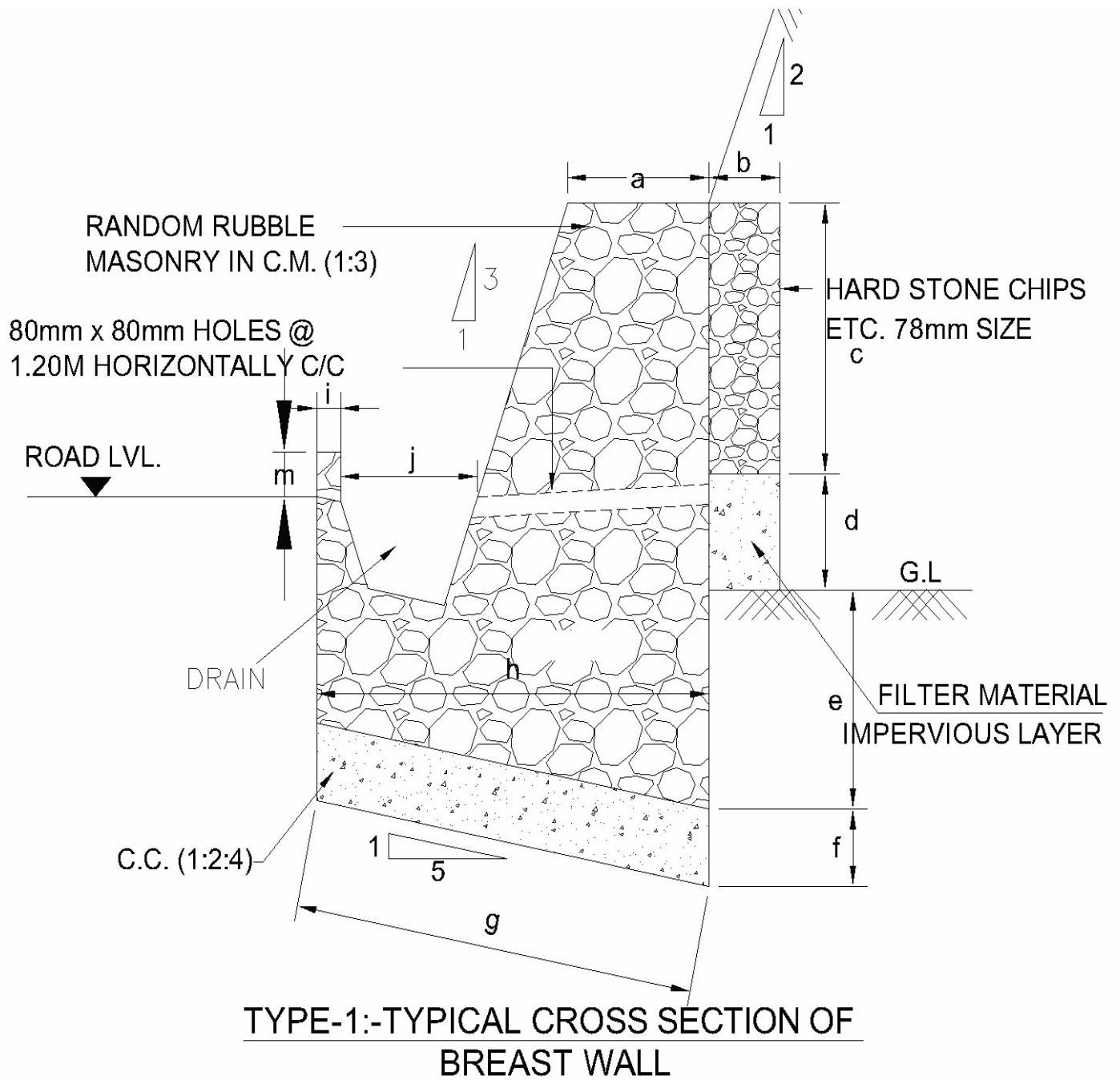


Variable Declaration

Breast Wall 3.0m Ht

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|---|----------|-----------|------|
| 1 | From Diagram | a | 0.600 | m |
| 2 | From Diagram | b | 0.300 | m |
| 3 | From Diagram | c | 2.550 | m |
| 4 | From Diagram | d | 0.450 | m |
| 5 | From Diagram | e | 0.850 | m |
| 6 | From Diagram | f | 0.300 | m |
| 7 | PCC Width $g = \sqrt{h^2 + (h/5)^5}$ | g | 2.225 | m |
| 8 | From Diagram | h | 2.225 | m |
| 9 | From Diagram | i | 0.100 | m |
| 10 | From Diagram | j | 0.600 | m |
| 11 | length | l | 1090.000 | m |
| 12 | Percentage of Earthwork in Ordinary Rock(20%) | p | 0.200 | |
| 13 | From Diagram | m | 0.000 | m |

Variable Declaration



Busbay and Passenger Shelter

| Chainage | Side | Name of Place |
|----------|-----------|------------------|
| 35+920 | Both Side | K. Senam Village |
| 41+570 | Both Side | Sehjang Village |

Total Nos

4 nos



Variable Declaration

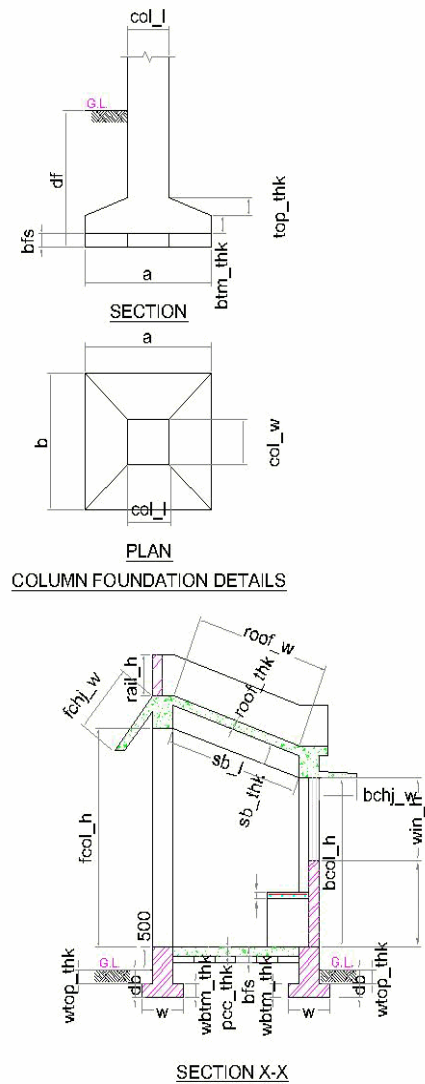
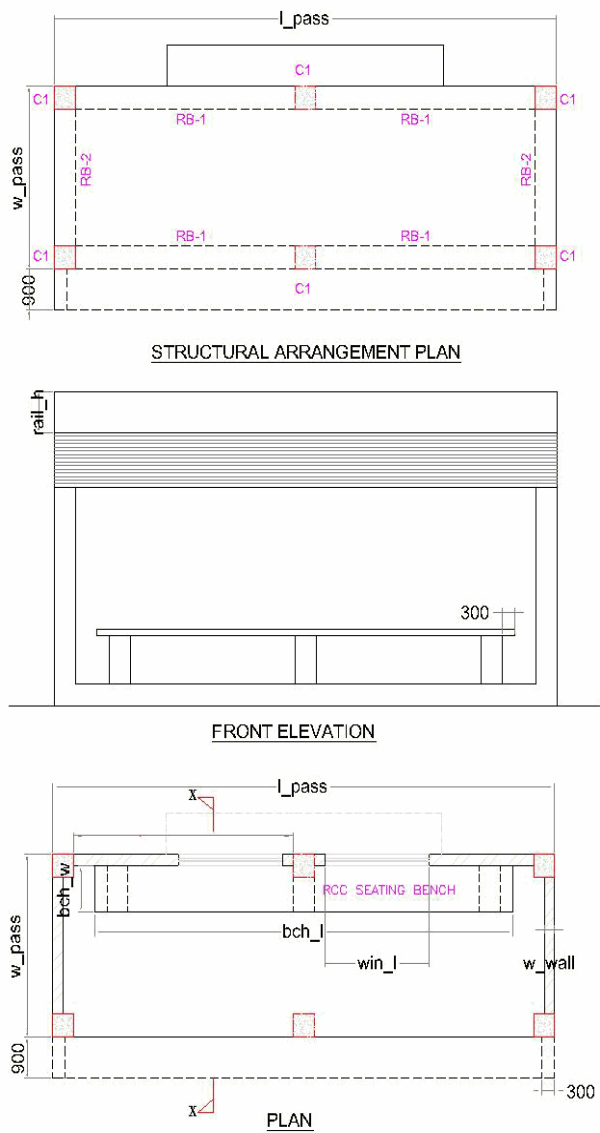
Passenger Shelter

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|--|----------|-----------|--------|
| 1 | No of Passenger Shelter | n | 4.000 | nos |
| 2 | Foundation Length for column | a | 0.750 | m |
| 3 | Foundation Width for column | b | 0.750 | m |
| 4 | Foundation Depth for column | df | 0.750 | m |
| 5 | Nos of column | col_n | 6.000 | Nos |
| 6 | Foundation length for Brick work | l | 13.500 | m |
| 7 | Foundation width for Brick work | w | 0.500 | m |
| 8 | Foundation depth for Brick work | db | 0.300 | m |
| 9 | Each column length | col_l | 0.250 | m |
| 10 | Each column width | col_w | 0.250 | m |
| 11 | Thickness of foundation at bottom | btm_thk | 0.100 | m |
| 12 | Thickness of foundation at top | top_thk | 0.100 | m |
| 13 | Foundation reinforcement | rf | 120.000 | kg/cum |
| 14 | Width of brick wall | w_wall | 0.125 | m |
| 15 | Thickness of pcc | pcc_thk | 0.100 | m |
| 16 | Length of Passenger shelter | l_pass | 6.000 | m |
| 17 | Width of Passenger shelter | w_pass | 2.000 | m |
| 18 | Foundation brick wall top thickness | wtop_thk | 0.150 | m |
| 19 | Foundation brick wall btm thickness | wbtm_thk | 0.150 | m |
| 20 | Side wall & back wall lower portion height | wall_h | 0.550 | m |
| 21 | Side wall upper portion length | sw_l | 1.500 | m |
| 22 | Side wall upper portion height | sw_h | 2.130 | m |
| 23 | Back wall upper portion Length | bw_l | 2.650 | m |
| 24 | Back wall upper portion height | bw_h | 0.950 | m |
| 25 | Seating bench length | bch_l | 5.000 | m |
| 26 | Seating bench width | bch_w | 0.500 | m |
| 27 | Seating bench thickness | bch_thk | 0.075 | m |
| 28 | Nos of window | win_n | 2.000 | nos |
| 29 | Length of window | win_l | 1.250 | m |
| 30 | Height of window | win_h | 0.900 | m |
| 31 | Front column height | fcol_h | 2.650 | m |
| 32 | Back column height | bcol_h | 2.100 | m |
| 33 | Side beam length (RB2) | sb_l | 1.530 | m |
| 34 | Side beam width | sb_w | 0.250 | m |
| 35 | Side beam thickness | sb_thk | 0.350 | m |
| 36 | Side beam length (RB1) | sb_a | 3.000 | m |

Variable Declaration

| | | | | |
|----|--|----------|---------|--------|
| 37 | Thickness of Roof slab | roof_thk | 0.110 | m |
| 38 | Width of front Chajja | fchj_w | 0.680 | m |
| 39 | Width of back Chajja | bchj_w | 0.450 | m |
| 40 | Length of railing | rail_l | 9.500 | m |
| 41 | Height of railing | rail_h | 0.450 | m |
| 42 | Width of roof slab | roof_w | 1.530 | m |
| 43 | Superstructure reinforcement | srf | 100.000 | kg/cum |
| 44 | Side wall inner side length | sw_in | 1.875 | m |
| 45 | Back wall inner side length | bw_in | 5.800 | m |
| 46 | Side wall height (plastering &painting) | sw_ht | 3.830 | m |
| 47 | Back wall height (plastering &painting) | bw_ht | 2.350 | m |
| 48 | top width of wall in foundation | fw_wall | 0.250 | m |

Variable Declaration



PASSENGER SHELTER

Busbay and Passenger Shelter

| Chainage | Side | Name of Place |
|----------|-----------|------------------|
| 35+920 | Both Side | K. Senam Village |
| 41+570 | Both Side | Sehjang Village |

Total Nos

4 nos

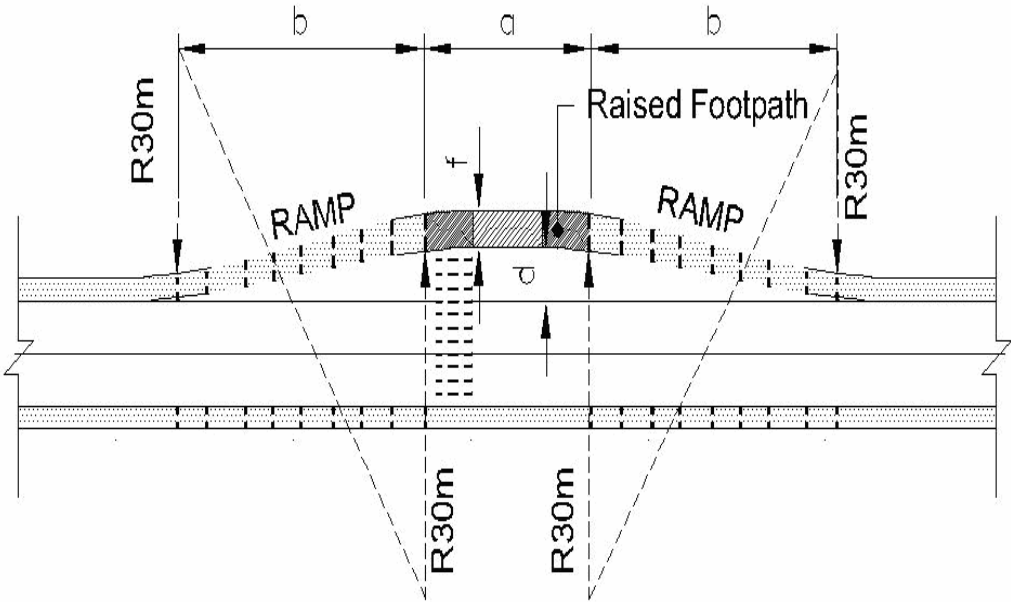


Variable Declaration

Busbay (2 Lane)

| SI No | Variable Description | Variable | Dimension | Unit |
|-------|-----------------------|----------|-----------|------------|
| 1 | BC Thickness | bc | 0.040 | m |
| 2 | DBM Thickness | dbm | 0.070 | m |
| 3 | WMM-I Thickness | wmm1 | 0.125 | m |
| 4 | WMM-II Thickness | wmm2 | 0.125 | m |
| 5 | GSB Thickness | gsb | 0.200 | m |
| 6 | SG Thickness | sg | 0.500 | m |
| 7 | Nos of Bus Bay | n | 4.000 | nos |
| 8 | Width Foothpath | f | 2.500 | m |
| 9 | Ref Drawing | a | 15.000 | m |
| 10 | Ref Drawing | b | 22.000 | m |
| 11 | Ref Drawing | d | 3.500 | m |
| 12 | GSB percentage Re-use | gsb_per | 36.630 | percentage |

Variable Declaration



TYPICAL LAYOUT OF PICK-UP BUS STOP ON HILLY AREA

Traffic Signs and Other Appurtenance

Summary Of Traffic Signs

| | | | |
|---|------|-----|-------------------------|
| Total No of Street Light= | 57 | Nos | Bill No- 06, Sl. No- 10 |
| Kilometer stones= | 13 | Nos | Bill No- 06, Sl. No- 2 |
| 5th Kilometer stones= | 3 | Nos | Bill No- 06, Sl. No- 1 |
| Boundary Stones= | 163 | Nos | Bill No- 06, Sl. No- 3 |
| Delineators (100 cm long and circular shaped)+Hazard marker = | 1887 | Nos | Bill No- 06, Sl. No- 8 |
| Road Stud= | 9537 | Nos | Bill No- 06, Sl. No- 9 |
| 900 mm Octagonal | 2 | Nos | Bill No- 06, Sl. No- 8 |
| 600 mm circular | 34 | Nos | Bill No- 06, Sl. No- 5 |
| 900 mm Tringular | 208 | Nos | Bill No- 06, Sl. No- 5 |
| 800 mm x 600 mm rectangular | 6 | Nos | Bill No- 06, Sl. No- 6 |
| Convex Mirror for Blind Curve | 20 | Nos | Bill No- 06, Sl. No- 16 |
| Rumble Strip= | 120 | sqm | Bill No- 06, Sl. No- 13 |



Traffic sign Calculation

| Sl No | Type | IRC-67 2012 Specification | Dimension | Chainage / Location | No | Remarks |
|-------|-------------------------------|---------------------------|------------------------|--------------------------|-----|---|
| 1 | Right Hand Side Curve | fig 15.02 | 900 mm Triangular | | 82 | @ 2per location |
| 2 | Left Hand Side Curve | fig 15.01 | 900 mm Triangular | | 82 | @ 2per location |
| 3 | Zig-Zag Curve | fig 15.07 | 900 mm Triangular | | 10 | @ 1per location |
| 4 | Reverse Curve | fig 15.06 & 15.05 | 900 mm Triangular | | 4 | @ 1per location |
| 5 | Built-up area | fig 15.35 | 900 mm Triangular | | 4 | @ 2per location |
| 6 | Side road | fig 15.09 & 15.10 | 900 mm Triangular | | 4 | @ 2per location |
| 7 | Pedestain Crossing | | 900 mm Triangular | side road, bus bay | 10 | @ 2per location |
| 8 | Bus Stop | fig 17.35 | 800x600 rectangular | | 6 | @ 2per location |
| 9 | Direction Sign | | <.0.9 sqm | Side road & cross road | 0 | @ 2per location |
| 10 | Direction Sign | | >0.9 sqm | bridge | 0 | @ 2per location |
| 11 | Hazard Marker | fig 15.76 & fig 15.77 | 900x300 mm rectangular | Culvert, Bridge Location | 268 | @ 4 per structure |
| 12 | Stop Sign | fig 14.01 | 900 mm Octagonal | Side road & cross road | 2 | @ 1 per location |
| 13 | Speed limit | fig 14.37 | 600mm Cicular | | 34 | @ 2per location |
| 14 | Rumble strip | fig 15.50 | 900 Triangular | | 6 | @ 2per location in Built Up Area & @ 1per location in Side Road |
| 15 | Hair pin Bend | fig 15.03 & 15.04 | 900 mm Triangular | | 6 | @ 2per location |
| 16 | Convex Mirror for Blind Curve | | | | 20 | @ 1per location |



Traffic sign Calculation

| SUMMARY | | | |
|--------------------------------|-----------|------------|-----|
| 90 cm equilateral triangle | | 208 | nos |
| Stop Sign (90 cm high octagon) | | 2 | nos |
| 60 cm circular | | 34 | nos |
| 80 cm x 60 cm rectangular | | 6 | nos |
| Direction Sign | <.0.9 sqm | 0 | nos |
| Direction Sign | >0.9 sqm | 0 | nos |
| Hazard Marker | | 268 | nos |
| Convex Mirror for Blind Curve | | 20 | nos |
| Rumble Strip | | 6 | nos |

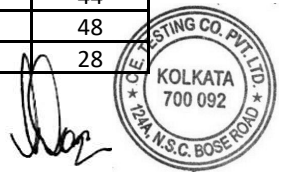
Calculation of km Stone, Hectometer Stone and Boundary Stone

| Item | Remarks | Nos |
|----------------------|---------------------------------------|------------|
| Kilometer stones | Total KM Stone | 13 |
| | No. of 5th KM stone | |
| 5th Kilometer stones | (km stone 5th, 10th , 15th, 20th etc) | 3 |
| Boundary stones | (Total Lengthx5x2) + 2x1 | 163 |

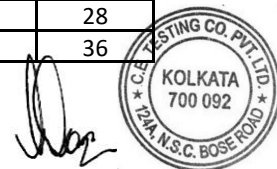


Quantity Calculation for Road Stud

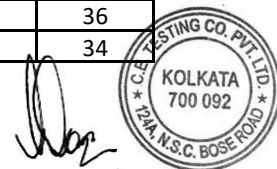
| SL. No. | Description of section | START | END | Transition length | START CH. | END CH. | Length | Radius | Spacing on Curve | Total On median (nos) | Total On shoulder |
|---------|--|-----------|-----------|----------------------|-----------|-----------|--------|--------|---------------------|--------------------------|----------------------|
| | | CHAINAGE | CHAINAGE | | Road Stud | Road stud | | | | | |
| 1 | Horizontal curve :: Curve radii upto 450 , spacing =6m. Curve radii 451 to 750 , spacing =9m. Curve radii 751 to 2000m & critical sections, spacing =18m | 33179.329 | 33242.990 | 15 | 33144.329 | 33277.990 | 133.66 | 125 | 6 | 23 | 46 |
| | | 33298.300 | 33310.902 | 40 | 33238.300 | 33370.902 | 132.60 | 50 | 6 | 23 | 46 |
| | | 33376.333 | 33381.052 | 25 | 33331.333 | 33426.052 | 94.72 | 85 | 6 | 16 | 32 |
| | | 33421.559 | 33439.373 | 15 | 33386.559 | 33474.373 | 87.81 | 80 | 6 | 15 | 30 |
| | | 33476.897 | 33504.064 | 20 | 33436.897 | 33544.064 | 107.17 | 50 | 6 | 18 | 36 |
| | | 33655.344 | 33672.701 | 25 | 33610.344 | 33717.701 | 107.36 | 80 | 6 | 18 | 36 |
| | | 33752.120 | 33785.079 | 30 | 33702.120 | 33835.079 | 132.96 | 30 | 6 | 23 | 46 |
| | | 33957.046 | 34070.777 | 20 | 33917.046 | 34110.777 | 193.73 | 100 | 6 | 33 | 66 |
| | | 34203.111 | 34312.421 | 20 | 34163.111 | 34352.421 | 189.31 | 300 | 6 | 32 | 64 |
| | | 34388.743 | 34472.936 | 20 | 34348.743 | 34512.936 | 164.19 | 100 | 6 | 28 | 56 |
| | | 34763.543 | 34787.737 | 30 | 34713.543 | 34837.737 | 124.19 | 30 | 6 | 21 | 42 |
| | | 34932.251 | 34981.814 | 15 | 34897.251 | 35016.814 | 119.56 | 100 | 6 | 20 | 40 |
| | | 35029.829 | 35070.458 | 25 | 34984.829 | 35115.458 | 130.63 | 40 | 6 | 22 | 44 |
| | | 35176.853 | 35183.720 | 20 | 35136.853 | 35223.720 | 86.87 | 45 | 6 | 15 | 30 |
| | | 35239.320 | 35266.671 | 20 | 35199.320 | 35306.671 | 107.35 | 25 | 6 | 18 | 36 |
| | | 35326.408 | 35337.929 | 25 | 35281.408 | 35382.929 | 101.52 | 40 | 6 | 17 | 34 |
| | | 35434.352 | 35441.017 | 25 | 35389.352 | 35486.017 | 96.67 | 40 | 6 | 17 | 34 |
| | | 35546.322 | 35588.043 | 20 | 35506.322 | 35628.043 | 121.72 | 20 | 6 | 21 | 42 |
| | | 35656.924 | 35659.920 | 30 | 35606.924 | 35709.920 | 103.00 | 30 | 6 | 18 | 36 |
| | | 35761.757 | 35780.953 | 25 | 35716.757 | 35825.953 | 109.20 | 40 | 6 | 19 | 38 |
| | | 35825.555 | 35872.890 | 15 | 35790.555 | 35907.890 | 117.33 | 125 | 6 | 20 | 40 |
| | | 35961.437 | 35997.102 | 15 | 35926.437 | 36032.102 | 105.67 | 180 | 6 | 18 | 36 |
| | | 36020.030 | 36051.192 | 20 | 35980.030 | 36091.192 | 111.16 | 20 | 6 | 19 | 38 |
| | | 36131.263 | 36196.475 | 35 | 36076.263 | 36251.475 | 175.21 | 60 | 6 | 30 | 60 |
| | | 36258.122 | 36275.266 | 15 | 36223.122 | 36310.266 | 87.14 | 125 | 6 | 15 | 30 |
| | | 36311.546 | 36329.715 | 20 | 36271.546 | 36369.715 | 98.17 | 100 | 6 | 17 | 34 |
| | | 36408.578 | 36435.907 | 20 | 36368.578 | 36475.907 | 107.33 | 25 | 6 | 18 | 36 |
| | | 36529.721 | 36577.429 | 20 | 36489.721 | 36617.429 | 127.71 | 23 | 6 | 22 | 44 |
| | | 36628.840 | 36640.047 | 20 | 36588.840 | 36680.047 | 91.21 | 50 | 6 | 16 | 32 |
| | | 36679.370 | 36690.790 | 15 | 36644.370 | 36725.790 | 81.42 | 70 | 6 | 14 | 28 |
| | | 36751.398 | 36779.369 | 30 | 36701.398 | 36829.369 | 127.97 | 30 | 6 | 22 | 44 |
| | | 36921.348 | 36953.778 | 35 | 36866.348 | 37008.778 | 142.43 | 60 | 6 | 24 | 48 |
| | | 37012.361 | 37025.618 | 15 | 36977.361 | 37060.618 | 83.26 | 60 | 6 | 14 | 28 |



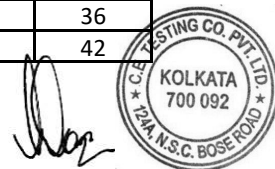
| SL. No. | Description of section | START | END | Transition length | START CH. | END CH. | Length | Radius | Spacing on Curve | Total On median (nos) | Total On shoulder |
|---------|--|-----------|-----------|----------------------|-----------|-----------|--------|--------|---------------------|--------------------------|----------------------|
| | | CHAINAGE | CHAINAGE | | Road Stud | Road stud | | | | | |
| | Horizontal curve :: Curve radii upto 450 , spacing =6m. Curve radii 451 to 750 , spacing =9m. Curve radii 751 to 2000m & critical sections, spacing =18m | 37073.044 | 37087.065 | 20 | 37033.044 | 37127.065 | 94.02 | 20 | 6 | 16 | 32 |
| | | 37160.135 | 37173.638 | 20 | 37120.135 | 37213.638 | 93.50 | 100 | 6 | 16 | 32 |
| | | 37254.113 | 37259.932 | 15 | 37219.113 | 37294.932 | 75.82 | 180 | 6 | 13 | 26 |
| | | 37320.612 | 37348.389 | 25 | 37275.612 | 37393.389 | 117.78 | 40 | 6 | 20 | 40 |
| | | 37403.351 | 37414.279 | 20 | 37363.351 | 37454.279 | 90.93 | 100 | 6 | 16 | 32 |
| | | 37495.420 | 37509.632 | 25 | 37450.420 | 37554.632 | 104.21 | 40 | 6 | 18 | 36 |
| | | 37561.255 | 37566.976 | 25 | 37516.255 | 37611.976 | 95.72 | 40 | 6 | 16 | 32 |
| | | 37613.461 | 37631.751 | 20 | 37573.461 | 37671.751 | 98.29 | 50 | 6 | 17 | 34 |
| | | 37745.934 | 37765.516 | 30 | 37695.934 | 37815.516 | 119.58 | 30 | 6 | 20 | 40 |
| | | 37834.907 | 37857.204 | 35 | 37779.907 | 37912.204 | 132.30 | 60 | 6 | 23 | 46 |
| | | 37983.109 | 37990.053 | 20 | 37943.109 | 38030.053 | 86.94 | 100 | 6 | 15 | 30 |
| | | 38031.089 | 38047.105 | 20 | 37991.089 | 38087.105 | 96.02 | 50 | 6 | 17 | 34 |
| | | 38087.095 | 38091.324 | 15 | 38052.095 | 38126.324 | 74.23 | 60 | 6 | 13 | 26 |
| | | 38165.105 | 38206.996 | 15 | 38130.105 | 38241.996 | 111.89 | 70 | 6 | 19 | 38 |
| | | 38251.095 | 38255.735 | 25 | 38206.095 | 38300.735 | 94.64 | 40 | 6 | 16 | 32 |
| | | 38297.747 | 38314.942 | 15 | 38262.747 | 38349.942 | 87.19 | 70 | 6 | 15 | 30 |
| | | 38345.160 | 38361.819 | 15 | 38310.160 | 38396.819 | 86.66 | 100 | 6 | 15 | 30 |
| | | 38400.199 | 38419.049 | 15 | 38365.199 | 38454.049 | 88.85 | 125 | 6 | 15 | 30 |
| | | 38506.410 | 38510.850 | 25 | 38461.410 | 38555.850 | 94.44 | 40 | 6 | 16 | 32 |
| | | 38568.051 | 38579.465 | 30 | 38518.051 | 38629.465 | 111.41 | 30 | 6 | 19 | 38 |
| | | 38640.765 | 38651.840 | 25 | 38595.765 | 38696.840 | 101.07 | 40 | 6 | 17 | 34 |
| | | 38762.694 | 38884.476 | 15 | 38727.694 | 38919.476 | 191.78 | 180 | 6 | 32 | 64 |
| | | 38930.050 | 38958.109 | 25 | 38885.050 | 39003.109 | 118.06 | 80 | 6 | 20 | 40 |
| | | 39036.125 | 39050.706 | 35 | 38981.125 | 39105.706 | 124.58 | 60 | 6 | 21 | 42 |
| | | 39112.098 | 39128.215 | 25 | 39067.098 | 39173.215 | 106.12 | 40 | 6 | 18 | 36 |
| | | 39178.993 | 39197.858 | 20 | 39138.993 | 39237.858 | 98.86 | 20 | 6 | 17 | 34 |
| | Horizontal curve :: | 39281.278 | 39285.111 | 25 | 39236.278 | 39330.111 | 93.83 | 80 | 6 | 16 | 32 |
| | | 39394.167 | 39407.548 | 15 | 39359.167 | 39442.548 | 83.38 | 180 | 6 | 14 | 28 |
| | | 39488.382 | 39509.644 | 35 | 39433.382 | 39564.644 | 131.26 | 60 | 6 | 22 | 44 |
| | | 39584.593 | 39608.562 | 15 | 39549.593 | 39643.562 | 93.97 | 150 | 6 | 16 | 32 |
| | | 39655.180 | 39677.665 | 30 | 39605.180 | 39727.665 | 122.49 | 30 | 6 | 21 | 42 |
| | | 39765.278 | 39772.019 | 15 | 39730.278 | 39807.019 | 76.74 | 125 | 6 | 13 | 26 |
| | | 39827.232 | 39839.529 | 15 | 39792.232 | 39874.529 | 82.30 | 125 | 6 | 14 | 28 |
| | | 39889.359 | 39905.748 | 25 | 39844.359 | 39950.748 | 106.39 | 80 | 6 | 18 | 36 |
| | | 39950.903 | 39964.189 | 20 | 39910.903 | 40004.189 | 93.29 | 100 | 6 | 16 | 32 |
| | | 40040.327 | 40042.182 | 20 | 40000.327 | 40082.182 | 81.86 | 100 | 6 | 14 | 28 |
| | | 40093.609 | 40101.378 | 30 | 40043.609 | 40151.378 | 107.77 | 70 | 6 | 18 | 36 |



| SL. No. | Description of section | START | END | Transition length | START CH. | END CH. | Length | Radius | Spacing on Curve | Total On median (nos) | Total On shoulder |
|---------|---|-----------|-----------|----------------------|-----------|-----------|--------|--------|---------------------|--------------------------|----------------------|
| | | CHAINAGE | CHAINAGE | | Road Stud | Road stud | | | | | |
| | Curve radii upto 450 , spacing =6m. | 40211.910 | 40224.263 | 15 | 40176.910 | 40259.263 | 82.35 | 180 | 6 | 14 | 28 |
| | | 40298.910 | 40329.730 | 30 | 40248.910 | 40379.730 | 130.82 | 30 | 6 | 22 | 44 |
| | | 40380.338 | 40428.192 | 15 | 40345.338 | 40463.192 | 117.85 | 60 | 6 | 20 | 40 |
| | Curve radii 451 to 750 , spacing =9m. | 40509.860 | 40513.287 | 25 | 40464.860 | 40558.287 | 93.43 | 40 | 6 | 16 | 32 |
| | | 40555.630 | 40564.089 | 15 | 40520.630 | 40599.089 | 78.46 | 60 | 6 | 14 | 28 |
| | | 40613.584 | 40634.415 | 30 | 40563.584 | 40684.415 | 120.83 | 70 | 6 | 21 | 42 |
| | Curve radii 751 to 2000m & critical sections, spacing =18m | 40769.712 | 40794.371 | 20 | 40729.712 | 40834.371 | 104.66 | 100 | 6 | 18 | 36 |
| | | 40883.532 | 40887.641 | 30 | 40833.532 | 40937.641 | 104.11 | 70 | 6 | 18 | 36 |
| | | 40943.147 | 40954.422 | 25 | 40898.147 | 40999.422 | 101.28 | 80 | 6 | 17 | 34 |
| | | 40995.949 | 41001.063 | 15 | 40960.949 | 41036.063 | 75.11 | 60 | 6 | 13 | 26 |
| | | 41041.512 | 41044.563 | 25 | 40996.512 | 41089.563 | 93.05 | 40 | 6 | 16 | 32 |
| | | 41103.059 | 41106.171 | 30 | 41053.059 | 41156.171 | 103.11 | 30 | 6 | 18 | 36 |
| | | 41165.030 | 41178.404 | 15 | 41130.030 | 41213.404 | 83.37 | 70 | 6 | 14 | 28 |
| | | 41226.729 | 41261.497 | 15 | 41191.729 | 41296.497 | 104.77 | 300 | 6 | 18 | 36 |
| | | 41310.705 | 41317.863 | 30 | 41260.705 | 41367.863 | 107.16 | 70 | 6 | 18 | 36 |
| | | 41388.576 | 41405.390 | 40 | 41328.576 | 41465.390 | 136.81 | 50 | 6 | 23 | 46 |
| | | 41476.152 | 41489.946 | 30 | 41426.152 | 41539.946 | 113.79 | 70 | 6 | 19 | 38 |
| | | 41644.752 | 41685.230 | 15 | 41609.752 | 41720.230 | 110.48 | 125 | 6 | 19 | 38 |
| | | 41723.378 | 41760.050 | 15 | 41688.378 | 41795.050 | 106.67 | 300 | 6 | 18 | 36 |
| | | 41840.430 | 41872.856 | 25 | 41795.430 | 41917.856 | 122.43 | 40 | 6 | 21 | 42 |
| | Horizontal curve :: | 41918.827 | 41928.186 | 20 | 41878.827 | 41968.186 | 89.36 | 50 | 6 | 15 | 30 |
| | | 41965.053 | 41973.935 | 15 | 41930.053 | 42008.935 | 78.88 | 60 | 6 | 14 | 28 |
| | | 42051.418 | 42071.570 | 20 | 42011.418 | 42111.570 | 100.15 | 50 | 6 | 17 | 34 |
| | | 42116.472 | 42125.721 | 15 | 42081.472 | 42160.721 | 79.25 | 60 | 6 | 14 | 28 |
| | | 42209.279 | 42230.260 | 20 | 42169.279 | 42270.260 | 100.98 | 50 | 6 | 17 | 34 |
| | | 42282.859 | 42302.589 | 15 | 42247.859 | 42337.589 | 89.73 | 125 | 6 | 15 | 30 |
| | | 42379.951 | 42460.865 | 30 | 42329.951 | 42510.865 | 180.91 | 36 | 6 | 31 | 62 |
| | | 42583.207 | 42603.629 | 40 | 42523.207 | 42663.629 | 140.42 | 50 | 6 | 24 | 48 |
| | | 42706.026 | 42717.788 | 35 | 42651.026 | 42772.788 | 121.76 | 60 | 6 | 21 | 42 |
| | | 42800.191 | 42856.908 | 15 | 42765.191 | 42891.908 | 126.72 | 80 | 6 | 22 | 44 |
| | | 42889.626 | 42915.530 | 15 | 42854.626 | 42950.530 | 95.90 | 30 | 6 | 16 | 32 |
| | Curve radii upto 450 , spacing =6m. | 42947.197 | 42957.738 | 15 | 42912.197 | 42992.738 | 80.54 | 30 | 6 | 14 | 28 |
| | | 42990.473 | 43001.327 | 15 | 42955.473 | 43036.327 | 80.85 | 40 | 6 | 14 | 28 |
| | | 43101.114 | 43127.522 | 20 | 43061.114 | 43167.522 | 106.41 | 50 | 6 | 18 | 36 |
| | Curve radii 451 to 750 , spacing =9m. | 43171.986 | 43183.998 | 15 | 43136.986 | 43218.998 | 82.01 | 60 | 6 | 14 | 28 |
| | | 43230.980 | 43247.495 | 25 | 43185.980 | 43292.495 | 106.51 | 40 | 6 | 18 | 36 |
| | | 43329.439 | 43347.051 | 20 | 43289.439 | 43387.051 | 97.61 | 20 | 6 | 17 | 34 |



| SL. No. | Description of section | START | END | Transition length | START CH. | END CH. | Length | Radius | Spacing on Curve | Total On median (nos) | Total On shoulder |
|---------|--|-----------|-----------|----------------------|-----------|-----------|--------|--------|---------------------|--------------------------|----------------------|
| | | CHAINAGE | CHAINAGE | | Road Stud | Road stud | | | | | |
| | Curve radii 751 to 2000m & critical sections, spacing =18m | 43384.161 | 43402.190 | 15 | 43349.161 | 43437.190 | 88.03 | 30 | 6 | 15 | 30 |
| | | 43438.212 | 43457.104 | 20 | 43398.212 | 43497.104 | 98.89 | 50 | 6 | 17 | 34 |
| | | 43492.309 | 43496.142 | 15 | 43457.309 | 43531.142 | 73.83 | 60 | 6 | 13 | 26 |
| | | 43552.300 | 43606.635 | 20 | 43512.300 | 43646.635 | 134.33 | 100 | 6 | 23 | 46 |
| | | 43647.312 | 43672.253 | 15 | 43612.312 | 43707.253 | 94.94 | 125 | 6 | 16 | 32 |
| | | 43719.806 | 43762.826 | 15 | 43684.806 | 43797.826 | 113.02 | 300 | 6 | 19 | 38 |
| | | 43769.708 | 43825.131 | 15 | 43734.708 | 43860.131 | 125.42 | 300 | 6 | 21 | 42 |
| | | 43925.640 | 44002.732 | 15 | 43890.640 | 44037.732 | 147.09 | 200 | 6 | 25 | 50 |
| | | 44177.211 | 44200.003 | 25 | 44132.211 | 44245.003 | 112.79 | 40 | 6 | 19 | 38 |
| | | 44251.626 | 44254.621 | 25 | 44206.626 | 44299.621 | 93.00 | 40 | 6 | 16 | 32 |
| | | 44304.773 | 44328.268 | 20 | 44264.773 | 44368.268 | 103.49 | 100 | 6 | 18 | 36 |
| | | 44375.083 | 44403.516 | 20 | 44335.083 | 44443.516 | 108.43 | 100 | 6 | 19 | 38 |
| | | 44448.946 | 44462.488 | 20 | 44408.946 | 44502.488 | 93.54 | 100 | 6 | 16 | 32 |
| | | 44531.593 | 44606.439 | 30 | 44481.593 | 44656.439 | 174.85 | 70 | 6 | 30 | 60 |
| | Horizontal curve :: | 44662.352 | 44669.759 | 25 | 44617.352 | 44714.759 | 97.41 | 40 | 6 | 17 | 34 |
| | | 44716.475 | 44738.033 | 20 | 44676.475 | 44778.033 | 101.56 | 50 | 6 | 17 | 34 |
| | | 44806.172 | 44835.233 | 20 | 44766.172 | 44875.233 | 109.06 | 50 | 6 | 19 | 38 |
| | | 44888.427 | 44912.477 | 30 | 44838.427 | 44962.477 | 124.05 | 30 | 6 | 21 | 42 |
| | | 45030.243 | 45045.842 | 25 | 44985.243 | 45090.842 | 105.60 | 40 | 6 | 18 | 36 |
| | | 45101.062 | 45107.726 | 25 | 45056.062 | 45152.726 | 96.66 | 40 | 6 | 17 | 34 |
| | | 45164.111 | 45241.470 | 15 | 45129.111 | 45276.470 | 147.36 | 125 | 6 | 25 | 50 |
| | | 45356.059 | 45385.552 | 20 | 45316.059 | 45425.552 | 109.49 | 100 | 6 | 19 | 38 |
| | | 45447.560 | 45511.304 | 40 | 45387.560 | 45571.304 | 183.74 | 50 | 6 | 31 | 62 |
| | | 45598.076 | 45687.815 | 40 | 45538.076 | 45747.815 | 209.74 | 300 | 6 | 35 | 70 |
| | | 45827.498 | 45829.940 | 30 | 45777.498 | 45879.940 | 102.44 | 30 | 6 | 18 | 36 |
| | | 45880.360 | 45884.971 | 15 | 45845.360 | 45919.971 | 74.61 | 60 | 6 | 13 | 26 |
| | | 45927.064 | 45955.754 | 15 | 45892.064 | 45990.754 | 98.69 | 125 | 6 | 17 | 34 |
| | Curve radii upto 450 , spacing =6m. | 46061.398 | 46107.570 | 25 | 46016.398 | 46152.570 | 136.17 | 80 | 6 | 23 | 46 |
| | | 46161.957 | 46241.476 | 25 | 46116.957 | 46286.476 | 169.52 | 80 | 6 | 29 | 58 |
| | | 46308.354 | 46320.280 | 35 | 46253.354 | 46375.280 | 121.93 | 60 | 6 | 21 | 42 |
| | Curve radii 451 to 750 , spacing =9m. | 46427.859 | 46443.467 | 15 | 46392.859 | 46478.467 | 85.61 | 125 | 6 | 15 | 30 |
| | | 46509.173 | 46529.410 | 40 | 46449.173 | 46589.410 | 140.24 | 50 | 6 | 24 | 48 |
| | | 46613.463 | 46663.064 | 40 | 46553.463 | 46723.064 | 169.60 | 50 | 6 | 29 | 58 |
| | Curve radii 751 to 2000m & critical sections, spacing =18m | 46734.977 | 46746.083 | 20 | 46694.977 | 46786.083 | 91.11 | 50 | 6 | 16 | 32 |
| | | 46827.894 | 46840.829 | 25 | 46782.894 | 46885.829 | 102.93 | 80 | 6 | 18 | 36 |
| | | 46904.777 | 46918.760 | 25 | 46859.777 | 46963.760 | 103.98 | 40 | 6 | 18 | 36 |
| | | 46974.563 | 47015.107 | 20 | 46934.563 | 47055.107 | 120.54 | 50 | 6 | 21 | 42 |



| SL. No. | Description of section | START | END | Transition length | START CH. | END CH. | Length | Radius | Spacing on Curve | Total On median (nos) | Total On shoulder |
|---------|---|-----------|-----------|----------------------|-----------|-----------|--------|--------|---------------------|--------------------------|----------------------|
| | | CHAINAGE | CHAINAGE | | Road Stud | Road stud | | | | | |
| | | 47055.366 | 47062.680 | 20 | 47015.366 | 47102.680 | 87.31 | 50 | 6 | 15 | 30 |
| | | 47165.217 | 47175.972 | 25 | 47120.217 | 47220.972 | 100.76 | 180 | 6 | 17 | 34 |
| | | 47286.787 | 47380.650 | 30 | 47236.787 | 47430.650 | 193.86 | 70 | 6 | 33 | 66 |
| | | 47445.736 | 47468.098 | 20 | 47405.736 | 47508.098 | 102.36 | 20 | 6 | 18 | 36 |
| | | 47512.293 | 47596.747 | 15 | 47477.293 | 47631.747 | 154.45 | 80 | 6 | 26 | 52 |
| | | 47650.154 | 47677.130 | 20 | 47610.154 | 47717.130 | 106.98 | 20 | 6 | 18 | 36 |
| | | 47750.730 | 47771.777 | 15 | 47715.730 | 47806.777 | 91.05 | 125 | 6 | 16 | 32 |
| | | 47807.450 | 47822.217 | 20 | 47767.450 | 47862.217 | 94.77 | 100 | 6 | 16 | 32 |
| | Horizontal curve :: | 47869.172 | 47881.084 | 25 | 47824.172 | 47926.084 | 101.91 | 80 | 6 | 17 | 34 |
| | | 47938.031 | 47979.660 | 25 | 47893.031 | 48024.660 | 131.63 | 40 | 6 | 22 | 44 |
| | Curve radii upto 450 , spacing =6m. | 48055.476 | 48076.923 | 30 | 48005.476 | 48126.923 | 121.45 | 30 | 6 | 21 | 42 |
| | | 48131.390 | 48162.748 | 20 | 48091.390 | 48202.748 | 111.36 | 20 | 6 | 19 | 38 |
| | | 48238.635 | 48249.554 | 20 | 48198.635 | 48289.554 | 90.92 | 50 | 6 | 16 | 32 |
| | | 48307.110 | 48309.120 | 25 | 48262.110 | 48354.120 | 92.01 | 40 | 6 | 16 | 32 |
| | Curve radii 451 to 750 , spacing =9m. | 48354.406 | 48368.524 | 20 | 48314.406 | 48408.524 | 94.12 | 50 | 6 | 16 | 32 |
| | | 48489.563 | 48499.620 | 40 | 48429.563 | 48559.620 | 130.06 | 50 | 6 | 22 | 44 |
| | | 48599.752 | 48628.903 | 20 | 48559.752 | 48668.903 | 109.15 | 20 | 6 | 19 | 38 |
| | | 48668.489 | 48721.135 | 15 | 48633.489 | 48756.135 | 122.65 | 30 | 6 | 21 | 42 |
| | Curve radii 751 to 2000m & critical sections, spacing =18m | 48873.609 | 48895.341 | 20 | 48833.609 | 48935.341 | 101.73 | 100 | 6 | 17 | 34 |
| | | 48976.010 | 48983.449 | 25 | 48931.010 | 49028.449 | 97.44 | 80 | 6 | 17 | 34 |
| | | 49069.760 | 49083.851 | 25 | 49024.760 | 49128.851 | 104.09 | 80 | 6 | 18 | 36 |
| | | | | | | | | | | | |
| 2 | Major Bridge | Structure | | | | | 250.00 | | 9 | 28 | 56 |
| 2 | Builtup sections | | | | | | 655 | | 18 | 37 | 74 |
| | | | | | | | | | | 3179 | 6358 |

Total no. of Road stud = 9537 no.



CALCULATION FOR DELINEATOR

In horizontal Curves (radius > 1000m)

| HIP / CURVE NO. | ELEMENT | START CHAINAGE | END CHAINAGE | RADIUS (M) | Spacing on Curve (S) | HAND OF ARC | Length | Nos in outside curve (s) | Nos in inner curve (2s) | 1.8s beginning of curve | 1.8s end of curve | 3s beginning of curve | 3s end of curve | 6s beginning of curve | 6s end of curve |
|-----------------------|---------|-------------------|-----------------|---------------|-------------------------|----------------|---------|--------------------------------|----------------------------------|-------------------------------|----------------------|-----------------------------|--------------------|-----------------------------|--------------------|
| | | | | | as per IRC:79- 1981 | | | | | | | | | | |
| 209 | Arc | 33179.329 | 33242.990 | 125 | 12 | Right | 63.661 | 6 | 3 | 1 | 1 | 1 | 0 | 1 | 0 |
| 210 | Arc | 33298.300 | 33310.902 | 50 | 8 | Left | 12.602 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 211 | Arc | 33376.333 | 33381.052 | 85 | 8 | Left | 4.719 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 212 | Arc | 33421.559 | 33439.373 | 80 | 8 | Right | 17.814 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 213 | Arc | 33476.897 | 33504.064 | 50 | 8 | Left | 27.167 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| 214 | Arc | 33655.344 | 33672.701 | 80 | 8 | Left | 17.357 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| 215 | Arc | 33752.120 | 33785.079 | 30 | 6 | Right | 32.959 | 6 | 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| 216 | Arc | 33957.046 | 34070.777 | 100 | 12 | Left | 113.731 | 10 | 5 | 1 | 1 | 1 | 1 | 1 | 0 |
| 217 | Arc | 34203.111 | 34312.421 | 300 | 25 | Right | 109.310 | 5 | 3 | 1 | 0 | 1 | 0 | 1 | 0 |
| 218 | Arc | 34388.743 | 34472.936 | 100 | 12 | Right | 84.193 | 8 | 4 | 1 | 1 | 1 | 1 | 1 | 1 |
| 219 | Arc | 34763.543 | 34787.737 | 30 | 6 | Right | 24.194 | 5 | 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| 220 | Arc | 34932.251 | 34981.814 | 100 | 12 | Right | 49.563 | 5 | 3 | 1 | 1 | 1 | 0 | 1 | 0 |
| 221 | Arc | 35029.829 | 35070.458 | 40 | 6 | Left | 40.629 | 7 | 4 | 1 | 1 | 1 | 1 | 1 | 0 |
| 222 | Arc | 35176.853 | 35183.720 | 45 | 6 | Left | 6.867 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 223 | Arc | 35239.320 | 35266.671 | 25 | 8 | Right | 27.351 | 4 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 224 | Arc | 35326.408 | 35337.929 | 40 | 6 | Left | 11.521 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 225 | Arc | 35434.352 | 35441.017 | 40 | 6 | Right | 6.665 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 226 | Arc | 35546.322 | 35588.043 | 20 | 6 | Left | 41.721 | 7 | 4 | 1 | 1 | 1 | 1 | 1 | 0 |
| 227 | Arc | 35656.924 | 35659.920 | 30 | 6 | Right | 2.996 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 228 | Arc | 35761.757 | 35780.953 | 40 | 6 | Right | 19.196 | 4 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 229 | Arc | 35825.555 | 35872.890 | 125 | 12 | Right | 47.335 | 4 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 230 | Arc | 35961.437 | 35997.102 | 180 | 12 | Right | 35.665 | 3 | 2 | 1 | 0 | 1 | 0 | 1 | 0 |
| 231 | Arc | 36020.030 | 36051.192 | 20 | 6 | Left | 31.162 | 6 | 3 | 1 | 1 | 1 | 1 | 1 | 0 |
| 232 | Arc | 36131.263 | 36196.475 | 60 | 8 | Right | 65.212 | 9 | 5 | 1 | 1 | 1 | 0 | 1 | 0 |
| 233 | Arc | 36258.122 | 36275.266 | 125 | 12 | Right | 17.144 | 2 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 234 | Arc | 36311.546 | 36329.715 | 100 | 12 | Left | 18.169 | 2 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 235 | Arc | 36408.578 | 36435.907 | 25 | 8 | Left | 27.329 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| 236 | Arc | 36529.721 | 36577.429 | 23 | 6 | Right | 47.708 | 8 | 4 | 1 | 1 | 1 | 0 | 1 | 0 |
| 237 | Arc | 36628.840 | 36640.047 | 50 | 8 | Left | 11.207 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 238 | Arc | 36679.370 | 36690.790 | 70 | 8 | Left | 11.420 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 239 | Arc | 36751.398 | 36779.369 | 30 | 6 | Right | 27.971 | 5 | 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| 240 | Arc | 36921.348 | 36953.778 | 60 | 8 | Left | 32.430 | 5 | 3 | 1 | 1 | 1 | 0 | 1 | 0 |
| 241 | Arc | 37012.361 | 37025.618 | 60 | 8 | Left | 13.257 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 242 | Arc | 37073.044 | 37087.065 | 20 | 6 | Right | 14.021 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| 243 | Arc | 37160.135 | 37173.638 | 100 | 12 | Left | 13.503 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 244 | Arc | 37254.113 | 37259.932 | 180 | 12 | Right | 5.819 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 245 | Arc | 37320.612 | 37348.389 | 40 | 6 | Left | 27.777 | 5 | 3 | 1 | 1 | 1 | 0 | 1 | 0 |
| 246 | Arc | 37403.351 | 37414.279 | 100 | 12 | Right | 10.928 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 247 | Arc | 37495.420 | 37509.632 | 40 | 6 | Left | 14.212 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 248 | Arc | 37561.255 | 37566.976 | 40 | 6 | Right | 5.721 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 249 | Arc | 37613.461 | 37631.751 | 50 | 8 | Left | 18.290 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| 250 | Arc | 37745.934 | 37765.516 | 30 | 6 | Right | 19.582 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| 251 | Arc | 37834.907 | 37857.204 | 60 | 8 | Left | 22.297 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| 252 | Arc | 37983.109 | 37990.053 | 100 | 12 | Right | 6.944 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 253 | Arc | 38031.089 | 38047.105 | 50 | 8 | Left | 16.016 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 254 | Arc | 38087.095 | 38091.324 | 60 | 8 | Right | 4.229 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 255 | Arc | 38165.105 | 38206.996 | 70 | 8 | Left | 41.891 | 6 | 3 | 1 | 1 | 1 | 0 | 1 | 0 |
| 256 | Arc | 38251.095 | 38255.735 | 40 | 6 | Right | 4.640 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 257 | Arc | 38297.747 | 38314.942 | 70 | 8 | Left | 17.195 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 258 | Arc | 38345.160 | 38361.819 | 100 | 12 | Right | 16.659 | 2 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| 259 | Arc | 38400.199 | 38419.049 | 125 | 12 | Left | 18.850 | 2 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 260 | Arc | 38506.410 | 38510.850 | 40 | 6 | Right | 4.440 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 261 | Arc | 38568.051 | 38579.465 | 30 | 6 | Left | 11.414 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 262 | Arc | 38640.765 | 38651.840 | 40 | 6 | Right | 11.075 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 263 | Arc | 38762.694 | 38884.476 | 180 | 12 | Left | 121.782 | 11 | 6 | 1 | 1 | 1 | 0 | 1 | 0 |
| 264 | Arc | 38930.050 | 38958.109 | 80 | 8 | Right | 28.059 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| 265 | Arc | 39036.125 | 39050.706 | 60 | 8 | Left | 14.581 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 266 | Arc | 39112.098 | 39128.215 | 40 | 6 | Right | 16.117 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |



| HIP / CURVE NO. | ELEMENT | START CHAINAGE | END CHAINAGE | RADIUS (M) | Spacing on Curve (S) | HAND OF ARC | Length | Nos in outside curve (s) | Nos in inner curve (2s) | 1.8s beginning of curve | 1.8s end of curve | 3s beginning of curve | 3s end of curve | 6s beginning of curve | 6s end of curve |
|-----------------------|---------|-------------------|-----------------|---------------|-------------------------|----------------|--------|--------------------------------|----------------------------------|-------------------------------|----------------------|-----------------------------|--------------------|-----------------------------|--------------------|
| | | | | | as per IRC:79- 1981 | | | | | | | | | | |
| 267 | Arc | 39178.993 | 39197.858 | 20 | 6 | Left | 18.865 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| 268 | Arc | 39281.278 | 39285.111 | 80 | 8 | Left | 3.833 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 269 | Arc | 39394.167 | 39407.548 | 180 | 12 | Right | 13.381 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 270 | Arc | 39488.382 | 39509.644 | 60 | 8 | Right | 21.262 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 271 | Arc | 39584.593 | 39608.562 | 150 | 12 | Left | 23.969 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 272 | Arc | 39655.180 | 39677.665 | 30 | 6 | Right | 22.485 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| 273 | Arc | 39765.278 | 39772.019 | 125 | 12 | Left | 6.741 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 274 | Arc | 39827.232 | 39839.529 | 125 | 12 | Right | 12.297 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 275 | Arc | 39889.359 | 39905.748 | 80 | 8 | Left | 16.389 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 276 | Arc | 39950.903 | 39964.189 | 100 | 12 | Right | 13.286 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 277 | Arc | 40040.327 | 40042.182 | 100 | 12 | Right | 1.855 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 278 | Arc | 40093.609 | 40101.378 | 70 | 8 | Left | 7.769 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 279 | Arc | 40211.910 | 40224.263 | 180 | 12 | Left | 12.353 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 280 | Arc | 40298.910 | 40329.730 | 30 | 6 | Left | 30.820 | 6 | 3 | 1 | 1 | 1 | 0 | 1 | 0 |
| 281 | Arc | 40380.338 | 40428.192 | 60 | 8 | Right | 47.854 | 6 | 3 | 1 | 1 | 1 | 1 | 1 | 0 |
| 282 | Arc | 40509.860 | 40513.287 | 40 | 6 | Left | 3.427 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 283 | Arc | 40555.630 | 40564.089 | 60 | 8 | Right | 8.459 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 284 | Arc | 40613.584 | 40634.415 | 70 | 8 | Left | 20.831 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| 285 | Arc | 40769.712 | 40794.371 | 100 | 12 | Right | 24.659 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 286 | Arc | 40883.532 | 40887.641 | 70 | 8 | Right | 4.109 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 287 | Arc | 40943.147 | 40954.422 | 80 | 8 | Left | 11.275 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 288 | Arc | 40995.949 | 41001.063 | 60 | 8 | Right | 5.114 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 289 | Arc | 41041.512 | 41044.563 | 40 | 6 | Left | 3.051 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 290 | Arc | 41103.059 | 41106.171 | 30 | 6 | Right | 3.112 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 291 | Arc | 41165.030 | 41178.404 | 70 | 8 | Left | 13.374 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 292 | Arc | 41226.729 | 41261.497 | 300 | 25 | Right | 34.768 | 2 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| 293 | Arc | 41310.705 | 41317.863 | 70 | 8 | Right | 7.158 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 294 | Arc | 41388.576 | 41405.390 | 50 | 8 | Left | 16.814 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 295 | Arc | 41476.152 | 41489.946 | 70 | 8 | Right | 13.794 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 296 | Arc | 41644.752 | 41685.230 | 125 | 12 | Left | 40.478 | 4 | 2 | 1 | 0 | 1 | 0 | 1 | 0 |
| 297 | Arc | 41723.378 | 41760.050 | 300 | 25 | Right | 36.672 | 2 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| 298 | Arc | 41840.430 | 41872.856 | 40 | 6 | Left | 32.426 | 6 | 3 | 1 | 1 | 1 | 0 | 1 | 0 |
| 299 | Arc | 41918.827 | 41928.186 | 50 | 8 | Right | 9.359 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 300 | Arc | 41965.053 | 41973.935 | 60 | 8 | Left | 8.882 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 301 | Arc | 42051.418 | 42071.570 | 50 | 8 | Right | 20.152 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 302 | Arc | 42116.472 | 42125.721 | 60 | 8 | Left | 9.249 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 303 | Arc | 42209.279 | 42230.260 | 50 | 8 | Right | 20.981 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 304 | Arc | 42282.859 | 42302.589 | 125 | 12 | Left | 19.730 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |



| HIP / CURVE NO. | ELEMENT | START CHAINAGE | END CHAINAGE | RADIUS (M) | Spacing on Curve (S) | HAND OF ARC | Length | Nos in outside curve (s) | Nos in inner curve (2s) | 1.8s beginning of curve | 1.8s end of curve | 3s beginning of curve | 3s end of curve | 6s beginning of curve | 6s end of curve |
|-----------------------|---------|-------------------|-----------------|---------------|-------------------------|----------------|--------|--------------------------------|----------------------------------|-------------------------------|----------------------|-----------------------------|--------------------|-----------------------------|--------------------|
| | | | | | as per IRC:79- 1981 | | | | | | | | | | |
| 305 | Arc | 42379.951 | 42460.865 | 36 | 6 | Right | 80.914 | 14 | 7 | 1 | 1 | 1 | 1 | 1 | 0 |
| 306 | Arc | 42583.207 | 42603.629 | 50 | 8 | Left | 20.422 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| 307 | Arc | 42706.026 | 42717.788 | 60 | 8 | Right | 11.762 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 308 | Arc | 42800.191 | 42856.908 | 80 | 8 | Left | 56.717 | 8 | 4 | 1 | 1 | 1 | 0 | 1 | 0 |
| 309 | Arc | 42889.626 | 42915.530 | 30 | 6 | Right | 25.904 | 5 | 3 | 1 | 1 | 1 | 0 | 1 | 0 |
| 310 | Arc | 42947.197 | 42957.738 | 30 | 6 | Left | 10.541 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 311 | Arc | 42990.473 | 43001.327 | 40 | 6 | Right | 10.854 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 312 | Arc | 43101.114 | 43127.522 | 50 | 8 | Right | 26.408 | 4 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 313 | Arc | 43171.986 | 43183.998 | 60 | 8 | Left | 12.012 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 314 | Arc | 43230.980 | 43247.495 | 40 | 6 | Left | 16.515 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| 315 | Arc | 43329.439 | 43347.051 | 20 | 6 | Right | 17.612 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 316 | Arc | 43384.161 | 43402.190 | 30 | 6 | Left | 18.029 | 4 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 317 | Arc | 43438.212 | 43457.104 | 50 | 8 | Right | 18.892 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 318 | Arc | 43492.309 | 43496.142 | 60 | 8 | Left | 3.833 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 319 | Arc | 43552.300 | 43606.635 | 100 | 12 | Left | 54.335 | 5 | 3 | 1 | 0 | 1 | 0 | 1 | 0 |
| 320 | Arc | 43647.312 | 43672.253 | 125 | 12 | Right | 24.941 | 3 | 2 | 0 | 1 | 1 | 0 | 1 | 0 |
| 321 | Arc | 43719.806 | 43762.826 | 300 | 25 | Left | 43.020 | 2 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| 322 | Arc | 43769.708 | 43825.131 | 300 | 25 | Right | 55.423 | 3 | 2 | 0 | 1 | 1 | 0 | 1 | 0 |
| 323 | Arc | 43925.640 | 44002.732 | 200 | 20 | Left | 77.092 | 4 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 324 | Arc | 44177.211 | 44200.003 | 40 | 6 | Right | 22.792 | 4 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 325 | Arc | 44251.626 | 44254.621 | 40 | 6 | Left | 2.995 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 326 | Arc | 44304.773 | 44328.268 | 100 | 12 | Right | 23.495 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 327 | Arc | 44375.083 | 44403.516 | 100 | 12 | Left | 28.433 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 328 | Arc | 44448.946 | 44462.488 | 100 | 12 | Right | 13.542 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 329 | Arc | 44531.593 | 44606.439 | 70 | 8 | Left | 74.846 | 10 | 5 | 1 | 1 | 1 | 0 | 1 | 0 |
| 330 | Arc | 44662.352 | 44669.759 | 40 | 6 | Right | 7.407 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 331 | Arc | 44716.475 | 44738.033 | 50 | 8 | Left | 21.558 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 332 | Arc | 44806.172 | 44835.233 | 50 | 8 | Right | 29.061 | 4 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 333 | Arc | 44888.427 | 44912.477 | 30 | 6 | Left | 24.050 | 5 | 3 | 1 | 1 | 1 | 1 | 1 | 0 |
| 334 | Arc | 45030.243 | 45045.842 | 40 | 6 | Right | 15.599 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 335 | Arc | 45101.062 | 45107.726 | 40 | 6 | Left | 6.664 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 336 | Arc | 45164.111 | 45241.470 | 125 | 12 | Right | 77.359 | 7 | 4 | 1 | 1 | 1 | 0 | 1 | 0 |
| 337 | Arc | 45356.059 | 45385.552 | 100 | 12 | Right | 29.493 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 338 | Arc | 45447.560 | 45511.304 | 50 | 8 | Left | 63.744 | 8 | 4 | 1 | 1 | 1 | 1 | 1 | 0 |
| 339 | Arc | 45598.076 | 45687.815 | 300 | 25 | Left | 89.739 | 4 | 2 | 0 | 1 | 1 | 0 | 1 | 0 |
| 340 | Arc | 45827.498 | 45829.940 | 30 | 6 | Right | 2.442 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 341 | Arc | 45880.360 | 45884.971 | 60 | 8 | Left | 4.611 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 342 | Arc | 45927.064 | 45955.754 | 125 | 12 | Right | 28.690 | 3 | 2 | 0 | 1 | 1 | 0 | 1 | 0 |
| 343 | Arc | 46061.398 | 46107.570 | 80 | 8 | Left | 46.172 | 6 | 3 | 1 | 1 | 1 | 0 | 1 | 0 |
| 344 | Arc | 46161.957 | 46241.476 | 80 | 8 | Right | 79.519 | 10 | 5 | 1 | 1 | 1 | 0 | 1 | 0 |
| 345 | Arc | 46308.354 | 46320.280 | 60 | 8 | Left | 11.926 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 346 | Arc | 46427.859 | 46443.467 | 125 | 12 | Left | 15.608 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 347 | Arc | 46509.173 | 46529.410 | 50 | 8 | Left | 20.237 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| 348 | Arc | 46613.463 | 46663.064 | 50 | 8 | Right | 49.601 | 7 | 4 | 1 | 1 | 1 | 0 | 1 | 0 |
| 349 | Arc | 46734.977 | 46746.083 | 50 | 8 | Left | 11.106 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 350 | Arc | 46827.894 | 46840.829 | 80 | 8 | Left | 12.935 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 351 | Arc | 46904.777 | 46918.760 | 40 | 6 | Right | 13.983 | 3 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 352 | Arc | 46974.563 | 47015.107 | 50 | 8 | Left | 40.544 | 6 | 3 | 1 | 1 | 1 | 0 | 1 | 0 |
| 353 | Arc | 47055.366 | 47062.680 | 50 | 8 | Right | 7.314 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 354 | Arc | 47165.217 | 47175.972 | 180 | 12 | Right | 10.755 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 355 | Arc | 47286.787 | 47380.650 | 70 | 8 | Left | 93.863 | 12 | 6 | 1 | 1 | 1 | 0 | 1 | 0 |
| 356 | Arc | 47445.736 | 47468.098 | 20 | 6 | Right | 22.362 | 4 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 357 | Arc | 47512.293 | 47596.747 | 80 | 8 | Left | 84.454 | 11 | 6 | 1 | 1 | 1 | 0 | 1 | 0 |
| 358 | Arc | 47650.154 | 47677.130 | 20 | 6 | Right | 26.976 | 5 | 3 | 1 | 1 | 1 | 1 | 1 | 0 |
| 359 | Arc | 47750.730 | 47771.777 | 125 | 12 | Right | 21.047 | 2 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 360 | Arc | 47807.450 | 47822.217 | 100 | 12 | Left | 14.767 | 2 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 361 | Arc | 47869.172 | 47881.084 | 80 | 8 | Right | 11.912 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 362 | Arc | 47938.031 | 47979.660 | 40 | 6 | Left | 41.629 | 7 | 4 | 1 | 1 | 1 | 1 | 1 | 0 |
| 363 | Arc | 48055.476 | 48076.923 | 30 | 6 | Left | 21.447 | 4 | 2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 364 | Arc | 48131.390 | 48162.748 | 20 | 6 | Right | 31.358 | 6 | 3 | 1 | 1 | 1 | 1 | 1 | 0 |
| 365 | Arc | 48238.635 | 48249.554 | 50 | 8 | Left | 10.919 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| 366 | Arc | 48307.110 | 48309.120 | 40 | 6 | Left | 2.010 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |



| HIP / CURVE NO. | ELEMENT | START CHAINAGE | END CHAINAGE | RADIUS (M) | Spacing on Curve (S) | HAND OF ARC | Length | Nos in outside curve (s) | Nos in inner curve (2s) | 1.8s beginning of curve | 1.8s end of curve | 3s beginning of curve | 3s end of curve | 6s beginning of curve | 6s end of curve | |
|-----------------------|---------|-------------------|-----------------|---------------|-------------------------|----------------|--------|--------------------------------|----------------------------------|-------------------------------|----------------------|-----------------------------|--------------------|-----------------------------|--------------------|---|
| | | | | | as per IRC:79- 1981 | | | | | | | | | | | |
| 367 | Arc | 48354.406 | 48368.524 | 50 | 8 | Right | 14.118 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | |
| 368 | Arc | 48489.563 | 48499.620 | 50 | 8 | Left | 10.057 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | |
| 369 | Arc | 48599.752 | 48628.903 | 20 | 6 | Right | 29.151 | 5 | 3 | 1 | 1 | 1 | 0 | 1 | 0 | |
| 370 | Arc | 48668.489 | 48721.135 | 30 | 6 | Left | 52.646 | 9 | 5 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 371 | Arc | 48873.609 | 48895.341 | 100 | 12 | Right | 21.732 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | |
| 372 | Arc | 48976.010 | 48983.449 | 80 | 8 | Right | 7.439 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | |
| 373 | Arc | 49069.760 | 49083.851 | 80 | 8 | Left | 14.091 | 2 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | |
| TOTAL | | | | | | | | = | 604 | 323 | 154 | 153 | 165 | 50 | 165 | 5 |

Total No of Road Delineators = 1619 nos.



CALCULATION FOR STREET LIGHTING

Street light in Built Up Location:

| TCS Type | Length | Length (m) |
|----------|--------|------------|
| TCS-1 | 0 | 0.00 |
| TCS-6 | 220 | 440.00 |
| TCS-7 | 435 | 870.00 |
| Total = | | 1310.00 |

Total length = 1310 m

Assuming, street lights @= 50m interval

for 1310 m 27 nos

At Busbay location=

(@ 5 nos per Busbay) 30 nos

Total nos of street light= 57 nos



Crash Barrier

| Chainage (m) | | Net Length (m) | Side |
|----------------|-------|-------------------|--------|
| From | To | | |
| 33150 | 33250 | 100.0 | Valley |
| 33440 | 33540 | 100.0 | Valley |
| 35000 | 35100 | 100.0 | Valley |
| 35500 | 35650 | 150.0 | Valley |
| 36350 | 36500 | 150.0 | Valley |
| 36600 | 36700 | 100.0 | Valley |
| 36900 | 37000 | 100.0 | Valley |
| 37250 | 37400 | 150.0 | Valley |
| 37450 | 37650 | 200.0 | Valley |
| 38000 | 38100 | 100.0 | Valley |
| 38150 | 38350 | 200.0 | Valley |
| 38530 | 38630 | 100.0 | Valley |
| 38130 | 38250 | 120.0 | Valley |
| 40250 | 40400 | 150.0 | Valley |
| 41320 | 41480 | 160.0 | Valley |
| 44500 | 44630 | 130.0 | Valley |
| 44700 | 45000 | 300.0 | Valley |
| 45400 | 45550 | 150.0 | Valley |
| 46470 | 46600 | 130.0 | Valley |
| 47250 | 47400 | 150.0 | Valley |
| 47900 | 48130 | 230.0 | |
| 48650 | 48750 | 100.0 | |
| Total = | | 3170.0 | |

Total no. of Bridges on the project=

Approach length on valley side for each bridge (25 m on both side)

Hence, Crash barrier length for 2 bridges (m)=

Therefore, total length of crash barrier=

3 nos.

50 m

300 m

3470 m



Reusable Sub-base Base Calculation
GSB Calculation

| | Required GSB Qty | Reusable GSB Quantity | |
|-------------------------------------|---------------------|--------------------------|-----|
| TCS-03 | 31817 | 11655 | Cum |
| TCS-03A | 3046 | 1116 | Cum |
| TCS-04 | 899 | 329 | Cum |
| TCS-04A | 256 | 94 | Cum |
| TCS-05 | 383 | 140 | Cum |
| TCS-06 | 434 | 159 | Cum |
| TCS-07 | 860 | 315 | Cum |
| TCS-09A | 1070 | 392 | Cum |
| Busbay (2 Lane) | 283 | 104 | Cum |
| Extra Widening on Flexible Pavement | 2017 | 739 | Cum |
| Minor Junction | 20 | 7 | Cum |
| Structure Minor Bridge | 264 | 97 | Cum |
| | 41349 | 15146 | |

Reuseable GSB Quantity= 36.63%

Total Dismantle Granular Quantity(cum)= **25243**
use 60% of Total Dismantle Granular Quantity for GSB (cum)= **15146**

Total Required GSB Qty (Cum)= **41349**
36.63 % of this required quantity will be bought from dismantle material i.e **15146**

Re Useable Quantity of GSB Material(cum)= **15146**
Remaining Quantity of GSB(cum) = **26203**



VOLUME VIII

BILL OF QUANTITY



Bill No : 01. Site Clearance and Dismantling

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|----------|----------|----------|
| 1 | 02.01/i | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth from 300 mm to 600 mm | Each | 10.00 | | |
| 2 | 02.01/ii | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 600 mm to 900 mm | Each | 30.00 | | |
| 3 | 02.01/iii | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 900 mm to 1800 mm | Each | 46.00 | | |
| 4 | 02.01/iv | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 1800 mm to 2700 mm | Each | 3.00 | | |
| 5 | 02.03/b | Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable materials and stacking of serviceable materials and stacking of serviceable materials upto 100m. from road boundary. (by mechanical means) | Ha | 27.17 | | |
| 6 | 02.04/i/c | Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. c)Pre- stressed/ Reinforced Cement Concrete grade M20 & above | | | | |

Bill No : 01. Site Clearance and Dismantling

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|-----------------|--|------|------------|----------|----------|
| | | | cum | 38.00 | | |
| 7 | 02.04/iii/b | Dismantling stone masonry b) Rubble stone masonry in cement mortar | Cum | 866.00 | | |
| 8 | 02.04/vii/a | Removing hume pipes class NP-3 a) 300mm to 600mm dia | rm | 30.00 | | |
| 9 | 02.04/vii/b | Removing hume pipes class NP-4 b) Above 600mm to 900mm dia | rm | 180.00 | | |
| 10 | 02.04/vii/c | Removing hume pipes class NP-5 c) Above 900mm dia | rm | 60.00 | | |
| 11 | 02.04/viii/e | Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m e)Kandar/Gravel metal crust upto 150 mm thick with power Roller with scarifier | sqm | 168,284.00 | | |
| 12 | 02.04/viii/f/ii | Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m f)Bituminous coarses 50-70mm along with premix Carpet and Surface dressing but without disturbing the base ii)With road roller attached with scarifier | sqm | 171,814.00 | | |
| | | Total of Bill 01. Site Clearance and Dismantling | | | | |

Bill No : 02. Earth work,Subgrade and Erosion control

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|--|------------|---|------|--------------|----------|----------|
| 1 | 02/nsc/1 | Supplying and laying Hydro Seeding on cutting Surface | sqm | 18,180.00 | | |
| 2 | 03.13 | Construction of Embankment with Material Deposited from Roadway Cutting Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2 | cum | 137,417.00 | | |
| 3 | 03.14 | Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2 | cum | 14,285.93 | | |
| 4 | 03.15 | Compacting original ground supporting subgrade Loosening of the ground upto a level of 500 mm below the subgrade level, watered, graded and compacted in layers to meet requirement of table 300-2 for subgrade construction. | cum | 28,739.90 | | |
| 5 | 03.31 | Excavation in Hill Area in Soil by Mechanical Means Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres | cum | 1,166,116.00 | | |
| 6 | 03.32 | Excavation in Hilly Area in Ordinary Rock by Mechanical Means not Requiring Blasting. Excavation in hilly area in ordinary rock not requiring ballasting by mechanical means including cutting and trimming of slopes and disposal of cut material with all lift and lead upto 1000 metres | cum | 291,529.00 | | |
| Total of Bill 02. Earth work,Subgrade and Erosion control | | | | | | |

Bill No : 03. Sub-Base & Base Courses

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|-----------|----------|----------|
| 1 | 04.01/Nsc1 | Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material | Cum | 26,676.11 | | |
| 2 | 04/nsc1 | Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 | Cum | 15,313.18 | | |
| 3 | 05.02 | Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.) | Cum | 43,284.70 | | |
| | | Total of Bill 03. Sub-Base & Base Courses | | | | |

Bill No : 04. Bituminous Courses

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|------------|----------|----------|
| 1 | 06.01/a | Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm | sqm | 170,433.00 | | |
| 2 | 06.02/ii | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. ii) On granular Surface Pre treated with prime Coat @ 0.25 - 0.30 kg/sqm | sqm | 160,350.00 | | |
| 3 | 06/Nsc1 | Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40 | cum | 11,930.31 | | |

Bill No : 04. Bituminous Courses

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|----------|----------|----------|
| 4 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | cum | 6,817.32 | | |
| | | Total of Bill 04. Bituminous Courses | | | | |

Bill No : 05. Junction Improvement (Major & Minor)

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|----------|
| 1 | 04.01/Nsc1 | Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material | Cum | 12.55 | | |
| 2 | 04/nsc1 | Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 | Cum | 7.25 | | |
| 3 | 05.02 | Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.) | Cum | 24.75 | | |
| 4 | 06.01/a | Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm | sqm | 99.00 | | |

Bill No : 05. Junction Improvement (Major & Minor)

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|----------|
| 5 | 06.02/i | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm | sqm | 99.00 | | |
| 6 | 06/Nsc1 | Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40 | cum | 6.93 | | |
| 7 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | cum | 3.96 | | |
| | | Total of Bill 05. Junction Improvement (Major & Minor) | | | | |

Bill No : 06. Traffic signs, Road marking & other road appurtenances

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|----------|
| 1 | 08.02/a | Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. a) 5th KM stone | each | 3.00 | | |
| 2 | 08.02/b | Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. b) Ordinary kilometer stone | each | 13.00 | | |
| 3 | 08.04 | Reinforced Cement Concrete M15 Boundary pillars of standard design, fixed in position including finishing but excluding painting | each | 163.00 | | |
| 4 | 08.11/i | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm equilateral triangle | each | 208.00 | | |
| 5 | 08.11/iii | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm circular | each | 34.00 | | |

Bill No : 06. Traffic signs, Road marking & other road appurtenances

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|----------|----------|----------|
| 6 | 08.11/iv | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 80 mm x 60 mm rectangular | each | 6.00 | | |
| 7 | 08.11/vii | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm high octagon | each | 2.00 | | |
| 8 | 08.14 | Road Marking with Hot Applied Thermoplastic Compound with Reflectorising Glass Beads on Bituminous Surface (Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes.) | sqm | 5,346.80 | | |

Bill No : 06. Traffic signs, Road marking & other road appurtenances

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|----------|
| 9 | 08.15/c/v | Road Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and confirming to IRC-79 and the drawings.) 120x120 -Road Delineator | each | 1,887.00 | | |
| 10 | 08.18/A/b | Metal Beam Crash Barrier Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fittings to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810) For post Height of 1.5 m | Rm | 3,470.00 | | |
| 11 | 08.20/ii | Road Markers/Road stud with lense reflector Providing & fixing of road stud 100x100 mm, die-cast in aluminium , resistance to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30mm upto a depth of 60mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973 Light Reflecting Lense Type | nos | 9,537.00 | | |
| 12 | 08.22 | Lighting on Bridges Providing & fixing lighting on Bridges, mounted on steel hollow circular poles of standard specification, 5 m high fixed on parapets with cement concrete, 20 m apart and fitted with sodium vapour lamp | nos | 53.00 | | |
| 13 | 08/nsc/2 | Convex Mirror For Blind Curve | nos | 20.00 | | |

Bill No : 06. Traffic signs, Road marking & other road appurtenances

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|----------|----------|----------|
| 14 | 08/nsc/6 | Rumble Strips Provision of 15 nos rumble strips covered with premix bituminous carpet, 15-20 mm high at center, 250 mm wide placed at 1 m center to center at approved locations to control speed, marked with white strips of road marking paint. | sqm | 120.00 | | |
| 15 | 16.09 | Mild steel railling complete as per drawing and Technical Specifications | Rm | 1,092.00 | | |
| | | Total of Bill 06. Traffic signs, Road marking & other road appurtenances | | | | |

Bill No : 07. Passenger Shelter

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|----------|
| 1 | 08.05 | Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface. | sqm | 264.27 | | |
| 2 | 10.16 | Cement Plaster 12mm Thick in Cement Mortar 1:3 | sqm | 264.27 | | |
| 3 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | cum | 39.63 | | |
| 4 | 14.01 | Brick masonry work in cement mortar 1:3 in foundation complete excluding pointing and plastering, as per drawing and technical specifications | cum | 6.08 | | |
| 5 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | cum | 4.03 | | |
| 6 | 14.03/e/l | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M25Grade | cum | 2.78 | | |
| 7 | 14.08 | HYSD bar reinforcement in foundation complete as per drawing and technical specification | MT | 0.33 | | |
| 8 | 14/nsc2 | Brick Flat Soling at Foundation | Sqm | 53.75 | | |
| 9 | 15.01 | Brick masonry work in cement mortar 1:3 in Sub-structure complete excluding pointing and plastering, as per drawing and technical specifications | cum | 12.96 | | |

Bill No : 07. Passenger Shelter

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|----------|
| 10 | 16.01/a/i | cement concrete Reinforced concrete in super-structure as per drawing and Technical Specification i/c form work complet eas per drawing and technical specification RCC Grade M25 For solid slab super-structure Upto 5m Upto 5m | cum | 16.61 | | |
| 11 | 16.03 | HYSD bar reinforcement in super-structure complete as per drawing and technical specifications | MT | 1.66 | | |
| | | Total of Bill 07. Passenger Shelter | | | | |

Bill No : 08. Bus Bay

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|----------|
| 1 | 03.14/Nsc | Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from Roadway Cutting with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2 | cum | 708.00 | | |
| 2 | 04.01/Nsc1 | Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material | Cum | 179.46 | | |
| 3 | 04/nsc1 | Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 | Cum | 103.74 | | |
| 4 | 05.02 | Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.) | Cum | 354.00 | | |

Bill No : 08. Bus Bay

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|----------|
| 5 | 05.03 | Construction of footpath/separator by providing a 150 mm compacted granular sub base as per clause 401 and 25 mm thick cement concrete grade M15, over laid with pre-cast concrete tiles in cement mortar including provision of all drainage arrangements but excluding kerb channel. | sqm | 590.00 | | |
| 6 | 06.01/a | Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm | sqm | 1,416.00 | | |
| 7 | 06.02/i | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm | sqm | 1,416.00 | | |
| 8 | 06/Nsc1 | Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40 | cum | 99.12 | | |

Bill No : 08. Bus Bay

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|----------|----------|----------|
| 9 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | cum | 56.64 | | |
| | | Total of Bill 08. Bus Bay | | | | |

Bill No : 09. Longitudinal Drains

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|-----------|----------|----------|
| 1 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | cum | 24,181.47 | | |
| 2 | 14.02/b | Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed) | cum | 8,242.74 | | |
| 3 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | cum | 168.68 | | |
| 4 | 14.03/b | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M20 Grade | cum | 34.65 | | |
| 5 | 15.02/b | Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed) | cum | 911.46 | | |
| 6 | 15.03/b/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade Upto 5m | cum | 80.33 | | |
| 7 | 15.03/f/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M25 Grade upto 5m height | cum | 727.68 | | |

Bill No : 09. Longitudinal Drains

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|----------|----------|----------|
| 8 | 15.05 | HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification | MT | 36.38 | | |
| 9 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | Rm | 433.50 | | |
| 10 | 24/i/b | Galvanised Mild steel J /L hook | kg | 69.20 | | |
| 11 | 40 | Gextextile material (fine net) | sqm | 77.85 | | |
| | | Total of Bill 09. Longitudinal Drains | | | | |

Bill No : 10. Protection Work

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|-----------|----------|----------|
| 1 | 12/Nsc1 | Geo-synthetics and Reinforced Earth With reinforcing elements of synthetic geogrids | Sqm | 1,352.00 | | |
| 2 | 12/Nsc9 | Composite RE Wall Drilling of 100mm diameter semi-perforated PVC pipe inside the hill slope wrapped with non woven geotextile complete as per drawing and as directed by the engineer. | m | 43,027.00 | | |
| 3 | 15.12/Nsc | Supply and Installation of Mechanically woven double twisted hexagonal shaped steel wire mesh gabion boxes with Zinc + PVC coating having mesh size of 100 mm x 120 mm by using mesh wire 2.7 mm (Inner dia) and 3.7 (outer dia) with selvedged wire 3.4 mm(inner dia) and 4.4 mm (outer dia) and lacing with 2.2mm inner dia and 3.3 mm outer dia.placing at indicated places in dry condition at easily accessible location as per direction of Engineer including tools, plant, labour etc. complete in all respect, carrying the material from nearest approach with all leads & lifts, manpower & machinery, materials, labor etc. complete as per detailed technical specifications and as directed by Engineer-In-Charge. | cum | 32,868.00 | | |
| 4 | 23/Nsc4 | Providing and spreading Mechanically Woven Double Twisted Hexagonal Shaped Wire Mesh Netting of Mesh Type 10x12 with D=100mm tolerance of $\pm 2\%$, Zn + PVC coated, Mesh Wire dia. 2.7/3.7mm (ID/OD), mechanically edged/selvedged with galvanization as per EN 10223-3, and shall have minimum 10 numbers of mesh openings per meter of mesh perpendicular to twist, lacing with wire of diameter 2.2/3.2 mm (ID/OD), at easily accessible location including top and bottom, with all leads and lifts, manpower and machinery, materials, labour etc. complete and as directed by Engineer - In – Charge | sqm | 32,270.00 | | |

Bill No : 10. Protection Work

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|---|------|-----------|----------|----------|
| 5 | 23/Nsc5 | Supply and installation of Continuous threaded Anchors (32mm dia, yield strength > 500 N/mm ²) nut, washer plate, coupler for connecting bars and full length grouting with admixture including all ancillary items for top/bottom/cortical anchoring as per detailed technical specifications and as directed by engineer in charge. | Rm | 25,213.00 | | |
| | | Total of Bill 10. Protection Work | | | | |

Bill No : 11. Breast wall

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|----------|
| 1 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | cum | 5,924.74 | | |
| 2 | 13.01/b/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary rock if blasting is not resorted to | cum | 1,481.18 | | |
| 3 | 13.03/a | Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials | cum | 1,304.43 | | |
| 4 | 13.03/b | Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Good Sandy Soil free from organic material | cum | 283.77 | | |
| 5 | 14.02/b | Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed) | cum | 2,786.13 | | |
| 6 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | cum | 1,314.43 | | |
| 7 | 15.02/b | Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed) | cum | 5,580.66 | | |
| 8 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | Rm | 2,388.78 | | |
| | | Total of Bill 11. Breast wall | | | | |

Bill No : 12. Retaining wall

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|------------|--|------|----------|----------|----------|
| 1 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | cum | 1,077.69 | | |
| 2 | 13.01/b/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary rock if blasting is not resorted to | cum | 258.02 | | |
| 3 | 13.04 | Filter medium behind abutment, wing wall and return wall complete as per drawing and technical specification . | cum | 954.84 | | |
| 4 | 14.02/b | Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed) | cum | 589.03 | | |
| 5 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | cum | 329.47 | | |
| 6 | 15.02/b | Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed) | cum | 907.47 | | |
| 7 | 15.03/b/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade Upto 5m | cum | 88.00 | | |
| 8 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | Rm | 1,444.00 | | |

| | | | | |
|--|--|---------------|--------------------|--|
| | | Total of Bill | 12. Retaining wall | |
|--|--|---------------|--------------------|--|

QUANTITY CALCULATION (ROAD PART)



Quantity Backup Calculation For Bill :

01. Site Clearance and Dismantling

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|----------------|--------------|-------------|
| 1 | 02.01/i | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth from 300 mm to 600 mm | | | |
| | | Refer: Site Clearance and Dismantling Formula: 10 | 10 | 10.00 | Each |
| | | | Total : | 10.00 | Each |
| 2 | 02.01/ii | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 600 mm to 900 mm | | | |
| | | Refer: Site Clearance and Dismantling Formula: 30 | 30 | 30.00 | Each |
| | | | Total : | 30.00 | Each |
| 3 | 02.01/iii | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 900 mm to 1800 mm | | | |
| | | Refer: Site Clearance and Dismantling Formula: 46 | 46 | 46.00 | Each |
| | | | Total : | 46.00 | Each |
| 4 | 02.01/iv | Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 1800 mm to 2700 mm | | | |
| | | Refer: Site Clearance and Dismantling Formula: 3 | 3 | 3.00 | Each |
| | | | Total : | 3.00 | Each |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|-------------|---|----------------|---------------|------------|
| 5 | 02.03/b | Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable materials and stacking of serviceable materials and stacking of serviceable materials upto 100m. from road boundary. (by mechanical means) | | | |
| | | Refer: Site Clearance and Dismantling Formula: 27.17 | 27.17 | 27.17 | Ha |
| | | | Total : | 27.17 | Ha |
| 6 | 02.04/i/c | Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. c)Pre- stressed/ Reinforced Cement Concrete grade M20 & above | | | |
| | | Refer: Site Clearance and Dismantling Formula: 38 | 38 | 38.00 | cum |
| | | | Total : | 38.00 | cum |
| 7 | 02.04/iii/b | Dismantling stone masonry b) Rubble stone masonry in cement mortar | | | |
| | | Refer: Site Clearance and Dismantling Formula: 866 | 866 | 866.00 | Cum |
| | | | Total : | 866.00 | Cum |
| 8 | 02.04/vii/a | Removing hume pipes class NP-3 a) 300mm to 600mm dia | | | |
| | | Refer: Site Clearance and Dismantling Formula: 30 | 30 | 30.00 | rm |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|----------------|--|----------------|-------------------|------------|
| | | | Total : | 30.00 | rm |
| 9 | 02.04/vii/b | Removing hume pipes class NP-4 b) Above 600mm to 900mm dia | | | |
| | | Refer: Site Clearance and Dismantling Formula: 180 | 180 | 180.00 | rm |
| | | | Total : | 180.00 | rm |
| 10 | 02.04/vii/c | Removing hume pipes class NP-5 c) Above 900mm dia | | | |
| | | Refer: Site Clearance and Dismantling Formula: 60 | 60 | 60.00 | rm |
| | | | Total : | 60.00 | rm |
| 11 | 02.04/viii/e | Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m e)Kandar/Gravel metal crust upto 150 mm thick with power Roller with scarifier | | | |
| | | Refer: Site Clearance and Dismantling Formula: 168284 | 168284 | 168,284.00 | sqm |
| | | | Total : | 168,284.00 | sqm |
| 12 | 02.04/viii/f/i | Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m f)Bituminous coarses 50-70mm along with premix Carpet and Surface dressing but without disturbing the base ii)With road roller attached with scarifier | | | |
| | | Refer: Site Clearance and Dismantling Formula: 171814 | 171814 | 171,814.00 | sqm |
| | | | Total : | 171,814.00 | sqm |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|---|-------------------|------------|
| 1 | 02/nsc/1 | Supplying and laying Hydro Seeding on cutting Surface | | | |
| | | Refer: Errosion Control Formula: 18180 | 18180 | 18,180.00 | sqm |
| | | | Total : | 18,180.00 | sqm |
| 2 | 03.13 | Construction of Embankment with Material Deposited from Roadway Cutting Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2 | | | |
| | | Refer: Earthwork Formula: tot_fill | 137417.000 | 137,417.00 | cum |
| | | | Total : | 137,417.00 | cum |
| 3 | 03.14 | Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2 | | | |
| | | Refer: TCS-03 Formula: es_area*1*I | 0.315*1*11988.000 | 3,776.22 | cum |
| | | Refer: TCS-03A Formula: (cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb+0.5*sg)*1*2)*I*sg+es_area*1*I | (7.000+2*1.500+1*1.000+(0.040+0.070+0.125+0.125+0.200+0.5*0.500)*1*2)*1192.000*0.500+0.315*1*1192.000 | 7,897.00 | cum |
| | | Refer: TCS-04 Formula: es_area*1*I | 0.315*1*592.000 | 186.48 | cum |
| | | Refer: TCS-04A Formula: (cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb+0.5*sg)*1*2)*I*sg+es_area*1*I | (7.000+2*1.500+1*1.000+(0.040+0.070+0.125+0.125+0.200+0.5*0.500)*1*2)*80.000*0.500+0.315*1*80.000 | 530.00 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|---|---------------------|------------|
| | | Refer: TCS-05 Formula: $(cw+2*ps+1*es-ext_pav+(bc+dbm+wmm1+wmm2+gsb+0.5*sg)*1*2)*l*sg+es_area*1*l$ | $(7.000+2*1.500+1*1.000-6.700+(0.040+0.070+0.125+0.125+0.200+0.5*0.500)*1*2)*579.000+0.500+0.315*1*579.000$ | 1,896.23 | cum |
| | | | Total : | 14,285.93 | cum |
| 4 | 03.15 | Compacting original ground supporting subgrade Loosening of the ground upto a level of 500 mm below the subgrade level, watered, graded and compacted in layers to meet requirement of table 300-2 for subgrade construction. | | | |
| | | Refer: TCS-03 Formula: $(cw+2*ps-ext_pav)*sg*l$ | $(7.000+2*1.500-6.700)*0.500*11988.000$ | 19,780.20 | cum |
| | | Refer: TCS-03A Formula: $(cw+2*ps-ext_pav)*sg*l$ | $(7.000+2*1.500-0.000)*0.500*1192.000$ | 5,960.00 | cum |
| | | Refer: TCS-04 Formula: $(cw+2*ps-ext_pav)*sg*l$ | $(7.000+2*1.500-6.700)*0.500*592.000$ | 976.80 | cum |
| | | Refer: TCS-05 Formula: $(cw+2*ps-ext_pav)*sg*l$ | $(7.000+2*1.500-6.700)*0.500*579.000$ | 955.35 | cum |
| | | Refer: TCS-06 Formula: $(cw+2*ps-ext_pav)*sg*l$ | $(7.000+2*1.500-6.700)*0.500*217.000$ | 358.05 | cum |
| | | Refer: TCS-07 Formula: $(cw+2*ps-ext_pav)*sg*l$ | $(7.000+2*1.500-6.700)*0.500*430.000$ | 709.50 | cum |
| | | | Total : | 28,739.90 | cum |
| 5 | 03.31 | Excavation in Hill Area in Soil by Mechanical Means Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres | | | |
| | | Refer: Earthwork Formula: $tot_cut*(1-per_rock/100)$ | $1457645.000*(1-20.000/100)$ | 1,166,116.00 | cum |
| | | | Total : | 1,166,116.00 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|--------------------------------|------------|------|
| 6 | 03.32 | Excavation in Hilly Area in Ordinary Rock by Mechanical Means not Requiring Blasting. Excavation in hilly area in ordinary rock not requiring ballasting by mechanical means including cutting and trimming of slopes and disposal of cut material with all lift and lead upto 1000 metres | | | |
| | | Refer: Earthwork Formula: $\text{tot_cut} * (\text{per_rock} / 100)$ | $1457645.000 * (20.000 / 100)$ | 291,529.00 | cum |
| | | | Total : | 291,529.00 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|--|-----------|------|
| 1 | 04.01/Nsc1 | Sub-base with Close Graded Material (Table: - 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material | | | |
| | | Refer: Extra Widening on Flexible Formula: Pavement $ew_area * gsb * (1 - gsb_per / 100)$ | $10083.000 * 0.200 * (1 - 36.630 / 100)$ | 1,277.92 | Cum |
| | | Refer: TCS-03 Formula: $((cw + 2 * ps + 1 * es + (bc + dbm + wmm1 + wmm2 + gsb * 0.5) * 2 * 1) * l * gsb + es_gsb * 1 * l) * (1 - gsb_per / 100)$ | $((7.000 + 2 * 1.500 + 1 * 1.000 + (0.040 + 0.070 + 0.125 + 0.125 + 0.200 * 0.5) * 2 * 1) * 11988.000 * 0.200 + 0.171 * 1 * 11988.000) * (1 - 36.630 / 100)$ | 19,409.81 | Cum |
| | | Refer: TCS-03A Formula: $((cw + 2 * ps + 1 * es + (bc + dbm + wmm1 + wmm2 + gsb * 0.5) * 2 * 1) * l * gsb + es_gsb * 1 * l) * (1 - gsb_per / 100)$ | $((7.000 + 2 * 1.500 + 1 * 1.000 + (0.040 + 0.070 + 0.125 + 0.125 + 0.200 * 0.5) * 2 * 1) * 1192.000 * 0.200 + 0.171 * 1 * 1192.000) * (1 - 36.630 / 100)$ | 1,929.97 | Cum |
| | | Refer: TCS-04 Formula: $((cw + 2 * ps + 1 * es + (bc + dbm + wmm1 + wmm2 + gsb * 0.5) * 2 * 1) * l * gsb + es_gsb * 1 * l) * (1 - gsb_per / 100)$ | $((7.000 + 2 * 1.500 + 1 * 1.000 + (0.040 + 0.070 + 0.125 + 0.125 + 0.200 * 0.5) * 2 * 1) * 592.000 * 0.200 + 0.171 * 1 * 592.000) * (1 - 36.630 / 100)$ | 958.51 | Cum |
| | | Refer: TCS-04A Formula: $((cw + 2 * ps + 1 * es + (bc + dbm + wmm1 + wmm2 + gsb * 0.5) * 2 * 1) * l * gsb + es_gsb * 1 * l) * (1 - gsb_per / 100)$ | $((7.000 + 2 * 1.500 + 1 * 1.000 + (0.040 + 0.070 + 0.125 + 0.125 + 0.200 * 0.5) * 2 * 1) * 80.000 * 0.200 + 0.171 * 1 * 80.000) * (1 - 36.630 / 100)$ | 129.53 | Cum |
| | | Refer: TCS-05 Formula: $((cw + 2 * ps + 1 * es + (bc + dbm + wmm1 + wmm2 + gsb * 0.5) * 2 * 1) * l * gsb + es_gsb * 1 * l) * (1 - gsb_per / 100)$ | $((7.000 + 2 * 1.500 + 1 * 1.000 + (0.040 + 0.070 + 0.125 + 0.125 + 0.200 * 0.5) * 2 * 1) * 579.000 * 0.200 + 0.171 * 1 * 579.000) * (1 - 36.630 / 100)$ | 937.46 | Cum |
| | | Refer: TCS-06 Formula: $(cw + 2 * ps) * gsb * l * (1 - gsb_per / 100)$ | $(7.000 + 2 * 1.500) * 0.200 * 217.000 * (1 - 36.630 / 100)$ | 275.03 | Cum |
| | | Refer: TCS-07 Formula: $(cw + 2 * ps) * gsb * l * (1 - gsb_per / 100)$ | $(7.000 + 2 * 1.500) * 0.200 * 430.000 * (1 - 36.630 / 100)$ | 544.98 | Cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|--|------------------|------------|
| | | Refer: TCS-09A Formula: $(cw+2*ps)*gsb*(1-gsb_per/100)$ | $(7.000+2*1.500)*0.200*130.000*$ $(1-36.630/100)$ | 164.76 | Cum |
| | | Refer: TCS-12 Formula: $(cw+2*ps)*gsb*(1-gsb_per/100)$ | $(7.000+2*1.500)*0.200*827.000*$ $(1-36.630/100)$ | 1,048.14 | Cum |
| | | | Total : | 26,676.11 | Cum |
| 2 | 04/nsc1 | Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 | | | |
| | | Refer: Extra Widening on Flexible Formula: Pavement $ew_area*gsb*(gsb_per/100)$ | $10083.000*0.200*(36.630/100)$ | 738.68 | Cum |
| | | Refer: TCS-03 Formula: $((cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es_gsb*1*I)*(gsb_per/100)$ | $((7.000+2*1.500+1*1.000+(0.040+0.070+0.125+0.125+0.200*0.5)*2*1)*11988.000*0.200+0.171*1*11988.000)*(36.630/100)$ | 11,219.53 | Cum |
| | | Refer: TCS-03A Formula: $((cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es_gsb*1*I)*(gsb_per/100)$ | $((7.000+2*1.500+1*1.000+(0.040+0.070+0.125+0.125+0.200*0.5)*2*1)*1192.000*0.200+0.171*1*1192.000)*(36.630/100)$ | 1,115.59 | Cum |
| | | Refer: TCS-04 Formula: $((cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es_gsb*1*I)*(gsb_per/100)$ | $((7.000+2*1.500+1*1.000+(0.040+0.070+0.125+0.125+0.200*0.5)*2*1)*592.000*0.200+0.171*1*592.000)*(36.630/100)$ | 554.05 | Cum |
| | | Refer: TCS-04A Formula: $((cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es_gsb*1*I)*(gsb_per/100)$ | $((7.000+2*1.500+1*1.000+(0.040+0.070+0.125+0.125+0.200*0.5)*2*1)*80.000*0.200+0.171*1*80.000)*(36.630/100)$ | 74.87 | Cum |
| | | Refer: TCS-05 Formula: $((cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es_gsb*1*I)*(gsb_per/100)$ | $((7.000+2*1.500+1*1.000+(0.040+0.070+0.125+0.125+0.200*0.5)*2*1)*579.000*0.200+0.171*1*579.000)*(36.630/100)$ | 541.88 | Cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|---|------------------|------------|
| | | Refer: TCS-06 Formula: $(cw+2*ps-ext_pav)*gsb*I*(gsb_per/100)$ | $(7.000+2*1.500-6.700)*0.200*217.000*$ $(36.630/100)$ | 52.46 | Cum |
| | | Refer: TCS-07 Formula: $(cw+2*ps)*gsb*I*(gsb_per/100)$ | $(7.000+2*1.500)*0.200*430.000*$ $(36.630/100)$ | 315.02 | Cum |
| | | Refer: TCS-09A Formula: $(cw+2*ps)*gsb*I*(gsb_per/100)$ | $(7.000+2*1.500)*0.200*130.000*$ $(36.630/100)$ | 95.24 | Cum |
| | | Refer: TCS-12 Formula: $(cw+2*ps)*gsb*I*(gsb_per/100)$ | $(7.000+2*1.500)*0.200*827.000*$ $(36.630/100)$ | 605.86 | Cum |
| | | | Total : | 15,313.18 | Cum |
| 3 | 05.02 | Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.) | | | |
| | | Refer: Extra Widening on Flexible Formula: Pavement $ew_area*(wmm1+wmm2)$ | $10083.000*(0.125+0.125)$ | 2,520.75 | Cum |
| | | Refer: TCS-03 Formula: $((((cw+2*ps+0.125*1)*wmm1)+((cw+2*ps+0.250*1)*wmm2))*I)$ | $((((7.000+2*1.500+0.125*1)*0.125)+((7.000+2*1.500+0.250*1)*0.125))*11988.000)$ | 30,531.94 | Cum |
| | | Refer: TCS-03A Formula: $((((cw+2*ps+0.125*1)*wmm1)+((cw+2*ps+0.250*1)*wmm2))*I)$ | $((((7.000+2*1.500+0.125*1)*0.125)+((7.000+2*1.500+0.250*1)*0.125))*1192.000)$ | 3,035.88 | Cum |
| | | Refer: TCS-04 Formula: $((((cw+2*ps+0.125*1)*wmm1)+((cw+2*ps+0.250*1)*wmm2))*I)$ | $((((7.000+2*1.500+0.125*1)*0.125)+((7.000+2*1.500+0.250*1)*0.125))*592.000)$ | 1,507.75 | Cum |
| | | Refer: TCS-04A Formula: $((((cw+2*ps+0.125*1)*wmm1)+((cw+2*ps+0.250*1)*wmm2))*I)$ | $((((7.000+2*1.500+0.125*1)*0.125)+((7.000+2*1.500+0.250*1)*0.125))*80.000)$ | 203.75 | Cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|--|------------------|------------|
| | | Refer: TCS-05 Formula: $(((cw+2*ps+0.125*1)*wmm1)+((cw+2*ps+0.250*1)*wmm2))*I)$ | $(((7.000+2*1.500+0.125*1)*0.125)+((7.000+2*1.500+0.250*1)*0.125))*579.000)$ | 1,474.64 | Cum |
| | | Refer: TCS-06 Formula: $(((cw+2*ps)*wmm1)+((cw+2*ps)*wmm2))*I)$ | $(((7.000+2*1.500)*0.125)+((7.000+2*1.500)*0.125))*217.000)$ | 542.50 | Cum |
| | | Refer: TCS-07 Formula: $(((cw+2*ps)*wmm1)+((cw+2*ps)*wmm2))*I)$ | $(((7.000+2*1.500)*0.125)+((7.000+2*1.500)*0.125))*430.000)$ | 1,075.00 | Cum |
| | | Refer: TCS-09A Formula: $(((cw+2*ps)*wmm1)+((cw+2*ps)*wmm2))*I)$ | $(((7.000+2*1.500)*0.125)+((7.000+2*1.500)*0.125))*130.000)$ | 325.00 | Cum |
| | | Refer: TCS-12 Formula: $(((cw+2*ps)*wmm1)+((cw+2*ps)*wmm2))*I)$ | $(((7.000+2*1.500)*0.125)+((7.000+2*1.500)*0.125))*827.000)$ | 2,067.50 | Cum |
| | | | Total : | 43,284.70 | Cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|---------------------------|-------------------|------------|
| 1 | 06.01/a | Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm | | | |
| | | Refer: Extra Widening on Flexible Formula: Pavement ew_area | 10083.000 | 10,083.00 | sqm |
| | | Refer: TCS-03 Formula: (cw+2*ps)*l | (7.000+2*1.500)*11988.000 | 119,880.00 | sqm |
| | | Refer: TCS-03A Formula: (cw+2*ps)*l | (7.000+2*1.500)*1192.000 | 11,920.00 | sqm |
| | | Refer: TCS-04 Formula: (cw+2*ps)*l | (7.000+2*1.500)*592.000 | 5,920.00 | sqm |
| | | Refer: TCS-04A Formula: (cw+2*ps)*l | (7.000+2*1.500)*80.000 | 800.00 | sqm |
| | | Refer: TCS-05 Formula: (cw+2*ps)*l | (7.000+2*1.500)*579.000 | 5,790.00 | sqm |
| | | Refer: TCS-06 Formula: (cw+2*ps)*l | (7.000+2*1.500)*217.000 | 2,170.00 | sqm |
| | | Refer: TCS-07 Formula: (cw+2*ps)*l | (7.000+2*1.500)*430.000 | 4,300.00 | sqm |
| | | Refer: TCS-09A Formula: (cw+2*ps)*l | (7.000+2*1.500)*130.000 | 1,300.00 | sqm |
| | | Refer: TCS-12 Formula: (cw+2*ps)*l | (7.000+2*1.500)*827.000 | 8,270.00 | sqm |
| | | | Total : | 170,433.00 | sqm |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|---------------------------|-------------------|------------|
| 2 | 06.02/ii | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. ii) On granular Surface Pre treated with prime Coat @ 0.25 - 0.30 kg/sqm | | | |
| | | Refer: TCS-03 Formula: (cw+2*ps)*l | (7.000+2*1.500)*11988.000 | 119,880.00 | sqm |
| | | Refer: TCS-03A Formula: (cw+2*ps)*l | (7.000+2*1.500)*1192.000 | 11,920.00 | sqm |
| | | Refer: TCS-04 Formula: (cw+2*ps)*l | (7.000+2*1.500)*592.000 | 5,920.00 | sqm |
| | | Refer: TCS-04A Formula: (cw+2*ps)*l | (7.000+2*1.500)*80.000 | 800.00 | sqm |
| | | Refer: TCS-05 Formula: (cw+2*ps)*l | (7.000+2*1.500)*579.000 | 5,790.00 | sqm |
| | | Refer: TCS-06 Formula: (cw+2*ps)*l | (7.000+2*1.500)*217.000 | 2,170.00 | sqm |
| | | Refer: TCS-07 Formula: (cw+2*ps)*l | (7.000+2*1.500)*430.000 | 4,300.00 | sqm |
| | | Refer: TCS-09A Formula: (cw+2*ps)*l | (7.000+2*1.500)*130.000 | 1,300.00 | sqm |
| | | Refer: TCS-12 Formula: (cw+2*ps)*l | (7.000+2*1.500)*827.000 | 8,270.00 | sqm |
| | | | Total : | 160,350.00 | sqm |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|-----------------------------------|----------|------|
| 3 | 06/Nsc1 | Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40 | | | |
| | | Refer: Extra Widening on Flexible Formula: Pavement $ew_area*dbm$ | $10083.000*0.070$ | 705.81 | cum |
| | | Refer: TCS-03 Formula: $(cw+2*ps)*dbm*I$ | $(7.000+2*1.500)*0.070*11988.000$ | 8,391.60 | cum |
| | | Refer: TCS-03A Formula: $(cw+2*ps)*dbm*I$ | $(7.000+2*1.500)*0.070*1192.000$ | 834.40 | cum |
| | | Refer: TCS-04 Formula: $(cw+2*ps)*dbm*I$ | $(7.000+2*1.500)*0.070*592.000$ | 414.40 | cum |
| | | Refer: TCS-04A Formula: $(cw+2*ps)*dbm*I$ | $(7.000+2*1.500)*0.070*80.000$ | 56.00 | cum |
| | | Refer: TCS-05 Formula: $(cw+2*ps)*dbm*I$ | $(7.000+2*1.500)*0.070*579.000$ | 405.30 | cum |
| | | Refer: TCS-06 Formula: $(cw+2*ps)*dbm*I$ | $(7.000+2*1.500)*0.070*217.000$ | 151.90 | cum |
| | | Refer: TCS-07 Formula: $(cw+2*ps)*dbm*I$ | $(7.000+2*1.500)*0.070*430.000$ | 301.00 | cum |
| | | Refer: TCS-09A Formula: $(cw+2*ps)*dbm*I$ | $(7.000+2*1.500)*0.070*130.000$ | 91.00 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|-----------------------------------|------------------|------------|
| | | Refer: TCS-12 Formula: (cw+2*ps)*dbm*I | $(7.000+2*1.500)*0.070*827.000$ | 578.90 | cum |
| | | | Total : | 11,930.31 | cum |
| 4 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii) Using bitumen 30/40 | | | |
| | | Refer: Extra Widening on Flexible Formula: Pavement ew_area*bc | $10083.000*0.040$ | 403.32 | cum |
| | | Refer: TCS-03 Formula: (cw+2*ps)*bc*I | $(7.000+2*1.500)*0.040*11988.000$ | 4,795.20 | cum |
| | | Refer: TCS-03A Formula: (cw+2*ps)*bc*I | $(7.000+2*1.500)*0.040*1192.000$ | 476.80 | cum |
| | | Refer: TCS-04 Formula: (cw+2*ps)*bc*I | $(7.000+2*1.500)*0.040*592.000$ | 236.80 | cum |
| | | Refer: TCS-04A Formula: (cw+2*ps)*bc*I | $(7.000+2*1.500)*0.040*80.000$ | 32.00 | cum |
| | | Refer: TCS-05 Formula: (cw+2*ps)*bc*I | $(7.000+2*1.500)*0.040*579.000$ | 231.60 | cum |
| | | Refer: TCS-06 Formula: (cw+2*ps)*bc*I | $(7.000+2*1.500)*0.040*217.000$ | 86.80 | cum |
| | | Refer: TCS-07 Formula: (cw+2*ps)*bc*I | $(7.000+2*1.500)*0.040*430.000$ | 172.00 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|---------------------------------|----------|------|
| | | Refer: TCS-09A Formula: $(cw+2*ps)*bc*I$ | $(7.000+2*1.500)*0.040*130.000$ | 52.00 | cum |
| | | Refer: TCS-12 Formula: $(cw+2*ps)*bc*I$ | $(7.000+2*1.500)*0.040*827.000$ | 330.80 | cum |
| | | | Total : | 6,817.32 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|---------------------------------------|--------------|------------|
| 1 | 04.01/Nsc1 | Sub-base with Close Graded Material (Table: - 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material | | | |
| | | Refer: Minor Junction Formula: $\text{tot_area} * \text{gsb} * (1 - \text{gsb_per} / 100)$ | $99.000 * 0.200 * (1 - 36.630 / 100)$ | 12.55 | Cum |
| | | | Total : | 12.55 | Cum |
| 2 | 04/nsc1 | Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 | | | |
| | | Refer: Minor Junction Formula: $\text{tot_area} * \text{gsb} * (\text{gsb_per} / 100)$ | $99.000 * 0.200 * (36.630 / 100)$ | 7.25 | Cum |
| | | | Total : | 7.25 | Cum |
| 3 | 05.02 | Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.) | | | |
| | | Refer: Minor Junction Formula: $\text{tot_area} * (\text{wmm1} + \text{wmm2})$ | $99.000 * (0.125 + 0.125)$ | 24.75 | Cum |
| | | | Total : | 24.75 | Cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|----------------|--------------|------------|
| 4 | 06.01/a | Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm | | | |
| | | Refer: Minor Junction Formula: tot_area | 99.000 | 99.00 | sqm |
| | | | Total : | 99.00 | sqm |
| 5 | 06.02/i | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm | | | |
| | | Refer: Minor Junction Formula: tot_area | 99.000 | 99.00 | sqm |
| | | | Total : | 99.00 | sqm |
| 6 | 06/Nsc1 | Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40 | | | |
| | | Refer: Minor Junction Formula: tot_area*dbm | 99.000*0.070 | 6.93 | cum |
| | | | Total : | 6.93 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|----------------|-------------|------------|
| 7 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | | | |
| | | Refer: Minor Junction Formula: tot_area*bc | 99.000*0.040 | 3.96 | cum |
| | | | Total : | 3.96 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|----------------|---------------|-------------|
| 1 | 08.02/a | Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. a) 5th KM stone | | | |
| | | Refer: Traffic Signs Formula: 3 | 3 | 3.00 | each |
| | | | Total : | 3.00 | each |
| 2 | 08.02/b | Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. b) Ordinary kilometer stone | | | |
| | | Refer: Traffic Signs Formula: 13 | 13 | 13.00 | each |
| | | | Total : | 13.00 | each |
| 3 | 08.04 | Reinforced Cement Concrete M15 Boundary pillars of standard design, fixed in position including finishing but excluding painting | | | |
| | | Refer: Traffic Signs Formula: 163 | 163 | 163.00 | each |
| | | | Total : | 163.00 | each |
| 4 | 08.11/i | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm equilateral triangle | | | |
| | | Refer: Traffic Signs Formula: 208 | 208 | 208.00 | each |
| | | | Total : | 208.00 | each |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|----------------|--------------|-------------|
| 5 | 08.11/iii | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm circular | | | |
| | | Refer: Traffic Signs Formula: 34 | 34 | 34.00 | each |
| | | | Total : | 34.00 | each |
| 6 | 08.11/iv | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 80 mm x 60 mm rectangular | | | |
| | | Refer: Traffic Signs Formula: 6 | 6 | 6.00 | each |
| | | | Total : | 6.00 | each |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|--|-------------|-------------|
| 7 | 08.11/vii | Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm high octagon | | | |
| | | Refer: Traffic Signs Formula: 2 | 2 | 2.00 | each |
| | | | Total : | 2.00 | each |
| 8 | 08.14 | Road Marking with Hot Applied Thermoplastic Compound with Reflectorising Glass Beads on Bituminous Surface (Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes.) | | | |
| | | Refer: TCS-03 Formula: $((l+6)/9)*lc*wc+(nc*l*wid_mar)$ | $((11988.000+6)/9)*3.000*0.100)+(2.000*11988.000*0.150)$ | 3,996.20 | sqm |
| | | Refer: TCS-03A Formula: $((l+6)/9)*lc*wc+(nc*l*wid_mar)$ | $((1192.000+6)/9)*3.000*0.100)+(2.000*1192.000*0.150)$ | 397.53 | sqm |
| | | Refer: TCS-04 Formula: $((l+6)/9)*lc*wc+(nc*l*wid_mar)$ | $((592.000+6)/9)*3.000*0.100)+(2.000*592.000*0.150)$ | 197.53 | sqm |
| | | Refer: TCS-04A Formula: $((l+6)/9)*lc*wc+(nc*l*wid_mar)$ | $((80.000+6)/9)*3.000*0.100)+(2.000*80.000*0.150)$ | 26.87 | sqm |
| | | Refer: TCS-05 Formula: $((l+6)/9)*lc*wc+(nc*l*wid_mar)$ | $((579.000+6)/9)*3.000*0.100)+(2.000*579.000*0.150)$ | 193.20 | sqm |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|--|-----------------|-------------|
| | | Refer: TCS-06 Formula: $((l+6)/9)*l*c*wc+(nc*l*wid_mar)$ | $((217.000+6)/9)*3.000*0.100)+$ $(2.000*217.000*0.150)$ | 72.53 | sqm |
| | | Refer: TCS-07 Formula: $((l+6)/9)*l*c*wc+(nc*l*wid_mar)$ | $((430.000+6)/9)*3.000*0.100)+$ $(2.000*430.000*0.150)$ | 143.53 | sqm |
| | | Refer: TCS-09A Formula: $((l+6)/9)*l*c*wc+(nc*l*wid_mar)$ | $((130.000+6)/9)*3.000*0.100)+$ $(2.000*130.000*0.150)$ | 43.53 | sqm |
| | | Refer: TCS-12 Formula: $((l+6)/9)*l*c*wc+(nc*l*wid_mar)$ | $((827.000+6)/9)*3.000*0.100)+$ $(2.000*827.000*0.150)$ | 275.87 | sqm |
| | | | Total : | 5,346.80 | sqm |
| 9 | 08.15/c/v | Road Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and confirming to IRC-79 and the drawings.) 120x120 -Road Delineator | | | |
| | | Refer: Traffic Signs Formula: 1887 | 1887 | 1,887.00 | each |
| | | | Total : | 1,887.00 | each |
| 10 | 08.18/A/b | Metal Beam Crash Barrier Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fitments to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810) For post Height of 1.5 m | | | |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|----------------|-----------------|------------|
| | | Refer: Crash Barrier Formula: 3470 | 3470 | 3,470.00 | Rm |
| | | | Total : | 3,470.00 | Rm |
| 11 | 08.20/ii | Road Markers/Road stud with lense reflector Providing & fixing of road stud 100x100 mm, die-cast in aluminium , resistance to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30mm upto a depth of 60mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973 Light Reflecting Lense Type | | | |
| | | Refer: Traffic Signs Formula: 9537 | 9537 | 9,537.00 | nos |
| | | | Total : | 9,537.00 | nos |
| 12 | 08.22 | Lighting on Bridges Providing & fixing lighting on Bridges, mounted on steel hollow circular poles of standard specification, 5 m high fixed on parapets with cement concrete, 20 m apart and fitted with sodium vapour lamp | | | |
| | | Refer: Traffic Signs Formula: 53 | 53 | 53.00 | nos |
| | | | Total : | 53.00 | nos |
| 13 | 08/nsc/2 | Convex Mirror For Blind Curve | | | |
| | | Refer: Traffic Signs Formula: 20 | 20 | 20.00 | nos |
| | | | Total : | 20.00 | nos |
| 14 | 08/nsc/6 | Rumble Strips Provision of 15 nos rumble strips covered with premix bituminous carpet, 15-20 mm high at center, 250 mm wide placed at 1 m center to center at approved locations to control speed, marked with white strips of road marking paint. | | | |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|-------------|----------|------|
| | | Refer: Traffic Signs Formula: 120 | 120 | 120.00 | sqm |
| | | | Total : | 120.00 | sqm |
| 15 | 16.09 | Mild steel railing complete as per drawing and Technical Specifications | | | |
| | | Refer: Railing Formula: 1092 | 1092 | 1,092.00 | Rm |
| | | | Total : | 1,092.00 | Rm |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|---|----------|------|
| 1 | 08.05 | Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface. | | | |
| | | Refer: Passenger Shelter Formula: $((sw_in*sw_ht*2)+(w_pass*sw_ht*2)+(bw_in*bw_ht)+(l_pass*bw_ht)+(col_l*fcol_h*6)+(l_pass*roof_w)-(2*win_n*win_l*win_h))*n$ | $((1.875*3.830*2)+(2.000*3.830*2)+(5.800*2.350)+(6.000*2.350)+(0.250*2.650*6)+(6.000*1.530)-(2*2.000*1.250*0.900))*4.000$ | 264.27 | sqm |
| | | | Total : | 264.27 | sqm |
| 2 | 10.16 | Cement Plaster 12mm Thick in Cement Morter 1:3 | | | |
| | | Refer: Passenger Shelter Formula: $((sw_in*sw_ht*2)+(w_pass*sw_ht*2)+(bw_in*bw_ht)+(l_pass*bw_ht)+(col_l*fcol_h*6)+(l_pass*roof_w)-(2*win_n*win_l*win_h))*n$ | $((1.875*3.830*2)+(2.000*3.830*2)+(5.800*2.350)+(6.000*2.350)+(0.250*2.650*6)+(6.000*1.530)-(2*2.000*1.250*0.900))*4.000$ | 264.27 | sqm |
| | | | Total : | 264.27 | sqm |
| 3 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | | | |
| | | Refer: Passenger Shelter Formula: $(((a+0.25*2)*(b+0.25*2)*df*col_n)+((l+2*0.1)*(w+2*0.1)*db))*n$ | $(((0.750+0.25*2)*(0.750+0.25*2)*0.750*6.000)+((13.500+2*0.1)*(0.500+2*0.1)*0.300))*4.000$ | 39.63 | cum |
| | | | Total : | 39.63 | cum |
| 4 | 14.01 | Brick masonry work in cement mortar 1:3 in foundation complete excluding pointing and plastering, as per drawing and technical specifications | | | |
| | | Refer: Passenger Shelter Formula: $((l*w*wbtm_thk)+(l*fw_wall*wtop_thk))*n$ | $((13.500*0.500*0.150)+(13.500*0.250*0.150))*4.000$ | 6.08 | cum |
| | | | Total : | 6.08 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|---|-------------|------------|
| 5 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | | | |
| | | Refer: Passenger Shelter Formula: (l_pass-2*w_wall)*(w_pass-2*w_wall) *pcc_thk*n | (6.000-2*0.125)*(2.000-2*0.125) *0.100*4.000 | 4.03 | cum |
| | | | Total : | 4.03 | cum |
| 6 | 14.03/e/II | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M25Grade | | | |
| | | Refer: Passenger Shelter Formula: (((a*b*btm_thk)+((a+col_l)*0.5)*((b+col_w)*0.5)*top_thk)+(col_l*col_w*(df-btm_thk-top_thk)))*col_n*n | ((((0.750*0.750*0.100)+((0.750+0.250)*0.5)*((0.750+0.250)*0.5)*0.100)+(0.250*0.250*(0.750-0.100-0.100)))*6.000*4.000 | 2.78 | cum |
| | | | Total : | 2.78 | cum |
| 7 | 14.08 | HYSD bar reinforcement in foundation complete as per drawing and technical specification | | | |
| | | Refer: Passenger Shelter Formula: (((a*b*btm_thk)+((a+col_l)*0.5)*((b+col_w)*0.5)*top_thk)+(col_l*col_w*(df-btm_thk-top_thk)))*col_n*n)*rf/1000 | (((((0.750*0.750*0.100)+((0.750+0.250)*0.5)*((0.750+0.250)*0.5)*0.100)+(0.250*0.250*(0.750-0.100-0.100)))*6.000*4.000)*120.000/1000 | 0.33 | MT |
| | | | Total : | 0.33 | MT |
| 8 | 14/nsc2 | Brick Flat Soling at Foundation | | | |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|---|--------------|------------|
| | | Refer: Passenger Shelter Formula: $((l_{pass}-2*w_{wall})*(w_{pass}-2*w_{wall}))+ (a*b*col_n)*n$ | $((6.000-2*0.125)*(2.000-2*0.125))+ (0.750*0.750*6.000))*4.000$ | 53.75 | Sqm |
| | | | Total : | 53.75 | Sqm |
| 9 | 15.01 | Brick masonry work in cement mortar 1:3 in Sub-structure complete excluding pointing and plastering, as per drawing and technical specifications | | | |
| | | Refer: Passenger Shelter Formula: $((l*w_{wall}*wall_h)+(sw_l*2*w_{wall}*sw_h)+(bw_l*4*w_{wall}*bw_h)+(rail_l*w_{wall}*rail_h))*n-(win_l*w_{wall}*win_h*2*n)$ | $((13.500*0.125*0.550)+(1.500*2*0.125*2.130)+(2.650*4*0.125*0.950)+(9.500*0.125*0.450))*4.000-(1.250*0.125*0.900*2*4.000)$ | 12.96 | cum |
| | | | Total : | 12.96 | cum |
| 10 | 16.01/a/i | cement concrete Reinforced concrete in super-structure as per drawing and Technical Specification i/c form work complet eas per drawing and technical specification RCC Grade M25 For solid slab super-structure Upto 5m Upto 5m | | | |
| | | Refer: Passenger Shelter Formula: $((col_l*col_w*col_h*col_n*0.5)+(col_l*col_w*bcol_h*col_n*0.5)+(sb_l*sb_w*sb_thk*2)+(sb_a*sb_w*sb_thk*4)+(l_{pass}*roof_w*roof_thk)+(l_{pass}*fchj_w*roof_thk)+(l_{pass}*bchj_w*roof_thk)+(bch_l*bch_w*bch_thk))*n$ | $((0.250*0.250*2.650*6.000*0.5)+(0.250*0.250*2.100*6.000*0.5)+(1.530*0.250*0.350*2)+(3.000*0.250*0.350*4)+(6.000*1.530*0.110)+(6.000*0.680*0.110)+(6.000*0.450*0.110)+(5.000*0.500*0.075))*4.000$ | 16.61 | cum |
| | | | Total : | 16.61 | cum |
| 11 | 16.03 | HYSD bar reinforcement in super-structure complete as per drawing and technical specifications | | | |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|--|-------------|-----------|
| | | Refer: Passenger Shelter Formula: $((col_l * col_w * fcol_h * col_n * 0.5) +$ $(col_l * col_w * bcol_h * col_n * 0.5) +$ $(sb_l * sb_w * sb_thk * 2) +$ $(sb_a * sb_w * sb_thk * 4) +$ $(l_pass * roof_w * roof_thk) +$ $(l_pass * fchj_w * roof_thk) +$ $(l_pass * bchj_w * roof_thk) +$ $(bch_l * bch_w * bch_thk)) * n * srf / 1000$ | $((0.250 * 0.250 * 2.650 * 6.000 * 0.5) +$ $(0.250 * 0.250 * 2.100 * 6.000 * 0.5) +$ $(1.530 * 0.250 * 0.350 * 2) +$ $(3.000 * 0.250 * 0.350 * 4) +$ $(6.000 * 1.530 * 0.110) +$ $(6.000 * 0.680 * 0.110) +$ $(6.000 * 0.450 * 0.110) +$ $(5.000 * 0.500 * 0.075))$ $* 4.000 * 100.000 / 1000$ | 1.66 | MT |
| | | | Total : | 1.66 | MT |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|--|---------------|------------|
| 1 | 03.14/Nsc | Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from Roadway Cutting with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2 | | | |
| | | Refer: Busbay (2 Lane) Formula: $((2*b+a)*(d+f))*n*sg$ | $((2*22.000+15.000)*(3.500+2.500))*4.000*0.500$ | 708.00 | cum |
| | | | Total : | 708.00 | cum |
| 2 | 04.01/Nsc1 | Sub-base with Close Graded Material (Table: - 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material | | | |
| | | Refer: Busbay (2 Lane) Formula: $((2*b+a)*(d+f))*n*gsb*(1-gsb_per/100)$ | $((2*22.000+15.000)*(3.500+2.500))*4.000*0.200*(1-36.630/100)$ | 179.46 | Cum |
| | | | Total : | 179.46 | Cum |
| 3 | 04/nsc1 | Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 | | | |
| | | Refer: Busbay (2 Lane) Formula: $((2*b+a)*(d+f))*n*gsb*(gsb_per/100)$ | $((2*22.000+15.000)*(3.500+2.500))*4.000*0.200*(36.630/100)$ | 103.74 | Cum |
| | | | Total : | 103.74 | Cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|---|-----------------|------------|
| 4 | 05.02 | Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.) | | | |
| | | Refer: Busbay (2 Lane) Formula: $((2*b+a)*(d+f))*n*(wmm1+wmm2)$ | $((2*22.000+15.000)*(3.500+2.500))*4.000*(0.125+0.125)$ | 354.00 | Cum |
| | | | Total : | 354.00 | Cum |
| 5 | 05.03 | Construction of footpath/separator by providing a 150 mm compacted granular sub base as per clause 401 and 25 mm thick cement concrete grade M15, over laid with pre-cast concrete tiles in cement mortar including provision of all drainage arrangements but excluding kerb channel. | | | |
| | | Refer: Busbay (2 Lane) Formula: $((2*b+a)*f)*n$ | $((2*22.000+15.000)*2.500)*4.000$ | 590.00 | sqm |
| | | | Total : | 590.00 | sqm |
| 6 | 06.01/a | Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm | | | |
| | | Refer: Busbay (2 Lane) Formula: $((2*b+a)*(d+f))*n$ | $((2*22.000+15.000)*(3.500+2.500))*4.000$ | 1,416.00 | sqm |
| | | | Total : | 1,416.00 | sqm |
| 7 | 06.02/i | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm | | | |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|---|-----------------|------------|
| | | Refer: Busbay (2 Lane) Formula: $((2*b+a)*(d+f))*n$ | $((2*22.000+15.000)*(3.500+2.500))$ $*4.000$ | 1,416.00 | sqm |
| | | | Total : | 1,416.00 | sqm |
| 8 | 06/Nsc1 | Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40 | | | |
| | | Refer: Busbay (2 Lane) Formula: $((2*b+a)*(d+f))*n*dbm$ | $((2*22.000+15.000)*(3.500+2.500))$ $*4.000*0.070$ | 99.12 | cum |
| | | | Total : | 99.12 | cum |
| 9 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | | | |
| | | Refer: Busbay (2 Lane) Formula: $((2*b+a)*(d+f))*n*bc$ | $((2*22.000+15.000)*(3.500+2.500))$ $*4.000*0.040$ | 56.64 | cum |
| | | | Total : | 56.64 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|---|------------------|------------|
| 1 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | | | |
| | | Refer: PCC Chut Drain Formula: $(a+2*wall_thk+0.1*2)*f_thk*I$ | $(0.600+2*0.150+0.1*2)*0.100*315.000$ | 34.65 | cum |
| | | Refer: RCC Cover Drain 1.0m Formula: $(t_width+off*2)*((ht+b_slab_thk)/2)*I$ | $(1.750+0.100*2)*((0.900+0.150)/2)*865.000$ | 885.54 | cum |
| | | Refer: RR Masonry Trapezoidal Drain Formula: $(a+2*b)*(h+f)*I$ | $(1.000+2*0.200)*(0.850+0.200)*15824.000$ | 23,261.28 | cum |
| | | | Total : | 24,181.47 | cum |
| 2 | 14.02/b | Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification R a n d o m R u b b l e M a s o n r y (coursed/uncoursed) | | | |
| | | Refer: RR Masonry Trapezoidal Drain Formula: $((0.5*(c+j+2*b)*f)+(((a-j)/2)^2+h^2)^{(1/2})*b*2)*I$ | $((0.5*(0.765+0.500+2*0.200)*0.200)+(((1.000-0.500)/2)^2+0.850^2)^{(1/2})*0.200*2)*15824.000$ | 8,242.74 | cum |
| | | | Total : | 8,242.74 | cum |
| 3 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | | | |
| | | Refer: RCC Cover Drain 1.0m Formula: $(t_width+off*2)*pcc_thk*I$ | $(1.750+0.100*2)*0.100*865.000$ | 168.68 | cum |
| | | | Total : | 168.68 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|---|---------------|------------|
| 4 | 14.03/b | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M20 Grade | | | |
| | | Refer: PCC Chut Drain Formula: (a+2*wall_thk+0.1*2)*f_thk*I | (0.600+2*0.150+0.1*2)*0.100*315.000 | 34.65 | cum |
| | | | Total : | 34.65 | cum |
| 5 | 15.02/b | Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification R a n d o m R u b b l e M a s o n r y (coursed/uncoursed) | | | |
| | | Refer: RR Masonry Trapezoidal Drain Formula: (I-(I/5*0.2))*b*d | (15824.000-(15824.000/5*0.2))*0.200*0.300 | 911.46 | cum |
| | | | Total : | 911.46 | cum |
| 6 | 15.03/b/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade Upto 5m | | | |
| | | Refer: PCC Chut Drain Formula: ((a+wall_thk*2)*btm_thk+ht*wall_thk*2)*I | ((0.600+0.150*2)*0.150+0.400*0.150*2)*315.000 | 80.33 | cum |
| | | | Total : | 80.33 | cum |
| 7 | 15.03/f/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M25 Grade upto 5m height | | | |
| | | Refer: RCC Cover Drain 1.0m Formula: (ht*w_thk*2+t_width*b_slab_thk+t_width*t_slab_thk)*I | (0.900*0.200*2+1.750*0.150+1.750*0.125)*865.000 | 727.68 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|---|---------------|------------|
| | | | Total : | 727.68 | cum |
| 8 | 15.05 | HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification | | | |
| | | Refer: RCC Cover Drain 1.0m Formula: (ht*w_thk*2+t_width*b_slab_thk+t_width*t_slab_thk)*l*s | (0.900*0.200*2+1.750*0.150+1.750*0.125)*865.000*0.050 | 36.38 | MT |
| | | | Total : | 36.38 | MT |
| 9 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | | | |
| | | Refer: RCC Cover Drain 1.0m Formula: (l/2+1) | (865.000/2+1) | 433.50 | Rm |
| | | | Total : | 433.50 | Rm |
| 10 | 24/i/b | Galvanised Mild steel J /L hook | | | |
| | | Refer: RCC Cover Drain 1.0m Formula: l/15*4*.3 | 865.000/15*4*.3 | 69.20 | kg |
| | | | Total : | 69.20 | kg |
| 11 | 40 | Gextextile material (fine net) | | | |
| | | Refer: RCC Cover Drain 1.0m Formula: (l/1)*4*(150*150/1000^2) | (865.000/1)*4*(150*150/1000^2) | 77.85 | sqm |
| | | | Total : | 77.85 | sqm |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|----------------|------------------|------------|
| 1 | 12/Nsc1 | Geo-synthetics and Reinforced Earth With reinforcing elements of synthetic geogrids | | | |
| | | Refer: DT Mesh for Protection Formula: 1352 | 1352 | 1,352.00 | Sqm |
| | | | Total : | 1,352.00 | Sqm |
| 2 | 12/Nsc9 | Composite RE Wall Drilling of 100mm diameter semi-perforated PVC pipe inside the hill slope wrapped with non woven geotextile complete as per drawing and as directed by the engineer. | | | |
| | | Refer: DT Mesh for Protection Formula: 43027 | 43027 | 43,027.00 | m |
| | | | Total : | 43,027.00 | m |
| 3 | 15.12/Nsc | Supply and Installation of Mechanically woven double twisted hexagonal shaped steel wire mesh gabion boxes with Zinc + PVC coating having mesh size of 100 mm x 120 mm by using mesh wire 2.7 mm (Inner dia) and 3.7 (outer dia) with sleeved wire 3.4 mm(inner dia) and 4.4 mm (outer dia) and lacing with 2.2mm inner dia and 3.3 mm outer dia.placing at indicated places in dry condition at easily accessible location as per direction of Engineer including tools, plant, labour etc. complete in all respect, carrying the material from nearest approach with all leads & lifts, manpower & machinery, materials, labor etc. complete as per detailed technical specifications and as directed by Engineer-In-Charge. | | | |
| | | Refer: Gabion Structure Formula: 32868 | 32868 | 32,868.00 | cum |
| | | | Total : | 32,868.00 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|----------------|------------------|------------|
| 4 | 23/Nsc4 | Providing and spreading Mechanically Woven Double Twisted Hexagonal Shaped Wire Mesh Netting of Mesh Type 10x12 with D=100mm tolerance of $\pm 2\%$, Zn + PVC coated, Mesh Wire dia. 2.7/3.7mm (ID/OD), mechanically edged/selvedged with galvanization as per EN 10223-3, and shall have minimum 10 numbers of mesh openings per meter of mesh perpendicular to twist, lacing with wire of diameter 2.2/3.2 mm (ID/OD), at easily accessible location including top and bottom, with all leads and lifts, manpower and machinery, materials, labour etc. complete and as directed by Engineer - In – Charge | | | |
| | | Refer: DT Mesh for Protection Formula: 32270 | 32270 | 32,270.00 | sqm |
| | | | Total : | 32,270.00 | sqm |
| 5 | 23/Nsc5 | Supply and installation of Continuous threaded Anchors (32mm dia, yield strength > 500 N/mm ²) nut, washer plate, coupler for connecting bars and full length grouting with admixture including all ancillary items for top/bottom/cortical anchoring as per detailed technical specifications and as directed by engineer in charge. | | | |
| | | Refer: DT Mesh for Protection Formula: 25213 | 25213 | 25,213.00 | Rm |
| | | | Total : | 25,213.00 | Rm |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|--|-----------------|------------|
| 1 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | | | |
| | | Refer: Breast Wall 2.0m Ht Formula: $(h+2*0.5)*(e+f)*(1-p)*l$ | $(1.890+2*0.5)*(0.850+0.300)*(1-0.200)$ *1012.000 | 2,690.71 | cum |
| | | Refer: Breast Wall 3.0m Ht Formula: $(h+2*0.5)*(e+f)*(1-p)*l$ | $(2.225+2*0.5)*(0.850+0.300)*(1-0.200)$ *1090.000 | 3,234.03 | cum |
| | | | Total : | 5,924.74 | cum |
| 2 | 13.01/b/ii | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary rock if blasting is not resorted to | | | |
| | | Refer: Breast Wall 2.0m Ht Formula: $(h+2*0.5)*(e+f)*p*l$ | $(1.890+2*0.5)*(0.850+0.300)$ *0.200*1012.000 | 672.68 | cum |
| | | Refer: Breast Wall 3.0m Ht Formula: $(h+2*0.5)*(e+f)*p*l$ | $(2.225+2*0.5)*(0.850+0.300)$ *0.200*1090.000 | 808.51 | cum |
| | | | Total : | 1,481.18 | cum |
| 3 | 13.03/a | Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials | | | |
| | | Refer: Breast Wall 2.0m Ht Formula: $c*b*l$ | $1.550*0.300*1012.000$ | 470.58 | cum |
| | | Refer: Breast Wall 3.0m Ht Formula: $c*b*l$ | $2.550*0.300*1090.000$ | 833.85 | cum |
| | | | Total : | 1,304.43 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|--|-----------------|------------|
| 4 | 13.03/b | Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Good Sandy Soil free from organic material | | | |
| | | Refer: Breast Wall 2.0m Ht Formula: $d*b*l$ | $0.450*0.300*1012.000$ | 136.62 | cum |
| | | Refer: Breast Wall 3.0m Ht Formula: $d*b*l$ | $0.450*0.300*1090.000$ | 147.15 | cum |
| | | | Total : | 283.77 | cum |
| 5 | 14.02/b | Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification R a n d o m R u b b l e M a s o n r y (coursed/uncoursed) | | | |
| | | Refer: Breast Wall 2.0m Ht Formula: $0.5*(e+(e-(h/5)))*h*l$ | $0.5*(0.850+(0.850-(1.890/5)))*1.890*1012.000$ | 1,264.28 | cum |
| | | Refer: Breast Wall 3.0m Ht Formula: $0.5*(e+(e-(h/5)))*h*l$ | $0.5*(0.850+(0.850-(2.225/5)))*2.225*1090.000$ | 1,521.84 | cum |
| | | | Total : | 2,786.13 | cum |
| 6 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | | | |
| | | Refer: Breast Wall 2.0m Ht Formula: $g*f*l$ | $1.933*0.300*1012.000$ | 586.86 | cum |
| | | Refer: Breast Wall 3.0m Ht Formula: $g*f*l$ | $2.225*0.300*1090.000$ | 727.58 | cum |
| | | | Total : | 1,314.43 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|--|-----------------|------------|
| 7 | 15.02/b | Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification R a n d o m R u b b l e M a s o n r y (coursed/uncoursed) | | | |
| | | Refer: Breast Wall 2.0m Ht Formula: $(0.5*((a+(c+d)/3)+a)*(d+c)+i*d+i*m)*l$ | $(0.5*((0.600+(1.550+0.450)/3)+0.600)*$ $(0.450+1.550)$ $+0.100*0.450+0.100*0.000)*1012.000$ | 1,934.61 | cum |
| | | Refer: Breast Wall 3.0m Ht Formula: $(0.5*((a+(c+d)/3)+a)*(d+c)+i*d+i*m)*l$ | $(0.5*((0.600+(2.550+0.450)/3)+0.600)*$ $(0.450+2.550)$ $+0.100*0.450+0.100*0.000)*1090.000$ | 3,646.05 | cum |
| | | | Total : | 5,580.66 | cum |
| 8 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | | | |
| | | Refer: Breast Wall 2.0m Ht Formula: $(l/1.2)*(h-j-i)$ | $(1012.000/1.2)*(1.890-0.600-0.100)$ | 1,003.57 | Rm |
| | | Refer: Breast Wall 3.0m Ht Formula: $(l/1.2)*(h-j-i)$ | $(1090.000/1.2)*(2.225-0.600-0.100)$ | 1,385.21 | Rm |
| | | | Total : | 2,388.78 | Rm |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|---|-----------------|------------|
| 1 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | | | |
| | | Refer: Retaining Wall 2.0m Formula: (((0.5*((pcc_thk+H2+d)+(pcc_thk+d))* (B1+2*o))+((H2+d)*(mw-o)))*I)*(1-p_c) | (((0.5*((0.300+0.211+0.600)+ (0.300+0.600))*(1.270+2*0.150))+ ((0.211+0.600)*(0.600-0.150))) *572.000)*(1-0.200) | 889.38 | cum |
| | | Refer: Retaining Wall 3.0m Formula: (((0.5*((pcc_th1k+H2+d)+(pcc_th1k+d))* (B1+2*o))+((H2+d)*(mw-o)))*I)*(1-p_c) | (((0.5*((0.300+0.267+0.600)+ (0.300+0.600))*(1.600+2*0.150))+ ((0.267+0.600)*(0.600-0.150))) *100.000)*(1-0.200) | 188.30 | cum |
| | | | Total : | 1,077.69 | cum |
| 2 | 13.01/b/ii | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary rock if blasting is not resorted to | | | |
| | | Refer: Retaining Wall 2.0m Formula: (((0.5*((pcc_thk+H2+d)+(pcc_thk+d))* (B1+2*o))+((H2+d)*(mw-o)))*I)*p_c | (((0.5*((0.300+0.211+0.600)+ (0.300+0.600))*(1.270+2*0.150))+ ((0.211+0.600)*(0.600-0.150))) *572.000)*0.200 | 222.35 | cum |
| | | Refer: Retaining Wall 3.0m Formula: (((0.5*((pcc_thk+H2+d)+(pcc_thk+d))* (B1+2*o))+((H2+d)*(mw-o)))*I)*p_c | (((0.5*((+0.267+0.600)+(+0.600))* (1.600+2*0.150))+((0.267+0.600)* (0.600-0.150)))*100.000)*0.200 | 35.68 | cum |
| | | | Total : | 258.02 | cum |
| 3 | 13.04 | Filter medium behind abutment, wing wall and return wall complete as per drawing and technical specification . | | | |
| | | Refer: Retaining Wall 2.0m Formula: mw*(H2+H1)*I | 0.600*(0.211+2.000)*572.000 | 758.82 | cum |
| | | Refer: Retaining Wall 3.0m Formula: mw*(H2+H1)*I | 0.600*(0.267+3.000)*100.000 | 196.02 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|---|---|---------------|------------|
| | | | Total : | 954.84 | cum |
| 4 | 14.02/b | Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification R a n d o m R u b b l e M a s o n r y (coursed/uncoursed) | | | |
| | | Refer: Retaining Wall 2.0m Formula: $((0.5*(B1+e)*d)+(0.5*B1*H2))*l$ | $((0.5*(1.270+1.067)*0.600)+(0.5*1.270*0.211))*572.000$ | 477.67 | cum |
| | | Refer: Retaining Wall 3.0m Formula: $((0.5*(B1+B3)*d)+(0.5*B1*H2))*l$ | $((0.5*(1.600+1.400)*0.600)+(0.5*1.600*0.267))*100.000$ | 111.36 | cum |
| | | | Total : | 589.03 | cum |
| 5 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | | | |
| | | Refer: Retaining Wall 2.0m Formula: $(B2+2*o)*pcc_thk*l$ | $(1.284+2*0.150)*0.300*572.000$ | 271.81 | cum |
| | | Refer: Retaining Wall 3.0m Formula: $(B2+2*o)*pcc_tH1k*l$ | $(1.622+2*0.150)*0.300*100.000$ | 57.66 | cum |
| | | | Total : | 329.47 | cum |
| 6 | 15.02/b | Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification R a n d o m R u b b l e M a s o n r y (coursed/uncoursed) | | | |
| | | Refer: Retaining Wall 2.0m Formula: $(0.5*(T+e)*(H1-d))*l$ | $(0.5*(0.600+1.067)*(2.000-0.600))*572.000$ | 667.47 | cum |
| | | Refer: Retaining Wall 3.0m Formula: $(0.5*(T+B3)*(H1-d))*l$ | $(0.5*(0.600+1.400)*(3.000-0.600))*100.000$ | 240.00 | cum |
| | | | Total : | 907.47 | cum |

| SI No | SOR Ref No | Description | Calculation | Quantity | Unit |
|-------|------------|--|--|-----------------|------------|
| 7 | 15.03/b/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade Upto 5m | | | |
| | | Refer: Retaining Wall 2.0m Formula: $(l-(l/10*gap))*para_ht*para_w$ | $(572.000-(572.000/10*0.300))$ $*0.450*0.300$ | 74.90 | cum |
| | | Refer: Retaining Wall 3.0m Formula: $(l-(l/10*gap))*para_ht*para_w$ | $(100.000-(100.000/10*0.300))$ $*0.450*0.300$ | 13.10 | cum |
| | | | Total : | 88.00 | cum |
| 8 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | | | |
| | | Refer: Retaining Wall 2.0m Formula: $n*l$ | $2.000*572.000$ | 1,144.00 | Rm |
| | | Refer: Retaining Wall 3.0m Formula: $n*l$ | $3.000*100.000$ | 300.00 | Rm |
| | | | Total : | 1,444.00 | Rm |

BILL OF QUANTITY (STRUCTURE PART)



Bill No : 13. Culvert

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|--------------------------------|------------|---|------|----------|----------|----------|
| Foundation | | | | | | |
| 1 | 10.20 | Plain cement concrete M-15 mix with stone aggregate 20mm. Nominal size mechanically mixed and vibrated in foundation depth of 1.5m. below ground / bed level and or 1.5m. above ground/bed level i/c formwork. | cum | 1,064.00 | | |
| 2 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | cum | 7,806.00 | | |
| Sub Total of Foundation | | | | | | |
| Sub Structure | | | | | | |
| 3 | 10.06/a | Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Sub-Structure | Ton | 412.00 | | |
| 4 | 10.20/b | Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting b)Selected Granular Material in Filling | cum | 3,161.00 | | |
| 5 | 10.20/c | Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting c)Filler Media behind abutment ,wing and return wall | cum | 3,935.00 | | |
| 6 | 15.03/f/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M25 Grade upto 5m height | cum | 5,144.00 | | |
| 7 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | | | | |

Bill No : 13. Culvert

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|---------------------|------------|---|----------------------|----------|----------|----------|
| | | | Rm | 1,962.00 | | |
| Sub Total of | | | Sub Structure | | | |
| | | Super Structure | | | | |
| 8 | 06.02/i | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm | sqm | 1,847.00 | | |
| 9 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | cum | 72.00 | | |
| 10 | 08.05 | Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface. | sqm | 935.00 | | |
| 11 | 08/nsc/5 | Reinforced Cement Concrete Crash Barrier-Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-40 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified | | | | |

Bill No : 13. Culvert

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|---------------------|----------------|---|------------------------|----------|----------|----------|
| | | | m | 366.00 | | |
| 12 | 10.06/b | Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Super-Structure | Ton | 75.00 | | |
| 13 | 16.01/a/i | cement concrete Reinforced concrete in super-structure as per drawing and Technical Specification i/c form work complete as per drawing and technical specification RCC Grade M25 For solid slab super-structure Upto 5m Upto 5m | cum | 943.00 | | |
| 14 | 16.11 | Drainage Spouts complete as per drawing and Technical specification | each | 128.00 | | |
| 15 | 16.17 | Mastic asphalt (providing and laying 12mm thick mastic asphalt wearing courses on top of deck slab excluding prime coat with paving grade bitumen meeting the requirement given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10cm centre in both direction, pressed into surface not less than 100 deg. C. protruding 1mm to 4mm over mastic surface, all complete as per clause 515) using Bitumen VG-40 (3/40) | sqm | 1,847.00 | | |
| Sub Total of | | | Super Structure | | | |
| | | Protection Work | | | | |
| 16 | 10.19 | Dry Boulder pitching | cum | 489.00 | | |
| 17 | 13.01/a/i /Nsc | Earth work in excavation Ordinary soil For Protection Work | cum | 2,995.00 | | |

Bill No : 13. Culvert

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|--------------|------------|---|--------------------|----------|----------|----------|
| 18 | 16/nsc | For Protection Work - cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade upto 5m height | cum | 1,651.00 | | |
| Sub Total of | | | Protection Work | | | |
| | | Miscellaneous Work | | | | |
| 19 | 08.05 | Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface. | sqm | 935.00 | | |
| Sub Total of | | | Miscellaneous Work | | | |
| | | Total of Bill 13. Culvert | | | | |

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|--------------------------------|------------|---|------|----------|----------|----------|
| Foundation | | | | | | |
| 1 | 13.01/a/i | Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m | cum | 1,285.00 | | |
| 2 | 14.03/a | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade | cum | 78.00 | | |
| 3 | 14.03/g | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M30 Grade | cum | 218.00 | | |
| 4 | 14.08 | HYSD bar reinforcement in foundation complete as per drawing and technical specification | MT | 26.00 | | |
| Sub Total of Foundation | | | | | | |
| Sub Structure | | | | | | |
| 5 | 13.03/a | Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials | cum | 65.00 | | |
| 6 | 13.03/b | Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Good Sandy Soil free from organic material | cum | 2,809.00 | | |
| 7 | 13.04 | Filter medium behind abutment,wing wall and return wall complete as per drawing and technical specification . | cum | 239.00 | | |
| 8 | 15.03/g/i | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M30 Grade upto 5m height | cum | 232.00 | | |

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|---------------------|------------|---|----------------------|----------|----------|----------|
| 9 | 15.03/g/ii | cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M30 Grade Between 5 to 10 m height | cum | 30.00 | | |
| 10 | 15.05 | HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification | MT | 37.00 | | |
| 11 | 15.12 | Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications | Rm | 432.00 | | |
| Sub Total of | | | Sub Structure | | | |
| | | Super Structure | | | | |
| 12 | 06.02/i | Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm | sqm | 535.00 | | |
| 13 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | cum | 64.00 | | |
| 14 | 14/nsc1/i | Filler joint i)Providing & fixing 2 mm thick corrugated copper plate in expansion joint complete as per drawing & Technical Specification. | | | | |

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|---------------------|---|------|----------|----------|----------|
| | | | m | 72.00 | | |
| 15 | 14/nsc1/i | Filler joint Providing & fixing 20 mm thick compressible fibre board in expansion joint complete as per drawing & Technical Specification. | m | 72.00 | | |
| 16 | 14/nsc1/i | Filler joint iii)Providing and fixing in position 20 mm thick premoulded joint filler in expansion joint for fixed ends of simply supported spans not exceeding 10 m to cater for a horizontal movement upto 20 mm, covered with sealant complete as per drawing and technical specifications. | m | 72.00 | | |
| 17 | 14/nsc1/i | Filler joint iv)Providing and filling joint sealing compound as per drawings and technical specifications with coarse sand and 6 per cent bitumen by weight. | m | 72.00 | | |
| 18 | 16.01/b/i /c2/ii | RCC Grade M30 For solid slab super-structure Approach Slab | cum | 233.00 | | |
| 19 | 16.03 | HYSD bar reinforcement in super-structure complete as per drawing and technical specifications | MT | 42.00 | | |
| 20 | 16.11 | Drainage Spouts complete as per drawing and Technical specification | each | 12.00 | | |
| 21 | 16.12/Ns | Reinforced cement concrete approach slab M-30 including reinforcement and formwork complete as per drawing and Technical specification | cum | 87.00 | | |
| 22 | 16.13 | PCC M15 ordinary Grade leveling course below approach slab complete as per drawing and Technical specification Below Approach Slab | cum | 32.00 | | |

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|---------------------|------------|--|------------------------|----------|----------|----------|
| 23 | 16.17 | Mastic asphalt (providing and laying 12mm thick mastic asphalt wearing courses on top of deck slab excluding prime coat with paving grade bitumen meeting the requirement given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10sqm and at an approximate spacing of 10cm centre in both direction ,pressed into surface not less than 100 deg. C. protruding 1mm to 4mm over mastic surface ,all complete as per clause 515) using Bitumen VG-40 (3/40) | sqm | 535.00 | | |
| Sub Total of | | | Super Structure | | | |
| | | Protection Work | | | | |
| 24 | 08/nsc/5 | Reinforced Cement Concrete Crash Barrier-Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-40 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified | m | 97.00 | | |
| 25 | 16/nsc | For Protection Work - cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade upto 5m height | cum | 20.00 | | |
| 26 | 17.01/a | laying apron complete as per drawing and Technical specification. Boulder | | | | |

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|---------------------------------|------------|---|------|----------|----------|----------|
| | | | cum | 72.00 | | |
| 27 | 17.02 | Filter material underneath pitching in slopes complete as per drawing and Technical specification | cum | 54.00 | | |
| 28 | 17.03/a | Pitching on slopes complete as per drawing and Technical specifications Stone | cum | 17.00 | | |
| Sub Total of Protection Work | | | | | | |
| | | Miscellaneous Work | | | | |
| 29 | 02.04/i/c | Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. c)Pre- stressed/ Reinforced Cement Concrete grade M20 & above | cum | 791.00 | | |
| 30 | 08.05 | Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface. | sqm | 304.00 | | |
| 31 | 08.12 | Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign asper IRC:67 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area not exceeding 0.9 sqm supported on a mild steel single angle iron post 75 x 75 x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing) | sqm | 6.00 | | |
| 32 | 13/nsc1 | Confirmatory Boring in Soil | cum | 18.00 | | |
| 33 | 13/nsc2 | Confirmatory Boring in Hard Rock | cum | 30.00 | | |
| Sub Total of Miscellaneous Work | | | | | | |

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|-------|-------------|--|------|----------|----------|----------|
| | | Diversion Work | | | | |
| 34 | 03.13 | Construction of Embankment with Material Deposited from Roadway Cutting Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2 | cum | 9,600.00 | | |
| 35 | 03.31 | Excavation in Hill Area in Soil by Mechanical Means Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres | cum | 7,680.00 | | |
| 36 | 04.01/Ns c1 | Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material | Cum | 384.00 | | |
| 37 | 05.02 | Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.) | Cum | 640.00 | | |

Bill No : 14. Minor Bridge

| SI No | SOR Ref No | Description | Unit | Quantity | Rate(Rs) | Cost(Rs) |
|---------------------------------------|------------|--|------|----------|----------|----------|
| 38 | 06/Nsc1 | Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40 | cum | 128.00 | | |
| 39 | 06/Nsc2 | Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40 | cum | 64.00 | | |
| 40 | 09.01/nsc1 | Laying Reinforced Cement Concrete Pipe NP4 / Prestressed Concrete Pipe on First Class Bedding in Single Row . B)1200 mm dia | Rm | 120.00 | | |
| Sub Total of Diversion Work | | | | | | |
| Total of Bill 14. Minor Bridge | | | | | | |

BOX CULVERT QUNATITY CALCULATIONS AND SUMMARY

| SUMMARY FOR BOX CULVERT | | Span(m) x Height(m)= | TYPE-1 2.0X2.0m_TW- 11_Catchpit with stepped_NC | TYPE-2 2.0X2.0m_TW- 11_Catchpit with stepped_SE-5.7% | TYPE-3 2.0X2.0m_TW- 11_Catchpit with stepped_SE-6.7% | TYPE-4 2.0X2.0m_TW- 11_Catchpit with stepped_SE-4% | TYPE-5 2.0X2.0m_TW- 12_Catchpit with stepped_NC | TYPE-6 2.0X3.0m_TW- 11_Catchpit with stepped_NC | TYPE-7 2.0X3.0m_TW- 11_Catchpit with stepped_SE-5.9% |
|-------------------------|-------------------------------------|-------------------------|--|---|---|---|--|--|---|
| | | | 27 | 2 | 1 | 6 | 1 | 6 | 1 |
| SI No. | Description | Unit | | | | | | | |
| 1 | Excavation | cum | 86.38 | 104.35 | 105.90 | 106.42 | 90.20 | 126.56 | 156.64 |
| 2 | PCC-M15 | cum | 11.55 | 14.82 | 15.14 | 15.24 | 12.09 | 17.57 | 21.83 |
| 3 | RCC-Substructure | cum | 48.11 | 62.70 | 64.32 | 64.84 | 50.70 | 87.96 | 114.34 |
| 4 | Steel | ton | 3.85 | 5.02 | 5.15 | 5.19 | 4.06 | 7.04 | 9.15 |
| 5 | Weep holes | nos | 18.00 | 22.00 | 33.00 | 33.00 | 20.00 | 33.00 | 33.00 |
| 6 | Filter media | cum | 38.69 | 49.44 | 51.46 | 52.10 | 40.73 | 70.83 | 85.19 |
| 7 | Sand Filling in Foundation Trenches | cum | 37.27 | 43.44 | 44.00 | 44.18 | 38.40 | 51.60 | 61.09 |
| 8 | RCC-Superstructure(up to 5m) | cum | 12.05 | 10.26 | 10.26 | 10.26 | 13.34 | 13.09 | 11.24 |
| 9 | Steel | ton | 0.96 | 0.82 | 0.82 | 0.82 | 1.07 | 1.05 | 0.90 |
| 10 | Bituminous Concrete | cum | 1.04 | 1.04 | 1.04 | 1.04 | 1.14 | 1.08 | 1.08 |
| 11 | Mastic Asphalt | sqm | 26.00 | 26.00 | 26.00 | 26.00 | 28.60 | 27.00 | 27.00 |
| 12 | Tack Coat | sqm | 26.00 | 26.00 | 26.00 | 26.00 | 28.60 | 27.00 | 27.00 |
| 13 | RCC M-40 Crash Barrier | m | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.40 | 5.40 |
| 14 | Drainage Spout | nos | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| 16 | Curtain Wall PCC M-20 | cum | 12.55 | 12.55 | 12.55 | 12.55 | 12.55 | 12.55 | 12.55 |
| 17 | Excavation in Soil | cum | 43.85 | 43.85 | 43.85 | 43.85 | 43.85 | 43.85 | 43.85 |
| 18 | PCC M-15 Below Curtain Wall | cum | 11.64 | 11.64 | 11.64 | 11.64 | 11.64 | 11.64 | 11.64 |
| 19 | 300 mm Boulder Pitching | cum | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| 20 | Painting | sqm | 13.30 | 13.30 | 13.30 | 13.30 | 13.30 | 13.81 | 13.81 |



| SUMMARY FOR BOX CULVERT | | Span(m) x Height(m)= | TYPE-8 2.0X3.0m_TW- 11_Catchpit with stepped_7% | TYPE-9 3.0X3.0m_TW- 11_Catchpit with stepped_NC | TYPE-10 3.0X3.0m_TW- 11_Catchpit with stepped_SE-7% | TYPE-11 3.0X4.0m_TW- 11_Catchpit with stepped_NC | TYPE-12 3.0X4.0m_TW- 11_Catchpit with stepped_SE-7% | TYPE-13 3.0X4.0m_TW- 11_Catchpit with stepped_NC_EC | TYPE-14 3.0X4.0m_TW- 11_Catchpit with stepped_SE- 7%_EC |
|-------------------------|-------------------------------------|-------------------------|--|--|--|---|--|--|---|
| | | | 6 | 2 | 1 | 3 | 5 | 1 | 1 |
| SI No. | Description | Unit | | | | | | | |
| 1 | Excavation | cum | 132.05 | 135.86 | 159.09 | 191.46 | 170.31 | 228.17 | 280.73 |
| 2 | PCC-M15 | cum | 18.37 | 19.16 | 22.27 | 26.24 | 24.10 | 25.78 | 32.09 |
| 3 | RCC-Substructure | cum | 92.31 | 96.24 | 117.13 | 157.56 | 127.56 | 155.55 | 204.34 |
| 4 | Steel | ton | 7.38 | 7.70 | 9.37 | 12.60 | 10.21 | 12.44 | 16.35 |
| 5 | Weep holes | nos | 36.00 | 33.00 | 52.00 | 52.00 | 52.00 | 52.00 | 60.00 |
| 6 | Filter media | cum | 74.07 | 72.28 | 88.05 | 112.51 | 89.73 | 105.17 | 140.37 |
| 7 | Sand Filling in Foundation Trenches | cum | 53.25 | 51.32 | 61.87 | 68.56 | 62.03 | 96.72 | 118.26 |
| 8 | RCC-Superstructure(up to 5m) | cum | 18.50 | 20.63 | 11.24 | 22.35 | 17.99 | 25.10 | 27.63 |
| 9 | Steel | ton | 1.48 | 1.65 | 0.90 | 1.79 | 1.44 | 2.01 | 2.21 |
| 10 | Bituminous Concrete | cum | 1.19 | 1.54 | 1.08 | 1.57 | 1.54 | | |
| 11 | Mastic Asphalt | sqm | 29.70 | 38.40 | 27.00 | 39.20 | 38.40 | | |
| 12 | Tack Coat | sqm | 29.70 | 38.40 | 27.00 | 39.20 | 38.40 | | |
| 13 | RCC M-40 Crash Barrier | m | 5.40 | 7.68 | 5.40 | 7.84 | 7.68 | | |
| 14 | Drainage Spout | nos | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | | |
| 16 | Curtain Wall PCC M-20 | cum | 12.55 | 13.91 | 12.55 | 13.91 | 13.91 | 13.91 | 13.91 |
| 17 | Excavation in Soil | cum | 43.85 | 50.80 | 43.85 | 50.80 | 50.80 | 52.56 | 52.56 |
| 18 | PCC M-15 Below Curtain Wall | cum | 11.64 | 14.22 | 11.64 | 14.22 | 14.22 | 14.22 | 14.22 |
| 19 | 300 mm Boulder Pitching | cum | 7.00 | 8.96 | 7.00 | 8.96 | 8.96 | 8.96 | 8.96 |
| 20 | Painting | sqm | 13.81 | 19.65 | 13.81 | 20.05 | 19.65 | | |



| SUMMARY FOR BOX CULVERT | | Span(m) x Height(m)= | TYPE-15 4.0X3.0m_TW- 11_Catchpit with stepped_SE-7% | Total |
|-------------------------|-------------------------------------|-------------------------|--|-------|
| | | | 1 | 64 |
| Sl No. | Description | Unit | | |
| 1 | Excavation | cum | 184.19 | 7634 |
| 2 | PCC-M15 | cum | 25.76 | 1041 |
| 3 | RCC-Substructure | cum | 143.83 | 5048 |
| 4 | Steel | ton | 11.51 | 404 |
| 5 | Weep holes | nos | 52.00 | 1926 |
| 6 | Filter media | cum | 90.59 | 3858 |
| 7 | Sand Filling in Foundation Trenches | cum | 60.37 | 3087 |
| 8 | RCC-Superstructure(up to 5m) | cum | 25.00 | 919 |
| 9 | Steel | ton | 2.00 | 74 |
| 10 | Bituminous Concrete | cum | 2.00 | 72 |
| 11 | Mastic Asphalt | sqm | 50.00 | 1795 |
| 12 | Tack Coat | sqm | 50.00 | 1795 |
| 13 | RCC M-40 Crash Barrier | m | 10.00 | 355 |
| 14 | Drainage Spout | nos | 2.00 | 124 |
| 16 | Curtain Wall PCC M-20 | cum | 15.27 | 822 |
| 17 | Excavation in Soil | cum | 57.74 | 2907 |
| 18 | PCC M-15 Below Curtain Wall | cum | 16.80 | 781 |
| 19 | 300 mm Boulder Pitching | cum | 10.93 | 475 |
| 20 | Painting | sqm | 25.58 | 909 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|----------|-------------------|-----|---|-------|--------|--------------|--------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 4.600 | 12.000 | 0.830 | 45.82 |
| | Shear Key | cum | 2 | 4.800 | 1.720 | 0.820 | 13.54 |
| | Return Wall II | cum | 4 | 3.510 | 3.500 | 0.550 | 27.03 |
| | | | | | | Total | 86.38 |

| | | | | | | | |
|----------|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 3.600 | 8.760 | 0.150 | 4.73 |
| | Shear Key | cum | 2 | 3.800 | 1.560 | 0.150 | 1.78 |
| | Return Wall II | cum | 4 | 3.110 | 2.700 | 0.150 | 5.04 |
| | | | | | | Total | 11.55 |

SUBSTRUCTURE

| | | | | | | | |
|----------|-----------------------------|-----|---|--------|---------|---------------|--------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 3.600 | 11.000 | 0.380 | 15.05 |
| | Box Side Wall | cum | 2 | 11.00 | 2.000 | 0.300 | 13.20 |
| | Base slab of Return wall II | cum | 4 | 3.010 | 2.500 | 0.250 | 7.53 |
| | Return wall I | cum | 4 | 0.500 | 2.350 | 0.250 | 1.18 |
| | Return wall II | cum | 4 | 3.010 | 0.225 | 2.480 | 6.72 |
| | Shear Key | cum | 2 | 3.600 | 0.58220 | | 4.19 |
| | Haunch | cum | 2 | 11.000 | 0.01125 | | 0.25 |
| | | | | | | Total= | 48.11 |

| | | | | | | | |
|----------|-----------------------------|-----|--|--|--|--------------|-------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 3.85 |
| | | | | | | Total | 3.85 |

| | | | | | | | |
|----------|--|--|--|--|--|--------------|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment = $10.5/2 =$ | | | | | 5 | |
| | No of weep holes in vertical direction per abutment = $1.7/1 =$ | | | | | 2 | |
| | No of weep holes in horizontal direction per return wall = $3/2 =$ | | | | | 2 | |
| | No of weep holes in vertical direction per return wall = $1.7/1 =$ | | | | | 2 | |
| | Total no of Weep holes per abutment = 5×2 | | | | | 10 | |
| | Total no of Weep holes per return wall = 2×2 | | | | | 4 | |
| | Total mtrs of weep holes = $10 \times 2 + 4 \times 4$ | | | | | Total | 18.00 |

| | | | | | | | |
|----------|---------------------|-----|---|--------|-------|--------------|--------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 10.500 | 0.600 | 1.700 | 21.42 |
| | Behind Return Wall | cum | 4 | 3.510 | 0.600 | 2.050 | 17.27 |
| | | | | | | Total | 38.69 |

| | | | | | | | |
|----------|--|-----|---|-------|--------|--------------|--------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 86.38 |
| | Less for PCC | cum | | | | | 11.55 |
| | Less for Bottom Slab RCC | cum | | | | | 15.05 |
| | Less for Shear Key RCC | cum | | | | | 4.19 |
| | Less for Return Wall-I RCC | cum | 4 | 0.500 | 0.250 | 0.300 | 0.15 |
| | Less for Return Wall-II Base Slab | cum | | | | | 7.53 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 3.010 | 0.250 | 0.430 | 1.29 |
| | Less for Box above Invert upto EGL | cum | 1 | 2.60 | 12.000 | 0.300 | 9.36 |
| | | | | | | Total | 37.27 |

SUPERSTRUCTURE

| | | | | | | | |
|----------|-------------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 2.600 | 11.000 | 0.413 | 11.80 |
| | (+)Haunch | cum | 2 | 11.00 | 0.01125 | | 0.25 |
| | | | | | | Total | 12.05 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|--------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 0.96 |
| | | | | | | Total | 0.96 |
| 10 | Bituminous Concrete | | | | | | |
| | | cum | 1 | 2.60 | 10.00 | 0.04 | 1.04 |
| | | | | | | Total | 1.04 |
| 11 | Mastic Asphalt | | | | | | |
| | | sqm | 1 | 2.60 | 10.00 | | 26.00 |
| | | | | | | Total | 26.00 |
| 12 | Tack Coat | | | | | | |
| | | sqm | 1 | 2.60 | 10.00 | | 26.00 |
| | | | | | | Total | 26.00 |
| 13 | RCC M-40 Crash Barrier | m | 2 | 2.60 | | | 5.20 |
| | | | | | | Total | 5.20 |
| 14 | Drainage Spout | nos. | 2 | | | | 2.0 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 15 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 3.400 | 2.00 | 0.30 | 2.04 |
| | | | | | | Total | 2.04 |
| 16 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 2.400 | 1.50 | 0.30 | 1.08 |
| | | | | | | Total | 1.08 |
| 17 | Curtain Wall PCC M-20 | | | | | | |
| | Side wall length parallel to road | cum | 1 | 2.400 | 0.360 | | 0.86 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 1.94 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 1.800 | 1.50 | 0.30 | 0.81 |
| | | cum | 1 | 2.666 | 1.50 | 0.30 | 1.20 |
| | | | | | | Total | 2.01 |
| 19 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 20 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 7.727 | 0.95 | 0.150 | 1.10 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 3.184 | 0.35 | 1.000 | 1.11 |
| | | cum | 1 | 4.569 | 0.35 | 1.600 | 2.56 |
| | | cum | 1 | 5.955 | 0.35 | 1.600 | 3.33 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 3.384 | 0.55 | 0.100 | 0.19 |
| | | cum | 1 | 4.769 | 0.55 | 0.100 | 0.26 |
| | | cum | 1 | 6.155 | 0.55 | 0.100 | 0.34 |
| | On trades | | | | | | |
| | | cum | 1 | 2.491 | 0.85 | 0.100 | 0.21 |
| | | cum | 1 | 3.876 | 0.85 | 0.100 | 0.33 |
| | | cum | 1 | 5.262 | 0.85 | 0.100 | 0.45 |
| | | cum | 1 | 6.734 | 1.00 | 0.100 | 0.67 |
| | | | | | | Total | 10.56 |
| 21 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 8.327 | 1.55 | 1.95 | 25.17 |
| | Stone Pitching and side wall | cum | 1 | 5.014 | 3.320 | | 16.64 |
| | | | | | | Total | 41.81 |
| 22 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 7.427 | 1.003 | | 7.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 9.44 |
| 23 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 2.491 | 0.85 | 0.300 | 0.64 |
| | | cum | 1 | 3.876 | 0.85 | 0.300 | 0.99 |
| | | cum | 1 | 5.262 | 0.85 | 0.300 | 1.34 |
| | | cum | 1 | 6.734 | 1.00 | 0.300 | 2.02 |
| | | | | | | Total | 4.99 |
| Miscellaneous | | | | | | | |
| 24 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 2.60 | 2.558 | | 13.30 |
| | | | | | | Total | 13.30 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|----------|-------------------|-----|---|-------|--------|--------------|---------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 4.600 | 12.000 | 0.830 | 45.82 |
| | Shear Key | cum | 2 | 4.800 | 1.720 | 0.820 | 13.54 |
| | Return Wall II | cum | 4 | 4.360 | 4.300 | 0.600 | 45.00 |
| | | | | | | Total | 104.35 |

| | | | | | | | |
|----------|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 3.600 | 8.760 | 0.150 | 4.73 |
| | Shear Key | cum | 2 | 3.800 | 1.560 | 0.150 | 1.78 |
| | Return Wall II | cum | 4 | 3.960 | 3.500 | 0.150 | 8.32 |
| | | | | | | Total | 14.82 |

SUBSTRUCTURE

| | | | | | | | |
|----------|-----------------------------|-----|---|--------|---------|---------------|--------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 3.600 | 11.000 | 0.380 | 15.05 |
| | Box Side Wall | cum | 2 | 11.00 | 2.285 | 0.300 | 15.08 |
| | Base slab of Return wall II | cum | 4 | 3.860 | 3.300 | 0.300 | 15.29 |
| | Return wall I | cum | 4 | 0.500 | 2.635 | 0.250 | 1.32 |
| | Return wall II | cum | 4 | 3.860 | 0.275 | 2.715 | 11.53 |
| | Shear Key | cum | 2 | 3.600 | 0.58220 | | 4.19 |
| | Haunch | cum | 2 | 11.000 | 0.01125 | | 0.25 |
| | | | | | | Total= | 62.70 |

| | | | | | | | |
|----------|-----------------------------|-----|--|--|--|--------------|-------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 5.02 |
| | | | | | | Total | 5.02 |

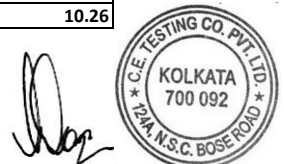
| | | | | | | | |
|----------|--|--|--|--|--|--------------|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment = $10.5/2 =$ | | | | | 5 | |
| | No of weep holes in vertical direction per abutment = $2/1 =$ | | | | | 2 | |
| | No of weep holes in horizontal direction per return wall = $3/2 =$ | | | | | 3 | |
| | No of weep holes in vertical direction per return wall = $2/1 =$ | | | | | 2 | |
| | Total no of Weep holes per abutment = 5×2 | | | | | 10 | |
| | Total no of Weep holes per return wall = 3×2 | | | | | 6 | |
| | Total mtrs of weep holes = $10 \times 2 + 6 \times 4$ | | | | | | |
| | | | | | | Total | 22.00 |

| | | | | | | | |
|----------|---------------------|-----|---|--------|-------|--------------|--------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 10.500 | 0.600 | 1.985 | 25.01 |
| | Behind Return Wall | cum | 4 | 4.360 | 0.600 | 2.335 | 24.43 |
| | | | | | | Total | 49.44 |

| | | | | | | | |
|----------|--|-----|---|-------|--------|--------------|--------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 104.35 |
| | Less for PCC | cum | | | | | 14.82 |
| | Less for Bottom Slab RCC | cum | | | | | 15.05 |
| | Less for Shear Key RCC | cum | | | | | 4.19 |
| | Less for Return Wall-I RCC | cum | 4 | 0.500 | 0.250 | 0.300 | 0.15 |
| | Less for Return Wall-II Base Slab | cum | | | | | 15.29 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 3.860 | 0.350 | 0.380 | 2.05 |
| | Less for Box above Invert upto EGL | cum | 1 | 2.60 | 12.000 | 0.300 | 9.36 |
| | | | | | | Total | 43.44 |

SUPERSTRUCTURE

| | | | | | | | |
|----------|-------------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 2.600 | 11.000 | 0.350 | 10.01 |
| | (+)Haunch | cum | 2 | 11.00 | 0.01125 | | 0.25 |
| | | | | | | Total | 10.26 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|--------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 0.82 |
| | | | | | | Total | 0.82 |
| 10 | Bituminous Concrete | | | | | | |
| | | cum | 1 | 2.60 | 10.00 | 0.04 | 1.04 |
| | | | | | | Total | 1.04 |
| 11 | Mastic Asphalt | | | | | | |
| | | sqm | 1 | 2.60 | 10.00 | | 26.00 |
| | | | | | | Total | 26.00 |
| 12 | Tack Coat | | | | | | |
| | | sqm | 1 | 2.60 | 10.00 | | 26.00 |
| | | | | | | Total | 26.00 |
| 13 | RCC M-40 Crash Barrier | m | 2 | 2.60 | | | 5.20 |
| | | | | | | Total | 5.20 |
| 14 | Drainage Spout | nos. | 2 | | | | 2.0 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 15 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 3.400 | 2.00 | 0.30 | 2.04 |
| | | | | | | Total | 2.04 |
| 16 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 2.400 | 1.50 | 0.30 | 1.08 |
| | | | | | | Total | 1.08 |
| 17 | Curtain Wall PCC M-20 | | | | | | |
| | Side wall length parallel to road | cum | 1 | 2.400 | 0.360 | | 0.86 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 1.94 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 1.800 | 1.50 | 0.30 | 0.81 |
| | | cum | 1 | 2.666 | 1.50 | 0.30 | 1.20 |
| | | | | | | Total | 2.01 |
| 19 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 20 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 7.727 | 0.95 | 0.150 | 1.10 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 3.184 | 0.35 | 1.000 | 1.11 |
| | | cum | 1 | 4.569 | 0.35 | 1.600 | 2.56 |
| | | cum | 1 | 5.955 | 0.35 | 1.600 | 3.33 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 3.384 | 0.55 | 0.100 | 0.19 |
| | | cum | 1 | 4.769 | 0.55 | 0.100 | 0.26 |
| | | cum | 1 | 6.155 | 0.55 | 0.100 | 0.34 |
| | On trades | | | | | | |
| | | cum | 1 | 2.491 | 0.85 | 0.100 | 0.21 |
| | | cum | 1 | 3.876 | 0.85 | 0.100 | 0.33 |
| | | cum | 1 | 5.262 | 0.85 | 0.100 | 0.45 |
| | | cum | 1 | 6.734 | 1.00 | 0.100 | 0.67 |
| | | | | | | Total | 10.56 |
| 21 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 8.327 | 1.55 | 1.95 | 25.17 |
| | Stone Pitching and side wall | cum | 1 | 5.014 | 3.320 | | 16.64 |
| | | | | | | Total | 41.81 |
| 22 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 7.427 | 1.003 | | 7.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 9.44 |
| 23 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 2.491 | 0.85 | 0.300 | 0.64 |
| | | cum | 1 | 3.876 | 0.85 | 0.300 | 0.99 |
| | | cum | 1 | 5.262 | 0.85 | 0.300 | 1.34 |
| | | cum | 1 | 6.734 | 1.00 | 0.300 | 2.02 |
| | | | | | | Total | 4.99 |
| Miscellaneous | | | | | | | |
| 24 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 2.60 | 2.558 | | 13.30 |
| | | | | | | Total | 13.30 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|---|----------------|-----|---|-------|--------|--------------|---------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 4.600 | 12.000 | 0.830 | 45.82 |
| | Shear Key | cum | 2 | 4.800 | 1.720 | 0.820 | 13.54 |
| | Return Wall II | cum | 4 | 4.510 | 4.300 | 0.600 | 46.54 |
| | | | | | | Total | 105.90 |

| | | | | | | | |
|---|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 3.600 | 8.760 | 0.150 | 4.73 |
| | Shear Key | cum | 2 | 3.800 | 1.560 | 0.150 | 1.78 |
| | Return Wall II | cum | 4 | 4.110 | 3.500 | 0.150 | 8.63 |
| | | | | | | Total | 15.14 |

SUBSTRUCTURE

| | | | | | | | |
|---|-----------------------------|-----|---|--------|---------|---------------|--------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 3.600 | 11.000 | 0.380 | 15.05 |
| | Box Side Wall | cum | 2 | 11.00 | 2.335 | 0.300 | 15.41 |
| | Base slab of Return wall II | cum | 4 | 4.010 | 3.300 | 0.300 | 15.88 |
| | Return wall I | cum | 4 | 0.500 | 2.685 | 0.250 | 1.34 |
| | Return wall II | cum | 4 | 4.010 | 0.275 | 2.765 | 12.20 |
| | Shear Key | cum | 2 | 3.600 | 0.58220 | | 4.19 |
| | Haunch | cum | 2 | 11.000 | 0.01125 | | 0.25 |
| | | | | | | Total= | 64.32 |

| | | | | | | | |
|---|-----------------------------|-----|--|--|--|--------------|-------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 5.15 |
| | | | | | | Total | 5.15 |

| | | | | | | | |
|---|--|--|--|--|--|----|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment =10.5/2 = | | | | | 5 | |
| | No of weep holes in vertical direction per abutment =2/1 = | | | | | 3 | |
| | No of weep holes in horizontal direction per return wall =3/2 = | | | | | 3 | |
| | No of weep holes in vertical direction per return wall =2/1 = | | | | | 3 | |
| | Total no of Weep holes per abutment = 5 x 3 | | | | | 15 | |
| | Total no of Weep holes per return wall = 3 x 3 | | | | | 9 | |
| | Total mtrs of weep holes = 15 x 2 + 9 x 4 | | | | | | 33.00 |

| | | | | | | | |
|---|--------------------|-----|---|--------|-------|--------------|--------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 10.500 | 0.600 | 2.035 | 25.64 |
| | Behind Return Wall | cum | 4 | 4.510 | 0.600 | 2.385 | 25.82 |
| | | | | | | Total | 51.46 |

| | | | | | | | |
|---|-------------------------------------|-----|---|-------|--------|--------------|--------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 105.90 |
| | Less for PCC | cum | | | | | 15.14 |
| | Less for Bottom Slab RCC | cum | | | | | 15.05 |
| | Less for Shear Key RCC | cum | | | | | 4.19 |
| | Less for Return Wall-I RCC | cum | 4 | 0.500 | 0.250 | 0.300 | 0.15 |
| | Less for Return Wall-II Base Slab | cum | | | | | 15.88 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 4.010 | 0.350 | 0.380 | 2.13 |
| | Less for Box above Invert upto EGL | cum | 1 | 2.60 | 12.000 | 0.300 | 9.36 |
| | | | | | | Total | 44.00 |

SUPERSTRUCTURE

| | | | | | | | |
|---|------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 2.600 | 11.000 | 0.350 | 10.01 |
| | (+)Haunch | cum | 2 | 11.00 | 0.01125 | | 0.25 |
| | | | | | | Total | 10.26 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|--------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 0.82 |
| | | | | | | Total | 0.82 |
| 10 | Bituminous Concrete | | | | | | |
| | | cum | 1 | 2.60 | 10.00 | 0.04 | 1.04 |
| | | | | | | Total | 1.04 |
| 11 | Mastic Asphalt | | | | | | |
| | | sqm | 1 | 2.60 | 10.00 | | 26.00 |
| | | | | | | Total | 26.00 |
| 12 | Tack Coat | | | | | | |
| | | sqm | 1 | 2.60 | 10.00 | | 26.00 |
| | | | | | | Total | 26.00 |
| 13 | RCC M-40 Crash Barrier | m | 2 | 2.60 | | | 5.20 |
| | | | | | | Total | 5.20 |
| 14 | Drainage Spout | nos. | 2 | | | | 2.0 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 15 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 3.400 | 2.00 | 0.30 | 2.04 |
| | | | | | | Total | 2.04 |
| 16 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 2.400 | 1.50 | 0.30 | 1.08 |
| | | | | | | Total | 1.08 |
| 17 | Curtain Wall PCC M-20 | | | | | | |
| | Side wall length parallel to road | cum | 1 | 2.400 | 0.360 | | 0.86 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 1.94 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 1.800 | 1.50 | 0.30 | 0.81 |
| | | cum | 1 | 2.666 | 1.50 | 0.30 | 1.20 |
| | | | | | | Total | 2.01 |
| 19 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 20 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 7.727 | 0.95 | 0.150 | 1.10 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 3.184 | 0.35 | 1.000 | 1.11 |
| | | cum | 1 | 4.569 | 0.35 | 1.600 | 2.56 |
| | | cum | 1 | 5.955 | 0.35 | 1.600 | 3.33 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 3.384 | 0.55 | 0.100 | 0.19 |
| | | cum | 1 | 4.769 | 0.55 | 0.100 | 0.26 |
| | | cum | 1 | 6.155 | 0.55 | 0.100 | 0.34 |
| | On trades | | | | | | |
| | | cum | 1 | 2.491 | 0.85 | 0.100 | 0.21 |
| | | cum | 1 | 3.876 | 0.85 | 0.100 | 0.33 |
| | | cum | 1 | 5.262 | 0.85 | 0.100 | 0.45 |
| | | cum | 1 | 6.734 | 1.00 | 0.100 | 0.67 |
| | | | | | | Total | 10.56 |
| 21 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 8.327 | 1.55 | 1.95 | 25.17 |
| | Stone Pitching and side wall | cum | 1 | 5.014 | 3.320 | | 16.64 |
| | | | | | | Total | 41.81 |
| 22 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 7.427 | 1.003 | | 7.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 9.44 |
| 23 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 2.491 | 0.85 | 0.300 | 0.64 |
| | | cum | 1 | 3.876 | 0.85 | 0.300 | 0.99 |
| | | cum | 1 | 5.262 | 0.85 | 0.300 | 1.34 |
| | | cum | 1 | 6.734 | 1.00 | 0.300 | 2.02 |
| | | | | | | Total | 4.99 |
| Miscellaneous | | | | | | | |
| 24 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 2.60 | 2.558 | | 13.30 |
| | | | | | | Total | 13.30 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|----------|-------------------|-----|---|-------|--------|--------------|---------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 4.600 | 12.000 | 0.830 | 45.82 |
| | Shear Key | cum | 2 | 4.800 | 1.720 | 0.820 | 13.54 |
| | Return Wall II | cum | 4 | 4.560 | 4.300 | 0.600 | 47.06 |
| | | | | | | Total | 106.42 |

| | | | | | | | |
|----------|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 3.600 | 8.760 | 0.150 | 4.73 |
| | Shear Key | cum | 2 | 3.800 | 1.560 | 0.150 | 1.78 |
| | Return Wall II | cum | 4 | 4.160 | 3.500 | 0.150 | 8.74 |
| | | | | | | Total | 15.24 |

SUBSTRUCTURE

| | | | | | | | |
|----------|-----------------------------|-----|---|--------|---------|---------------|--------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 3.600 | 11.000 | 0.380 | 15.05 |
| | Box Side Wall | cum | 2 | 11.00 | 2.350 | 0.300 | 15.51 |
| | Base slab of Return wall II | cum | 4 | 4.060 | 3.300 | 0.300 | 16.08 |
| | Return wall I | cum | 4 | 0.500 | 2.700 | 0.250 | 1.35 |
| | Return wall II | cum | 4 | 4.060 | 0.275 | 2.780 | 12.42 |
| | Shear Key | cum | 2 | 3.600 | 0.58220 | | 4.19 |
| | Haunch | cum | 2 | 11.000 | 0.01125 | | 0.25 |
| | | | | | | Total= | 64.84 |

| | | | | | | | |
|----------|-----------------------------|-----|--|--|--|--------------|-------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 5.19 |
| | | | | | | Total | 5.19 |

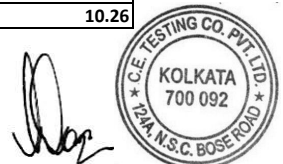
| | | | | | | | |
|----------|--|--|--|--|--|--------------|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment =10.5/2 = | | | | | 5 | |
| | No of weep holes in vertical direction per abutment =2.1/1 = | | | | | 3 | |
| | No of weep holes in horizontal direction per return wall =3/2 = | | | | | 3 | |
| | No of weep holes in vertical direction per return wall =2.1/1 = | | | | | 3 | |
| | Total no of Weep holes per abutment = 5 x 3 | | | | | 15 | |
| | Total no of Weep holes per return wall = 3 x 3 | | | | | 9 | |
| | Total mtrs of weep holes = 15 x 2 + 9 x 4 | | | | | Total | 33.00 |

| | | | | | | | |
|----------|---------------------|-----|---|--------|-------|--------------|--------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 10.500 | 0.600 | 2.050 | 25.83 |
| | Behind Return Wall | cum | 4 | 4.560 | 0.600 | 2.400 | 26.27 |
| | | | | | | Total | 52.10 |

| | | | | | | | |
|----------|--|-----|---|-------|--------|--------------|--------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 106.42 |
| | Less for PCC | cum | | | | | 15.24 |
| | Less for Bottom Slab RCC | cum | | | | | 15.05 |
| | Less for Shear Key RCC | cum | | | | | 4.19 |
| | Less for Return Wall-I RCC | cum | 4 | 0.500 | 0.250 | 0.300 | 0.15 |
| | Less for Return Wall-II Base Slab | cum | | | | | 16.08 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 4.060 | 0.350 | 0.380 | 2.16 |
| | Less for Box above Invert upto EGL | cum | 1 | 2.60 | 12.000 | 0.300 | 9.36 |
| | | | | | | Total | 44.18 |

SUPERSTRUCTURE

| | | | | | | | |
|----------|-------------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 2.600 | 11.000 | 0.350 | 10.01 |
| | (+)Haunch | cum | 2 | 11.00 | 0.01125 | | 0.25 |
| | | | | | | Total | 10.26 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|--------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 0.82 |
| | | | | | | Total | 0.82 |
| 10 | Bituminous Concrete | | | | | | |
| | | cum | 1 | 2.60 | 10.00 | 0.04 | 1.04 |
| | | | | | | Total | 1.04 |
| 11 | Mastic Asphalt | | | | | | |
| | | sqm | 1 | 2.60 | 10.00 | | 26.00 |
| | | | | | | Total | 26.00 |
| 12 | Tack Coat | | | | | | |
| | | sqm | 1 | 2.60 | 10.00 | | 26.00 |
| | | | | | | Total | 26.00 |
| 13 | RCC M-40 Crash Barrier | m | 2 | 2.60 | | | 5.20 |
| | | | | | | Total | 5.20 |
| 14 | Drainage Spout | nos. | 2 | | | | 2.0 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 15 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 3.400 | 2.00 | 0.30 | 2.04 |
| | | | | | | Total | 2.04 |
| 16 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 2.400 | 1.50 | 0.30 | 1.08 |
| | | | | | | Total | 1.08 |
| 17 | Curtain Wall PCC M-20 | | | | | | |
| | Side wall length parallal to road | cum | 1 | 2.400 | 0.360 | | 0.86 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 1.94 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 1.800 | 1.50 | 0.30 | 0.81 |
| | | cum | 1 | 2.666 | 1.50 | 0.30 | 1.20 |
| | | | | | | Total | 2.01 |
| 19 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 20 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 7.727 | 0.95 | 0.150 | 1.10 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 3.184 | 0.35 | 1.000 | 1.11 |
| | | cum | 1 | 4.569 | 0.35 | 1.600 | 2.56 |
| | | cum | 1 | 5.955 | 0.35 | 1.600 | 3.33 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 3.384 | 0.55 | 0.100 | 0.19 |
| | | cum | 1 | 4.769 | 0.55 | 0.100 | 0.26 |
| | | cum | 1 | 6.155 | 0.55 | 0.100 | 0.34 |
| | On trades | | | | | | |
| | | cum | 1 | 2.491 | 0.85 | 0.100 | 0.21 |
| | | cum | 1 | 3.876 | 0.85 | 0.100 | 0.33 |
| | | cum | 1 | 5.262 | 0.85 | 0.100 | 0.45 |
| | | cum | 1 | 6.734 | 1.00 | 0.100 | 0.67 |
| | | | | | | Total | 10.56 |
| 21 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 8.327 | 1.55 | 1.95 | 25.17 |
| | Stone Pitching and side wall | cum | 1 | 5.014 | 3.320 | | 16.64 |
| | | | | | | Total | 41.81 |
| 22 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 7.427 | 1.003 | | 7.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 9.44 |
| 23 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 2.491 | 0.85 | 0.300 | 0.64 |
| | | cum | 1 | 3.876 | 0.85 | 0.300 | 0.99 |
| | | cum | 1 | 5.262 | 0.85 | 0.300 | 1.34 |
| | | cum | 1 | 6.734 | 1.00 | 0.300 | 2.02 |
| | | | | | | Total | 4.99 |
| Miscellaneous | | | | | | | |
| 24 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 2.60 | 2.558 | | 13.30 |
| | | | | | | Total | 13.30 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =12 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|----------|-------------------|-----|---|-------|--------|--------------|--------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 4.600 | 13.000 | 0.830 | 49.63 |
| | Shear Key | cum | 2 | 4.800 | 1.720 | 0.820 | 13.54 |
| | Return Wall II | cum | 4 | 3.510 | 3.500 | 0.550 | 27.03 |
| | | | | | | Total | 90.20 |

| | | | | | | | |
|----------|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 3.600 | 9.760 | 0.150 | 5.27 |
| | Shear Key | cum | 2 | 3.800 | 1.560 | 0.150 | 1.78 |
| | Return Wall II | cum | 4 | 3.110 | 2.700 | 0.150 | 5.04 |
| | | | | | | Total | 12.09 |

SUBSTRUCTURE

| | | | | | | | |
|----------|-----------------------------|-----|---|--------|---------|---------------|--------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 3.600 | 12.000 | 0.380 | 16.42 |
| | Box Side Wall | cum | 2 | 12.00 | 2.000 | 0.300 | 14.40 |
| | Base slab of Return wall II | cum | 4 | 3.010 | 2.500 | 0.250 | 7.53 |
| | Return wall I | cum | 4 | 0.500 | 2.350 | 0.250 | 1.18 |
| | Return wall II | cum | 4 | 3.010 | 0.225 | 2.480 | 6.72 |
| | Shear Key | cum | 2 | 3.600 | 0.58220 | | 4.19 |
| | Haunch | cum | 2 | 12.000 | 0.01125 | | 0.27 |
| | | | | | | Total= | 50.70 |

| | | | | | | | |
|----------|-----------------------------|-----|--|--|--|--------------|-------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 4.06 |
| | | | | | | Total | 4.06 |

| | | | | | | | |
|----------|--|--|--|--|--|--------------|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment = $11.5/2 =$ | | | | | 6 | |
| | No of weep holes in vertical direction per abutment = $1.7/1 =$ | | | | | 2 | |
| | No of weep holes in horizontal direction per return wall = $3/2 =$ | | | | | 2 | |
| | No of weep holes in vertical direction per return wall = $1.7/1 =$ | | | | | 2 | |
| | Total no of Weep holes per abutment = 6×2 | | | | | 12 | |
| | Total no of Weep holes per return wall = 2×2 | | | | | 4 | |
| | Total mtrs of weep holes = $12 \times 2 + 4 \times 4$ | | | | | | |
| | | | | | | Total | 20.00 |

| | | | | | | | |
|----------|---------------------|-----|---|--------|-------|--------------|--------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 11.500 | 0.600 | 1.700 | 23.46 |
| | Behind Return Wall | cum | 4 | 3.510 | 0.600 | 2.050 | 17.27 |
| | | | | | | Total | 40.73 |

| | | | | | | | |
|----------|--|-----|---|-------|--------|--------------|--------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 90.20 |
| | Less for PCC | cum | | | | | 12.09 |
| | Less for Bottom Slab RCC | cum | | | | | 16.42 |
| | Less for Shear Key RCC | cum | | | | | 4.19 |
| | Less for Return Wall-I RCC | cum | 4 | 0.500 | 0.250 | 0.300 | 0.15 |
| | Less for Return Wall-II Base Slab | cum | | | | | 7.53 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 3.010 | 0.250 | 0.430 | 1.29 |
| | Less for Box above Invert upto EGL | cum | 1 | 2.60 | 13.000 | 0.300 | 10.14 |
| | | | | | | Total | 38.40 |

SUPERSTRUCTURE

| | | | | | | | |
|----------|-------------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 2.600 | 12.000 | 0.419 | 13.07 |
| | (+)Haunch | cum | 2 | 12.00 | 0.01125 | | 0.27 |
| | | | | | | Total | 13.34 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =12 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|--------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 1.07 |
| | | | | | | Total | 1.07 |
| 10 | Bituminous Concrete | | | | | | |
| | | cum | 1 | 2.60 | 11.00 | 0.04 | 1.14 |
| | | | | | | Total | 1.14 |
| 11 | Mastic Asphalt | | | | | | |
| | | sqm | 1 | 2.60 | 11.00 | | 28.60 |
| | | | | | | Total | 28.60 |
| 12 | Tack Coat | | | | | | |
| | | sqm | 1 | 2.60 | 11.00 | | 28.60 |
| | | | | | | Total | 28.60 |
| 13 | RCC M-40 Crash Barrier | m | 2 | 2.60 | | | 5.20 |
| | | | | | | Total | 5.20 |
| 14 | Drainage Spout | nos. | 2 | | | | 2.0 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 15 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 3.400 | 2.00 | 0.30 | 2.04 |
| | | | | | | Total | 2.04 |
| 16 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 2.400 | 1.50 | 0.30 | 1.08 |
| | | | | | | Total | 1.08 |
| 17 | Curtain Wall PCC M-20 | | | | | | |
| | Side wall length parallel to road | cum | 1 | 2.400 | 0.360 | | 0.86 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 1.94 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 1.800 | 1.50 | 0.30 | 0.81 |
| | | cum | 1 | 2.666 | 1.50 | 0.30 | 1.20 |
| | | | | | | Total | 2.01 |
| 19 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =12 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 20 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 7.727 | 0.95 | 0.150 | 1.10 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 3.184 | 0.35 | 1.000 | 1.11 |
| | | cum | 1 | 4.569 | 0.35 | 1.600 | 2.56 |
| | | cum | 1 | 5.955 | 0.35 | 1.600 | 3.33 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 3.384 | 0.55 | 0.100 | 0.19 |
| | | cum | 1 | 4.769 | 0.55 | 0.100 | 0.26 |
| | | cum | 1 | 6.155 | 0.55 | 0.100 | 0.34 |
| | On trades | | | | | | |
| | | cum | 1 | 2.491 | 0.85 | 0.100 | 0.21 |
| | | cum | 1 | 3.876 | 0.85 | 0.100 | 0.33 |
| | | cum | 1 | 5.262 | 0.85 | 0.100 | 0.45 |
| | | cum | 1 | 6.734 | 1.00 | 0.100 | 0.67 |
| | | | | | | Total | 10.56 |
| 21 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 8.327 | 1.55 | 1.95 | 25.17 |
| | Stone Pitching and side wall | cum | 1 | 5.014 | 3.320 | | 16.64 |
| | | | | | | Total | 41.81 |
| 22 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 7.427 | 1.003 | | 7.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 9.44 |
| 23 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 2.491 | 0.85 | 0.300 | 0.64 |
| | | cum | 1 | 3.876 | 0.85 | 0.300 | 0.99 |
| | | cum | 1 | 5.262 | 0.85 | 0.300 | 1.34 |
| | | cum | 1 | 6.734 | 1.00 | 0.300 | 2.02 |
| | | | | | | Total | 4.99 |
| Miscellaneous | | | | | | | |
| 24 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 2.60 | 2.558 | | 13.30 |
| | | | | | | Total | 13.30 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|----------|-------------------|-----|---|-------|--------|--------------|---------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 6.300 | 12.000 | 0.870 | 65.77 |
| | Shear Key | cum | 2 | 6.500 | 1.680 | 0.780 | 17.04 |
| | Return Wall II | cum | 4 | 4.240 | 4.300 | 0.600 | 43.76 |
| | | | | | | Total | 126.56 |

| | | | | | | | |
|----------|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 5.300 | 8.840 | 0.150 | 7.03 |
| | Shear Key | cum | 2 | 5.500 | 1.503 | 0.150 | 2.48 |
| | Return Wall II | cum | 4 | 3.840 | 3.500 | 0.150 | 8.06 |
| | | | | | | Total | 17.57 |

SUBSTRUCTURE

| | | | | | | | |
|----------|-----------------------------|-----|---|--------|---------|---------------|--------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 5.300 | 11.000 | 0.420 | 24.49 |
| | Box Side Wall | cum | 2 | 11.00 | 3.000 | 0.350 | 23.10 |
| | Base slab of Return wall II | cum | 4 | 3.740 | 3.300 | 0.300 | 14.81 |
| | Return wall I | cum | 4 | 1.300 | 3.370 | 0.300 | 5.26 |
| | Return wall II | cum | 4 | 3.740 | 0.275 | 3.490 | 14.36 |
| | Shear Key | cum | 2 | 5.300 | 0.53820 | | 5.70 |
| | Haunch | cum | 2 | 11.000 | 0.01125 | | 0.25 |
| | | | | | | Total= | 87.96 |

| | | | | | | | |
|----------|-----------------------------|-----|--|--|--|--------------|-------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 7.04 |
| | | | | | | Total | 7.04 |

| | | | | | | | |
|----------|--|--|--|--|--|--------------|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment = $10.4/2 =$ | | | | | 5 | |
| | No of weep holes in vertical direction per abutment = $2.7/1 =$ | | | | | 3 | |
| | No of weep holes in horizontal direction per return wall = $4.5/2 =$ | | | | | 3 | |
| | No of weep holes in vertical direction per return wall = $2.7/1 =$ | | | | | 3 | |
| | Total no of Weep holes per abutment = 5×3 | | | | | 15 | |
| | Total no of Weep holes per return wall = 3×3 | | | | | 9 | |
| | Total mtrs of weep holes = $15 \times 2 + 9 \times 4$ | | | | | | |
| | | | | | | Total | 33.00 |

| | | | | | | | |
|----------|---------------------|-----|---|--------|-------|--------------|--------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 10.400 | 0.600 | 2.700 | 33.70 |
| | Behind Return Wall | cum | 4 | 5.040 | 0.600 | 3.070 | 37.13 |
| | | | | | | Total | 70.83 |

| | | | | | | | |
|----------|--|-----|---|-------|--------|--------------|--------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 126.56 |
| | Less for PCC | cum | | | | | 17.57 |
| | Less for Bottom Slab RCC | cum | | | | | 24.49 |
| | Less for Shear Key RCC | cum | | | | | 5.70 |
| | Less for Return Wall-I RCC | cum | 4 | 1.300 | 0.300 | 0.300 | 0.47 |
| | Less for Return Wall-II Base Slab | cum | | | | | 14.81 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 3.740 | 0.350 | 0.420 | 2.20 |
| | Less for Box above Invert upto EGL | cum | 1 | 2.70 | 12.000 | 0.300 | 9.72 |
| | | | | | | Total | 51.60 |

SUPERSTRUCTURE

| | | | | | | | |
|----------|-------------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 2.700 | 11.000 | 0.433 | 12.85 |
| | (+)Haunch | cum | 2 | 11.00 | 0.01125 | | 0.25 |
| | | | | | | Total | 13.09 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|--------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 1.05 |
| | | | | | | Total | 1.05 |
| 10 | Bituminous Concrete | | | | | | |
| | | cum | 1 | 2.70 | 10.00 | 0.04 | 1.08 |
| | | | | | | Total | 1.08 |
| 11 | Mastic Asphalt | | | | | | |
| | | sqm | 1 | 2.70 | 10.00 | | 27.00 |
| | | | | | | Total | 27.00 |
| 12 | Tack Coat | | | | | | |
| | | sqm | 1 | 2.70 | 10.00 | | 27.00 |
| | | | | | | Total | 27.00 |
| 13 | RCC M-40 Crash Barrier | m | 2 | 2.70 | | | 5.40 |
| | | | | | | Total | 5.40 |
| 14 | Drainage Spout | nos. | 2 | | | | 2.0 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 15 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 3.400 | 2.00 | 0.30 | 2.04 |
| | | | | | | Total | 2.04 |
| 16 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 2.400 | 1.50 | 0.30 | 1.08 |
| | | | | | | Total | 1.08 |
| 17 | Curtain Wall PCC M-20 | | | | | | |
| | Side wall length parallel to road | cum | 1 | 2.400 | 0.360 | | 0.86 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 1.94 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 1.800 | 1.50 | 0.30 | 0.81 |
| | | cum | 1 | 2.666 | 1.50 | 0.30 | 1.20 |
| | | | | | | Total | 2.01 |
| 19 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 20 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 7.727 | 0.95 | 0.150 | 1.10 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 3.184 | 0.35 | 1.000 | 1.11 |
| | | cum | 1 | 4.569 | 0.35 | 1.600 | 2.56 |
| | | cum | 1 | 5.955 | 0.35 | 1.600 | 3.33 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 3.384 | 0.55 | 0.100 | 0.19 |
| | | cum | 1 | 4.769 | 0.55 | 0.100 | 0.26 |
| | | cum | 1 | 6.155 | 0.55 | 0.100 | 0.34 |
| | On trades | | | | | | |
| | | cum | 1 | 2.491 | 0.85 | 0.100 | 0.21 |
| | | cum | 1 | 3.876 | 0.85 | 0.100 | 0.33 |
| | | cum | 1 | 5.262 | 0.85 | 0.100 | 0.45 |
| | | cum | 1 | 6.734 | 1.00 | 0.100 | 0.67 |
| | | | | | | Total | 10.56 |
| 21 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 8.327 | 1.55 | 1.95 | 25.17 |
| | Stone Pitching and side wall | cum | 1 | 5.014 | 3.320 | | 16.64 |
| | | | | | | Total | 41.81 |
| 22 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 7.427 | 1.003 | | 7.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 9.44 |
| 23 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 2.491 | 0.85 | 0.300 | 0.64 |
| | | cum | 1 | 3.876 | 0.85 | 0.300 | 0.99 |
| | | cum | 1 | 5.262 | 0.85 | 0.300 | 1.34 |
| | | cum | 1 | 6.734 | 1.00 | 0.300 | 2.02 |
| | | | | | | Total | 4.99 |
| Miscellaneous | | | | | | | |
| 24 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 2.70 | 2.558 | | 13.81 |
| | | | | | | Total | 13.81 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|----------|-------------------|-----|---|-------|--------|--------------|---------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 6.300 | 12.000 | 0.870 | 65.77 |
| | Shear Key | cum | 2 | 6.500 | 1.680 | 0.780 | 17.04 |
| | Return Wall II | cum | 4 | 5.120 | 5.150 | 0.700 | 73.83 |
| | | | | | | Total | 156.64 |

| | | | | | | | |
|----------|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 5.300 | 8.840 | 0.150 | 7.03 |
| | Shear Key | cum | 2 | 5.500 | 1.503 | 0.150 | 2.48 |
| | Return Wall II | cum | 4 | 4.720 | 4.350 | 0.150 | 12.32 |
| | | | | | | Total | 21.83 |

SUBSTRUCTURE

| | | | | | | | |
|----------|-----------------------------|-----|---|--------|---------|---------------|---------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 5.300 | 11.000 | 0.420 | 24.49 |
| | Box Side Wall | cum | 2 | 11.00 | 3.295 | 0.350 | 25.37 |
| | Base slab of Return wall II | cum | 4 | 4.620 | 4.150 | 0.400 | 30.68 |
| | Return wall I | cum | 4 | 1.300 | 3.665 | 0.300 | 5.72 |
| | Return wall II | cum | 4 | 4.620 | 0.325 | 3.685 | 22.13 |
| | Shear Key | cum | 2 | 5.300 | 0.53820 | | 5.70 |
| | Haunch | cum | 2 | 11.000 | 0.01125 | | 0.25 |
| | | | | | | Total= | 114.34 |

| | | | | | | | |
|----------|-----------------------------|-----|--|--|--|--------------|-------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 9.15 |
| | | | | | | Total | 9.15 |

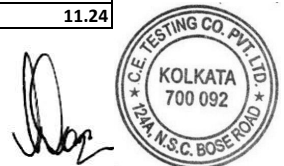
| | | | | | | | |
|----------|--|--|--|--|--|--------------|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment = $10.4/2 =$ | | | | | 5 | |
| | No of weep holes in vertical direction per abutment = $3/1 =$ | | | | | 3 | |
| | No of weep holes in horizontal direction per return wall = $4.5/2 =$ | | | | | 3 | |
| | No of weep holes in vertical direction per return wall = $3/1 =$ | | | | | 3 | |
| | Total no of Weep holes per abutment = 5×3 | | | | | 15 | |
| | Total no of Weep holes per return wall = 3×3 | | | | | 9 | |
| | Total mtrs of weep holes = $15 \times 2 + 9 \times 4$ | | | | | | |
| | | | | | | Total | 33.00 |

| | | | | | | | |
|----------|---------------------|-----|---|--------|-------|--------------|--------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 10.400 | 0.600 | 2.995 | 37.38 |
| | Behind Return Wall | cum | 4 | 5.920 | 0.600 | 3.365 | 47.81 |
| | | | | | | Total | 85.19 |

| | | | | | | | |
|----------|--|-----|---|-------|--------|--------------|--------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 156.64 |
| | Less for PCC | cum | | | | | 21.83 |
| | Less for Bottom Slab RCC | cum | | | | | 24.49 |
| | Less for Shear Key RCC | cum | | | | | 5.70 |
| | Less for Return Wall-I RCC | cum | 4 | 1.300 | 0.300 | 0.300 | 0.47 |
| | Less for Return Wall-II Base Slab | cum | | | | | 30.68 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 4.620 | 0.450 | 0.320 | 2.66 |
| | Less for Box above Invert upto EGL | cum | 1 | 2.70 | 12.000 | 0.300 | 9.72 |
| | | | | | | Total | 61.09 |

SUPERSTRUCTURE

| | | | | | | | |
|----------|-------------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 2.700 | 11.000 | 0.370 | 10.99 |
| | (+)Haunch | cum | 2 | 11.00 | 0.01125 | | 0.25 |
| | | | | | | Total | 11.24 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|--------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 0.90 |
| | | | | | | Total | 0.90 |
| 10 | Bituminous Concrete | | | | | | |
| | | cum | 1 | 2.70 | 10.00 | 0.04 | 1.08 |
| | | | | | | Total | 1.08 |
| 11 | Mastic Asphalt | | | | | | |
| | | sqm | 1 | 2.70 | 10.00 | | 27.00 |
| | | | | | | Total | 27.00 |
| 12 | Tack Coat | | | | | | |
| | | sqm | 1 | 2.70 | 10.00 | | 27.00 |
| | | | | | | Total | 27.00 |
| 13 | RCC M-40 Crash Barrier | m | 2 | 2.70 | | | 5.40 |
| | | | | | | Total | 5.40 |
| 14 | Drainage Spout | nos. | 2 | | | | 2.0 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 15 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 3.400 | 2.00 | 0.30 | 2.04 |
| | | | | | | Total | 2.04 |
| 16 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 2.400 | 1.50 | 0.30 | 1.08 |
| | | | | | | Total | 1.08 |
| 17 | Curtain Wall PCC M-20 | | | | | | |
| | Side wall length parallel to road | cum | 1 | 2.400 | 0.360 | | 0.86 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 1.94 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 1.800 | 1.50 | 0.30 | 0.81 |
| | | cum | 1 | 2.666 | 1.50 | 0.30 | 1.20 |
| | | | | | | Total | 2.01 |
| 19 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 20 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 7.727 | 0.95 | 0.150 | 1.10 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 3.184 | 0.35 | 1.000 | 1.11 |
| | | cum | 1 | 4.569 | 0.35 | 1.600 | 2.56 |
| | | cum | 1 | 5.955 | 0.35 | 1.600 | 3.33 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 3.384 | 0.55 | 0.100 | 0.19 |
| | | cum | 1 | 4.769 | 0.55 | 0.100 | 0.26 |
| | | cum | 1 | 6.155 | 0.55 | 0.100 | 0.34 |
| | On trades | | | | | | |
| | | cum | 1 | 2.491 | 0.85 | 0.100 | 0.21 |
| | | cum | 1 | 3.876 | 0.85 | 0.100 | 0.33 |
| | | cum | 1 | 5.262 | 0.85 | 0.100 | 0.45 |
| | | cum | 1 | 6.734 | 1.00 | 0.100 | 0.67 |
| | | | | | | Total | 10.56 |
| 21 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 8.327 | 1.55 | 1.95 | 25.17 |
| | Stone Pitching and side wall | cum | 1 | 5.014 | | 3.320 | 16.64 |
| | | | | | | Total | 41.81 |
| 22 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 7.427 | 1.003 | | 7.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 9.44 |
| 23 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 2.491 | 0.85 | 0.300 | 0.64 |
| | | cum | 1 | 3.876 | 0.85 | 0.300 | 0.99 |
| | | cum | 1 | 5.262 | 0.85 | 0.300 | 1.34 |
| | | cum | 1 | 6.734 | 1.00 | 0.300 | 2.02 |
| | | | | | | Total | 4.99 |
| Miscellaneous | | | | | | | |
| 24 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 2.70 | 2.558 | | 13.81 |
| | | | | | | Total | 13.81 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =12 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|----------|-------------------|-----|---|-------|--------|--------------|---------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 6.300 | 13.000 | 0.870 | 71.25 |
| | Shear Key | cum | 2 | 6.500 | 1.680 | 0.780 | 17.04 |
| | Return Wall II | cum | 4 | 4.240 | 4.300 | 0.600 | 43.76 |
| | | | | | | Total | 132.05 |

| | | | | | | | |
|----------|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 5.300 | 9.840 | 0.150 | 7.82 |
| | Shear Key | cum | 2 | 5.500 | 1.503 | 0.150 | 2.48 |
| | Return Wall II | cum | 4 | 3.840 | 3.500 | 0.150 | 8.06 |
| | | | | | | Total | 18.37 |

SUBSTRUCTURE

| | | | | | | | |
|----------|-----------------------------|-----|---|--------|---------|---------------|--------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 5.300 | 12.000 | 0.420 | 26.71 |
| | Box Side Wall | cum | 2 | 12.00 | 3.000 | 0.350 | 25.20 |
| | Base slab of Return wall II | cum | 4 | 3.740 | 3.300 | 0.300 | 14.81 |
| | Return wall I | cum | 4 | 1.300 | 3.370 | 0.300 | 5.26 |
| | Return wall II | cum | 4 | 3.740 | 0.275 | 3.490 | 14.36 |
| | Shear Key | cum | 2 | 5.300 | 0.53820 | | 5.70 |
| | Haunch | cum | 2 | 12.000 | 0.01125 | | 0.27 |
| | | | | | | Total= | 92.31 |

| | | | | | | | |
|----------|-----------------------------|-----|--|--|--|--------------|-------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 7.38 |
| | | | | | | Total | 7.38 |

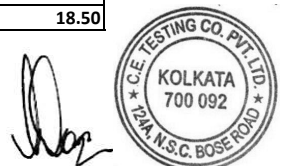
| | | | | | | | |
|----------|--|--|--|--|--|--------------|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment = $11.4/2 =$ | | | | | 6 | |
| | No of weep holes in vertical direction per abutment = $2.7/1 =$ | | | | | 3 | |
| | No of weep holes in horizontal direction per return wall = $4.5/2 =$ | | | | | 3 | |
| | No of weep holes in vertical direction per return wall = $2.7/1 =$ | | | | | 3 | |
| | Total no of Weep holes per abutment = 6×3 | | | | | 18 | |
| | Total no of Weep holes per return wall = 3×3 | | | | | 9 | |
| | Total mtrs of weep holes = $18 \times 2 + 9 \times 4$ | | | | | Total | 36.00 |

| | | | | | | | |
|----------|---------------------|-----|---|--------|-------|--------------|--------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 11.400 | 0.600 | 2.700 | 36.94 |
| | Behind Return Wall | cum | 4 | 5.040 | 0.600 | 3.070 | 37.13 |
| | | | | | | Total | 74.07 |

| | | | | | | | |
|----------|--|-----|---|-------|--------|--------------|--------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 132.05 |
| | Less for PCC | cum | | | | | 18.37 |
| | Less for Bottom Slab RCC | cum | | | | | 26.71 |
| | Less for Shear Key RCC | cum | | | | | 5.70 |
| | Less for Return Wall-I RCC | cum | 4 | 1.300 | 0.300 | 0.300 | 0.47 |
| | Less for Return Wall-II Base Slab | cum | | | | | 14.81 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 3.740 | 0.350 | 0.420 | 2.20 |
| | Less for Box above Invert upto EGL | cum | 1 | 2.70 | 13.000 | 0.300 | 10.53 |
| | | | | | | Total | 53.25 |

SUPERSTRUCTURE

| | | | | | | | |
|----------|-------------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 2.700 | 12.000 | 0.563 | 18.23 |
| | (+)Haunch | cum | 2 | 12.00 | 0.01125 | | 0.27 |
| | | | | | | Total | 18.50 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =12 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|--------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 1.48 |
| | | | | | | Total | 1.48 |
| 10 | Bituminous Concrete | | | | | | |
| | | cum | 1 | 2.70 | 11.00 | 0.04 | 1.19 |
| | | | | | | Total | 1.19 |
| 11 | Mastic Asphalt | | | | | | |
| | | sqm | 1 | 2.70 | 11.00 | | 29.70 |
| | | | | | | Total | 29.70 |
| 12 | Tack Coat | | | | | | |
| | | sqm | 1 | 2.70 | 11.00 | | 29.70 |
| | | | | | | Total | 29.70 |
| 13 | RCC M-40 Crash Barrier | m | 2 | 2.70 | | | 5.40 |
| | | | | | | Total | 5.40 |
| 14 | Drainage Spout | nos. | 2 | | | | 2.0 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 15 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 3.400 | 2.00 | 0.30 | 2.04 |
| | | | | | | Total | 2.04 |
| 16 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 2.400 | 1.50 | 0.30 | 1.08 |
| | | | | | | Total | 1.08 |
| 17 | Curtain Wall PCC M-20 | | | | | | |
| | Side wall length parallal to road | cum | 1 | 2.400 | 0.360 | | 0.86 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 1.94 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 1.800 | 1.50 | 0.30 | 0.81 |
| | | cum | 1 | 2.666 | 1.50 | 0.30 | 1.20 |
| | | | | | | Total | 2.01 |
| 19 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =12 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 20 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 7.727 | 0.95 | 0.150 | 1.10 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 3.184 | 0.35 | 1.000 | 1.11 |
| | | cum | 1 | 4.569 | 0.35 | 1.600 | 2.56 |
| | | cum | 1 | 5.955 | 0.35 | 1.600 | 3.33 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 3.384 | 0.55 | 0.100 | 0.19 |
| | | cum | 1 | 4.769 | 0.55 | 0.100 | 0.26 |
| | | cum | 1 | 6.155 | 0.55 | 0.100 | 0.34 |
| | On trades | | | | | | |
| | | cum | 1 | 2.491 | 0.85 | 0.100 | 0.21 |
| | | cum | 1 | 3.876 | 0.85 | 0.100 | 0.33 |
| | | cum | 1 | 5.262 | 0.85 | 0.100 | 0.45 |
| | | cum | 1 | 6.734 | 1.00 | 0.100 | 0.67 |
| | | | | | | Total | 10.56 |
| 21 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 8.327 | 1.55 | 1.95 | 25.17 |
| | Stone Pitching and side wall | cum | 1 | 5.014 | 3.320 | | 16.64 |
| | | | | | | Total | 41.81 |
| 22 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 7.427 | 1.003 | | 7.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 9.44 |
| 23 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 2.491 | 0.85 | 0.300 | 0.64 |
| | | cum | 1 | 3.876 | 0.85 | 0.300 | 0.99 |
| | | cum | 1 | 5.262 | 0.85 | 0.300 | 1.34 |
| | | cum | 1 | 6.734 | 1.00 | 0.300 | 2.02 |
| | | | | | | Total | 4.99 |
| Miscellaneous | | | | | | | |
| 24 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 2.70 | 2.558 | | 13.81 |
| | | | | | | Total | 13.81 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/33/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|---|----------------|-----|---|-------|--------|--------------|---------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 6.640 | 12.000 | 0.870 | 69.32 |
| | Shear Key | cum | 2 | 6.840 | 1.680 | 0.780 | 17.93 |
| | Return Wall II | cum | 4 | 4.710 | 4.300 | 0.600 | 48.61 |
| | | | | | | Total | 135.86 |

| | | | | | | | |
|---|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 5.640 | 8.840 | 0.150 | 7.48 |
| | Shear Key | cum | 2 | 5.840 | 1.503 | 0.150 | 2.63 |
| | Return Wall II | cum | 4 | 4.310 | 3.500 | 0.150 | 9.05 |
| | | | | | | Total | 19.16 |

SUBSTRUCTURE

| | | | | | | | |
|---|-----------------------------|-----|---|--------|---------|---------------|--------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 5.640 | 11.000 | 0.420 | 26.06 |
| | Box Side Wall | cum | 2 | 11.00 | 3.000 | 0.420 | 27.72 |
| | Base slab of Return wall II | cum | 4 | 4.210 | 3.300 | 0.300 | 16.67 |
| | Return wall I | cum | 4 | 0.900 | 3.420 | 0.250 | 3.08 |
| | Return wall II | cum | 4 | 4.210 | 0.275 | 3.540 | 16.39 |
| | Shear Key | cum | 2 | 5.640 | 0.53820 | | 6.07 |
| | Haunch | cum | 2 | 11.000 | 0.01125 | | 0.25 |
| | | | | | | Total= | 96.24 |

| | | | | | | | |
|---|-----------------------------|-----|--|--|--|--------------|-------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 7.70 |
| | | | | | | Total | 7.70 |

| | | | | | | | |
|---|--|--|--|--|--|--------------|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment = $10.5/2 =$ | | | | | 5 | |
| | No of weep holes in vertical direction per abutment = $2.7/1 =$ | | | | | 3 | |
| | No of weep holes in horizontal direction per return wall = $4.5/2 =$ | | | | | 3 | |
| | No of weep holes in vertical direction per return wall = $2.7/1 =$ | | | | | 3 | |
| | Total no of Weep holes per abutment = 5×3 | | | | | 15 | |
| | Total no of Weep holes per return wall = 3×3 | | | | | 9 | |
| | Total mtrs of weep holes = $15 \times 2 + 9 \times 4$ | | | | | | |
| | | | | | | Total | 33.00 |

| | | | | | | | |
|---|--------------------|-----|---|--------|-------|--------------|--------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 10.500 | 0.600 | 2.700 | 34.02 |
| | Behind Return Wall | cum | 4 | 5.110 | 0.600 | 3.120 | 38.26 |
| | | | | | | Total | 72.28 |

| | | | | | | | |
|---|-------------------------------------|-----|---|-------|--------|--------------|--------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 135.86 |
| | Less for PCC | cum | | | | | 19.16 |
| | Less for Bottom Slab RCC | cum | | | | | 26.06 |
| | Less for Shear Key RCC | cum | | | | | 6.07 |
| | Less for Return Wall-I RCC | cum | 4 | 0.900 | 0.250 | 0.300 | 0.27 |
| | Less for Return Wall-II Base Slab | cum | | | | | 16.67 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 4.210 | 0.350 | 0.420 | 2.48 |
| | Less for Box above Invert upto EGL | cum | 1 | 3.84 | 12.000 | 0.300 | 13.82 |
| | | | | | | Total | 51.32 |

SUPERSTRUCTURE

| | | | | | | | |
|---|------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 3.840 | 11.000 | 0.483 | 20.38 |
| | (+)Haunch | cum | 2 | 11.00 | 0.01125 | | 0.25 |
| | | | | | | Total | 20.63 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/33/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|--------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 1.65 |
| | | | | | | Total | 1.65 |
| 10 | Bituminous Concrete | | | | | | |
| | | cum | 1 | 3.84 | 10.00 | 0.04 | 1.54 |
| | | | | | | Total | 1.54 |
| 11 | Mastic Asphalt | | | | | | |
| | | sqm | 1 | 3.84 | 10.00 | | 38.40 |
| | | | | | | Total | 38.40 |
| 12 | Tack Coat | | | | | | |
| | | sqm | 1 | 3.84 | 10.00 | | 38.40 |
| | | | | | | Total | 38.40 |
| 13 | RCC M-40 Crash Barrier | m | 2 | 3.84 | | | 7.68 |
| | | | | | | Total | 7.68 |
| 14 | Drainage Spout | nos. | 2 | | | | 2.0 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 15 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 4.400 | 2.00 | 0.30 | 2.64 |
| | | | | | | Total | 2.64 |
| 16 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 3.400 | 1.50 | 0.30 | 1.53 |
| | | | | | | Total | 1.53 |
| 17 | Curtain Wall PCC M-20 | | | | | | |
| | Side wall length parallal to road | cum | 1 | 3.400 | 0.360 | | 1.22 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 2.30 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 2.800 | 1.50 | 0.30 | 1.26 |
| | | cum | 1 | 3.666 | 1.50 | 0.30 | 1.65 |
| | | | | | | Total | 2.91 |
| 19 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/33/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 20 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 8.727 | 0.95 | 0.150 | 1.24 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 4.184 | 0.35 | 1.000 | 1.46 |
| | | cum | 1 | 5.569 | 0.35 | 1.600 | 3.12 |
| | | cum | 1 | 6.955 | 0.35 | 1.600 | 3.89 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 4.384 | 0.55 | 0.100 | 0.24 |
| | | cum | 1 | 5.769 | 0.55 | 0.100 | 0.32 |
| | | cum | 1 | 7.155 | 0.55 | 0.100 | 0.39 |
| | On trades | | | | | | |
| | | cum | 1 | 3.491 | 0.85 | 0.100 | 0.30 |
| | | cum | 1 | 4.876 | 0.85 | 0.100 | 0.41 |
| | | cum | 1 | 6.262 | 0.85 | 0.100 | 0.53 |
| | | cum | 1 | 7.734 | 1.00 | 0.100 | 0.77 |
| | | | | | | Total | 12.69 |
| 21 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 9.327 | 1.55 | 1.95 | 28.19 |
| | Stone Pitching and side wall | cum | 1 | 6.014 | 3.320 | | 19.96 |
| | | | | | | Total | 48.16 |
| 22 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 8.427 | 1.003 | | 8.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 10.44 |
| 23 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 3.491 | 0.85 | 0.300 | 0.89 |
| | | cum | 1 | 4.876 | 0.85 | 0.300 | 1.24 |
| | | cum | 1 | 6.262 | 0.85 | 0.300 | 1.60 |
| | | cum | 1 | 7.734 | 1.00 | 0.300 | 2.32 |
| | | | | | | Total | 6.05 |
| Miscellaneous | | | | | | | |
| 24 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 3.84 | 2.558 | | 19.65 |
| | | | | | | Total | 19.65 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|----------|-------------------|-----|---|-------|--------|--------------|---------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 6.300 | 12.000 | 0.870 | 65.77 |
| | Shear Key | cum | 2 | 6.500 | 1.680 | 0.780 | 17.04 |
| | Return Wall II | cum | 4 | 5.290 | 5.150 | 0.700 | 76.28 |
| | | | | | | Total | 159.09 |

| | | | | | | | |
|----------|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 5.300 | 8.840 | 0.150 | 7.03 |
| | Shear Key | cum | 2 | 5.500 | 1.503 | 0.150 | 2.48 |
| | Return Wall II | cum | 4 | 4.890 | 4.350 | 0.150 | 12.76 |
| | | | | | | Total | 22.27 |

SUBSTRUCTURE

| | | | | | | | |
|----------|-----------------------------|-----|---|--------|---------|---------------|---------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 5.300 | 11.000 | 0.420 | 24.49 |
| | Box Side Wall | cum | 2 | 11.00 | 3.350 | 0.350 | 25.80 |
| | Base slab of Return wall II | cum | 4 | 4.790 | 4.150 | 0.400 | 31.81 |
| | Return wall I | cum | 4 | 1.300 | 3.720 | 0.300 | 5.80 |
| | Return wall II | cum | 4 | 4.790 | 0.325 | 3.740 | 23.29 |
| | Shear Key | cum | 2 | 5.300 | 0.53820 | | 5.70 |
| | Haunch | cum | 2 | 11.000 | 0.01125 | | 0.25 |
| | | | | | | Total= | 117.13 |

| | | | | | | | |
|----------|-----------------------------|-----|--|--|--|--------------|-------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 9.37 |
| | | | | | | Total | 9.37 |

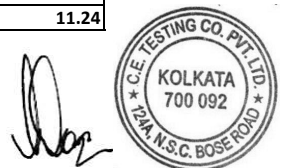
| | | | | | | | |
|----------|--|--|--|--|--|--------------|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment = $10.4/2 =$ | | | | | 5 | |
| | No of weep holes in vertical direction per abutment = $3.1/1 =$ | | | | | 4 | |
| | No of weep holes in horizontal direction per return wall = $4.5/2 =$ | | | | | 4 | |
| | No of weep holes in vertical direction per return wall = $3.1/1 =$ | | | | | 4 | |
| | Total no of Weep holes per abutment = 5×4 | | | | | 20 | |
| | Total no of Weep holes per return wall = 4×4 | | | | | 16 | |
| | Total mtrs of weep holes = $20 \times 2 + 16 \times 4$ | | | | | | |
| | | | | | | Total | 52.00 |

| | | | | | | | |
|----------|---------------------|-----|---|--------|-------|--------------|--------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 10.400 | 0.600 | 3.050 | 38.06 |
| | Behind Return Wall | cum | 4 | 6.090 | 0.600 | 3.420 | 49.99 |
| | | | | | | Total | 88.05 |

| | | | | | | | |
|----------|--|-----|---|-------|--------|--------------|--------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 159.09 |
| | Less for PCC | cum | | | | | 22.27 |
| | Less for Bottom Slab RCC | cum | | | | | 24.49 |
| | Less for Shear Key RCC | cum | | | | | 5.70 |
| | Less for Return Wall-I RCC | cum | 4 | 1.300 | 0.300 | 0.300 | 0.47 |
| | Less for Return Wall-II Base Slab | cum | | | | | 31.81 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 4.790 | 0.450 | 0.320 | 2.76 |
| | Less for Box above Invert upto EGL | cum | 1 | 2.70 | 12.000 | 0.300 | 9.72 |
| | | | | | | Total | 61.87 |

SUPERSTRUCTURE

| | | | | | | | |
|----------|-------------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 2.700 | 11.000 | 0.370 | 10.99 |
| | (+)Haunch | cum | 2 | 11.00 | 0.01125 | | 0.25 |
| | | | | | | Total | 11.24 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|--------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 0.90 |
| | | | | | | Total | 0.90 |
| 10 | Bituminous Concrete | | | | | | |
| | | cum | 1 | 2.70 | 10.00 | 0.04 | 1.08 |
| | | | | | | Total | 1.08 |
| 11 | Mastic Asphalt | | | | | | |
| | | sqm | 1 | 2.70 | 10.00 | | 27.00 |
| | | | | | | Total | 27.00 |
| 12 | Tack Coat | | | | | | |
| | | sqm | 1 | 2.70 | 10.00 | | 27.00 |
| | | | | | | Total | 27.00 |
| 13 | RCC M-40 Crash Barrier | m | 2 | 2.70 | | | 5.40 |
| | | | | | | Total | 5.40 |
| 14 | Drainage Spout | nos. | 2 | | | | 2.0 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 15 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 3.400 | 2.00 | 0.30 | 2.04 |
| | | | | | | Total | 2.04 |
| 16 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 2.400 | 1.50 | 0.30 | 1.08 |
| | | | | | | Total | 1.08 |
| 17 | Curtain Wall PCC M-20 | | | | | | |
| | Side wall length parallal to road | cum | 1 | 2.400 | 0.360 | | 0.86 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 1.94 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 1.800 | 1.50 | 0.30 | 0.81 |
| | | cum | 1 | 2.666 | 1.50 | 0.30 | 1.20 |
| | | | | | | Total | 2.01 |
| 19 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 20 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 7.727 | 0.95 | 0.150 | 1.10 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 3.184 | 0.35 | 1.000 | 1.11 |
| | | cum | 1 | 4.569 | 0.35 | 1.600 | 2.56 |
| | | cum | 1 | 5.955 | 0.35 | 1.600 | 3.33 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 3.384 | 0.55 | 0.100 | 0.19 |
| | | cum | 1 | 4.769 | 0.55 | 0.100 | 0.26 |
| | | cum | 1 | 6.155 | 0.55 | 0.100 | 0.34 |
| | On trades | | | | | | |
| | | cum | 1 | 2.491 | 0.85 | 0.100 | 0.21 |
| | | cum | 1 | 3.876 | 0.85 | 0.100 | 0.33 |
| | | cum | 1 | 5.262 | 0.85 | 0.100 | 0.45 |
| | | cum | 1 | 6.734 | 1.00 | 0.100 | 0.67 |
| | | | | | | Total | 10.56 |
| 21 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 8.327 | 1.55 | 1.95 | 25.17 |
| | Stone Pitching and side wall | cum | 1 | 5.014 | 3.320 | | 16.64 |
| | | | | | | Total | 41.81 |
| 22 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 7.427 | 1.003 | | 7.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 9.44 |
| 23 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 2.491 | 0.85 | 0.300 | 0.64 |
| | | cum | 1 | 3.876 | 0.85 | 0.300 | 0.99 |
| | | cum | 1 | 5.262 | 0.85 | 0.300 | 1.34 |
| | | cum | 1 | 6.734 | 1.00 | 0.300 | 2.02 |
| | | | | | | Total | 4.99 |
| Miscellaneous | | | | | | | |
| 24 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 2.70 | 2.558 | | 13.81 |
| | | | | | | Total | 13.81 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|---|----------------|-----|---|-------|--------|--------------|---------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 8.320 | 12.000 | 0.930 | 92.85 |
| | Shear Key | cum | 2 | 8.520 | 1.620 | 0.720 | 19.88 |
| | Return Wall II | cum | 4 | 5.460 | 5.150 | 0.700 | 78.73 |
| | | | | | | Total | 191.46 |

| | | | | | | | |
|---|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 7.320 | 8.960 | 0.150 | 9.84 |
| | Shear Key | cum | 2 | 7.520 | 1.418 | 0.150 | 3.20 |
| | Return Wall II | cum | 4 | 5.060 | 4.350 | 0.150 | 13.21 |
| | | | | | | Total | 26.24 |

SUBSTRUCTURE

| | | | | | | | |
|---|-----------------------------|-----|---|--------|---------|---------------|---------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 7.320 | 11.000 | 0.480 | 38.65 |
| | Box Side Wall | cum | 2 | 11.00 | 4.000 | 0.460 | 40.48 |
| | Base slab of Return wall II | cum | 4 | 4.960 | 4.150 | 0.400 | 32.93 |
| | Return wall I | cum | 4 | 1.700 | 4.450 | 0.300 | 9.08 |
| | Return wall II | cum | 4 | 4.960 | 0.325 | 4.530 | 29.21 |
| | Shear Key | cum | 2 | 7.320 | 0.47520 | | 6.96 |
| | Haunch | cum | 2 | 11.000 | 0.01125 | | 0.25 |
| | | | | | | Total= | 157.56 |

| | | | | | | | |
|---|-----------------------------|-----|--|--|--|--------------|--------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 12.60 |
| | | | | | | Total | 12.60 |

| | | | | | | | |
|---|--|--|--|--|--|--------------|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment =10.4/2 = | | | | | 5 | |
| | No of weep holes in vertical direction per abutment =3.7/1 = | | | | | 4 | |
| | No of weep holes in horizontal direction per return wall =6/2 = | | | | | 4 | |
| | No of weep holes in vertical direction per return wall =3.7/1 = | | | | | 4 | |
| | Total no of Weep holes per abutment = 5 x 4 | | | | | 20 | |
| | Total no of Weep holes per return wall = 4 x 4 | | | | | 16 | |
| | Total mtrs of weep holes = 20 x 2 + 16 x 4 | | | | | Total | 52.00 |

| | | | | | | | |
|---|--------------------|-----|---|--------|-------|--------------|---------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 10.400 | 0.600 | 3.700 | 46.18 |
| | Behind Return Wall | cum | 4 | 6.660 | 0.600 | 4.150 | 66.33 |
| | | | | | | Total | 112.51 |

| | | | | | | | |
|---|-------------------------------------|-----|---|-------|--------|--------------|--------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 191.46 |
| | Less for PCC | cum | | | | | 26.24 |
| | Less for Bottom Slab RCC | cum | | | | | 38.65 |
| | Less for Shear Key RCC | cum | | | | | 6.96 |
| | Less for Return Wall-I RCC | cum | 4 | 1.700 | 0.300 | 0.300 | 0.61 |
| | Less for Return Wall-II Base Slab | cum | | | | | 32.93 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 4.960 | 0.450 | 0.380 | 3.39 |
| | Less for Box above Invert upto EGL | cum | 1 | 3.92 | 12.000 | 0.300 | 14.11 |
| | | | | | | Total | 68.56 |

SUPERSTRUCTURE

| | | | | | | | |
|---|------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 3.920 | 11.000 | 0.513 | 22.10 |
| | (+)Haunch | cum | 2 | 11.00 | 0.01125 | | 0.25 |
| | | | | | | Total | 22.35 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|--------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 1.79 |
| | | | | | | Total | 1.79 |
| 10 | Bituminous Concrete | | | | | | |
| | | cum | 1 | 3.92 | 10.00 | 0.04 | 1.57 |
| | | | | | | Total | 1.57 |
| 11 | Mastic Asphalt | | | | | | |
| | | sqm | 1 | 3.92 | 10.00 | | 39.20 |
| | | | | | | Total | 39.20 |
| 12 | Tack Coat | | | | | | |
| | | sqm | 1 | 3.92 | 10.00 | | 39.20 |
| | | | | | | Total | 39.20 |
| 13 | RCC M-40 Crash Barrier | m | 2 | 3.92 | | | 7.84 |
| | | | | | | Total | 7.84 |
| 14 | Drainage Spout | nos. | 2 | | | | 2.0 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 15 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 4.400 | 2.00 | 0.30 | 2.64 |
| | | | | | | Total | 2.64 |
| 16 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 3.400 | 1.50 | 0.30 | 1.53 |
| | | | | | | Total | 1.53 |
| 17 | Curtain Wall PCC M-20 | | | | | | |
| | Side wall length parallal to road | cum | 1 | 3.400 | 0.360 | | 1.22 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 2.30 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 2.800 | 1.50 | 0.30 | 1.26 |
| | | cum | 1 | 3.666 | 1.50 | 0.30 | 1.65 |
| | | | | | | Total | 2.91 |
| 19 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 20 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 8.727 | 0.95 | 0.150 | 1.24 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 4.184 | 0.35 | 1.000 | 1.46 |
| | | cum | 1 | 5.569 | 0.35 | 1.600 | 3.12 |
| | | cum | 1 | 6.955 | 0.35 | 1.600 | 3.89 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 4.384 | 0.55 | 0.100 | 0.24 |
| | | cum | 1 | 5.769 | 0.55 | 0.100 | 0.32 |
| | | cum | 1 | 7.155 | 0.55 | 0.100 | 0.39 |
| | On trades | | | | | | |
| | | cum | 1 | 3.491 | 0.85 | 0.100 | 0.30 |
| | | cum | 1 | 4.876 | 0.85 | 0.100 | 0.41 |
| | | cum | 1 | 6.262 | 0.85 | 0.100 | 0.53 |
| | | cum | 1 | 7.734 | 1.00 | 0.100 | 0.77 |
| | | | | | | Total | 12.69 |
| 21 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 9.327 | 1.55 | 1.95 | 28.19 |
| | Stone Pitching and side wall | cum | 1 | 6.014 | 3.320 | | 19.96 |
| | | | | | | Total | 48.16 |
| 22 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 8.427 | 1.003 | | 8.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 10.44 |
| 23 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 3.491 | 0.85 | 0.300 | 0.89 |
| | | cum | 1 | 4.876 | 0.85 | 0.300 | 1.24 |
| | | cum | 1 | 6.262 | 0.85 | 0.300 | 1.60 |
| | | cum | 1 | 7.734 | 1.00 | 0.300 | 2.32 |
| | | | | | | Total | 6.05 |
| Miscellaneous | | | | | | | |
| 24 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 3.92 | 2.558 | | 20.05 |
| | | | | | | Total | 20.05 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/33/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|----------|-------------------|-----|---|-------|--------|--------------|---------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 6.640 | 12.000 | 0.870 | 69.32 |
| | Shear Key | cum | 2 | 6.840 | 1.680 | 0.780 | 17.93 |
| | Return Wall II | cum | 4 | 5.760 | 5.150 | 0.700 | 83.06 |
| | | | | | | Total | 170.31 |

| | | | | | | | |
|----------|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 5.640 | 8.840 | 0.150 | 7.48 |
| | Shear Key | cum | 2 | 5.840 | 1.503 | 0.150 | 2.63 |
| | Return Wall II | cum | 4 | 5.360 | 4.350 | 0.150 | 13.99 |
| | | | | | | Total | 24.10 |

SUBSTRUCTURE

| | | | | | | | |
|----------|-----------------------------|-----|---|--------|---------|---------------|---------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 5.640 | 11.000 | 0.420 | 26.06 |
| | Box Side Wall | cum | 2 | 11.00 | 3.350 | 0.420 | 30.95 |
| | Base slab of Return wall II | cum | 4 | 5.260 | 4.150 | 0.400 | 34.93 |
| | Return wall I | cum | 4 | 0.900 | 3.770 | 0.250 | 3.39 |
| | Return wall II | cum | 4 | 5.260 | 0.325 | 3.790 | 25.92 |
| | Shear Key | cum | 2 | 5.640 | 0.53820 | | 6.07 |
| | Haunch | cum | 2 | 11.000 | 0.01125 | | 0.25 |
| | | | | | | Total= | 127.56 |

| | | | | | | | |
|----------|-----------------------------|-----|--|--|--|--------------|--------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 10.21 |
| | | | | | | Total | 10.21 |

| | | | | | | | |
|----------|--|--|--|--|--|--------------|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment = $10.5/2 =$ | | | | | 5 | |
| | No of weep holes in vertical direction per abutment = $3.1/1 =$ | | | | | 4 | |
| | No of weep holes in horizontal direction per return wall = $4.5/2 =$ | | | | | 4 | |
| | No of weep holes in vertical direction per return wall = $3.1/1 =$ | | | | | 4 | |
| | Total no of Weep holes per abutment = 5×4 | | | | | 20 | |
| | Total no of Weep holes per return wall = 4×4 | | | | | 16 | |
| | Total mtrs of weep holes = $20 \times 2 + 16 \times 4$ | | | | | Total | 52.00 |

| | | | | | | | |
|----------|---------------------|-----|---|--------|-------|--------------|--------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 10.500 | 0.600 | 3.050 | 38.43 |
| | Behind Return Wall | cum | 4 | 6.160 | 0.600 | 3.470 | 51.30 |
| | | | | | | Total | 89.73 |

| | | | | | | | |
|----------|--|-----|---|-------|--------|--------------|--------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 170.31 |
| | Less for PCC | cum | | | | | 24.10 |
| | Less for Bottom Slab RCC | cum | | | | | 26.06 |
| | Less for Shear Key RCC | cum | | | | | 6.07 |
| | Less for Return Wall-I RCC | cum | 4 | 0.900 | 0.250 | 0.300 | 0.27 |
| | Less for Return Wall-II Base Slab | cum | | | | | 34.93 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 5.260 | 0.450 | 0.320 | 3.03 |
| | Less for Box above Invert upto EGL | cum | 1 | 3.84 | 12.000 | 0.300 | 13.82 |
| | | | | | | Total | 62.03 |

SUPERSTRUCTURE

| | | | | | | | |
|----------|-------------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 3.840 | 11.000 | 0.420 | 17.74 |
| | (+)Haunch | cum | 2 | 11.00 | 0.01125 | | 0.25 |
| | | | | | | Total | 17.99 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/33/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|--------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 1.44 |
| | | | | | | Total | 1.44 |
| 10 | Bituminous Concrete | | | | | | |
| | | cum | 1 | 3.84 | 10.00 | 0.04 | 1.54 |
| | | | | | | Total | 1.54 |
| 11 | Mastic Asphalt | | | | | | |
| | | sqm | 1 | 3.84 | 10.00 | | 38.40 |
| | | | | | | Total | 38.40 |
| 12 | Tack Coat | | | | | | |
| | | sqm | 1 | 3.84 | 10.00 | | 38.40 |
| | | | | | | Total | 38.40 |
| 13 | RCC M-40 Crash Barrier | m | 2 | 3.84 | | | 7.68 |
| | | | | | | Total | 7.68 |
| 14 | Drainage Spout | nos. | 2 | | | | 2.0 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 15 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 4.400 | 2.00 | 0.30 | 2.64 |
| | | | | | | Total | 2.64 |
| 16 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 3.400 | 1.50 | 0.30 | 1.53 |
| | | | | | | Total | 1.53 |
| 17 | Curtain Wall PCC M-20 | | | | | | |
| | Side wall length parallal to road | cum | 1 | 3.400 | 0.360 | | 1.22 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 2.30 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 2.800 | 1.50 | 0.30 | 1.26 |
| | | cum | 1 | 3.666 | 1.50 | 0.30 | 1.65 |
| | | | | | | Total | 2.91 |
| 19 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/33/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 20 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 8.727 | 0.95 | 0.150 | 1.24 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 4.184 | 0.35 | 1.000 | 1.46 |
| | | cum | 1 | 5.569 | 0.35 | 1.600 | 3.12 |
| | | cum | 1 | 6.955 | 0.35 | 1.600 | 3.89 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 4.384 | 0.55 | 0.100 | 0.24 |
| | | cum | 1 | 5.769 | 0.55 | 0.100 | 0.32 |
| | | cum | 1 | 7.155 | 0.55 | 0.100 | 0.39 |
| | On trades | | | | | | |
| | | cum | 1 | 3.491 | 0.85 | 0.100 | 0.30 |
| | | cum | 1 | 4.876 | 0.85 | 0.100 | 0.41 |
| | | cum | 1 | 6.262 | 0.85 | 0.100 | 0.53 |
| | | cum | 1 | 7.734 | 1.00 | 0.100 | 0.77 |
| | | | | | | Total | 12.69 |
| 21 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 9.327 | 1.55 | 1.95 | 28.19 |
| | Stone Pitching and side wall | cum | 1 | 6.014 | 3.320 | | 19.96 |
| | | | | | | Total | 48.16 |
| 22 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 8.427 | 1.003 | | 8.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 10.44 |
| 23 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 3.491 | 0.85 | 0.300 | 0.89 |
| | | cum | 1 | 4.876 | 0.85 | 0.300 | 1.24 |
| | | cum | 1 | 6.262 | 0.85 | 0.300 | 1.60 |
| | | cum | 1 | 7.734 | 1.00 | 0.300 | 2.32 |
| | | | | | | Total | 6.05 |
| Miscellaneous | | | | | | | |
| 24 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 3.84 | 2.558 | | 19.65 |
| | | | | | | Total | 19.65 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/3 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|----------|-------------------|-----|---|-------|--------|--------------|---------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 7.760 | 12.000 | 1.120 | 104.29 |
| | Shear Key | cum | 2 | 7.960 | 1.630 | 0.730 | 18.94 |
| | Return Wall II | cum | 4 | 5.660 | 5.150 | 0.900 | 104.94 |
| | | | | | | Total | 228.17 |

| | | | | | | | |
|----------|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 6.760 | 8.940 | 0.150 | 9.07 |
| | Shear Key | cum | 2 | 6.960 | 1.432 | 0.150 | 2.99 |
| | Return Wall II | cum | 4 | 5.260 | 4.350 | 0.150 | 13.73 |
| | | | | | | Total | 25.78 |

SUBSTRUCTURE

| | | | | | | | |
|----------|-----------------------------|-----|---|--------|---------|---------------|---------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 6.760 | 11.000 | 0.470 | 34.95 |
| | Box Side Wall | cum | 2 | 11.00 | 4.000 | 0.480 | 42.24 |
| | Base slab of Return wall II | cum | 4 | 5.160 | 4.150 | 0.400 | 34.26 |
| | Return wall I | cum | 4 | 1.400 | 4.390 | 0.300 | 7.37 |
| | Return wall II | cum | 4 | 5.160 | 0.325 | 4.460 | 29.92 |
| | Shear Key | cum | 2 | 6.760 | 0.48545 | | 6.56 |
| | Haunch | cum | 2 | 11.000 | 0.01125 | | 0.25 |
| | | | | | | Total= | 155.55 |

| | | | | | | | |
|----------|-----------------------------|-----|--|--|--|--------------|--------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 12.44 |
| | | | | | | Total | 12.44 |

| | | | | | | | |
|----------|--|--|--|--|--|----|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment =10.4/2 = | | | | | 5 | |
| | No of weep holes in vertical direction per abutment =3.7/1 = | | | | | 4 | |
| | No of weep holes in horizontal direction per return wall =6/2 = | | | | | 4 | |
| | No of weep holes in vertical direction per return wall =3.5/1 = | | | | | 4 | |
| | Total no of Weep holes per abutment = 5 x 4 | | | | | 20 | |
| | Total no of Weep holes per return wall = 4 x 4 | | | | | 16 | |
| | Total mtrs of weep holes = 20 x 2 + 16 x 4 | | | | | | 52.00 |

| | | | | | | | |
|----------|---------------------|-----|---|--------|-------|--------------|---------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 10.400 | 0.600 | 3.520 | 43.93 |
| | Behind Return Wall | cum | 4 | 6.560 | 0.600 | 3.890 | 61.24 |
| | | | | | | Total | 105.17 |

| | | | | | | | |
|----------|--|-----|---|-------|--------|--------------|--------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 228.17 |
| | Less for PCC | cum | | | | | 25.78 |
| | Less for Bottom Slab RCC | cum | | | | | 34.95 |
| | Less for Shear Key RCC | cum | | | | | 6.56 |
| | Less for Return Wall-I RCC | cum | 4 | 1.400 | 0.300 | 0.500 | 0.84 |
| | Less for Return Wall-II Base Slab | cum | | | | | 34.26 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 5.160 | 0.450 | 0.570 | 5.29 |
| | Less for Box above Invert upto EGL | cum | 1 | 3.96 | 12.000 | 0.500 | 23.76 |
| | | | | | | Total | 96.72 |

SUPERSTRUCTURE

| | | | | | | | |
|----------|-------------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 3.960 | 11.000 | 0.390 | 16.98 |
| | (+)Haunch | cum | 2 | 11.00 | 0.01125 | | 0.25 |
| | (+)RCC Wall | cum | 2 | 6.760 | 1.580 | 0.300 | 6.41 |
| | (+)RCC Column | cum | 4 | 0.600 | 0.900 | 0.680 | 1.47 |
| | | | | | | Total | 25.10 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/3 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|-------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 2.01 |
| | | | | | | Total | 2.01 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--------------------------|-----|---|-------|------|--------------|-------------|
| 10 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 4.400 | 2.00 | 0.50 | 4.40 |
| | | | | | | Total | 4.40 |

| | | | | | | | |
|----|--------------------------|-----|---|-------|------|--------------|-------------|
| 11 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 3.400 | 1.50 | 0.30 | 1.53 |
| | | | | | | Total | 1.53 |

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 12 | Catch Pit Stone Masonry/PCC M15 | | | | | | |
| | Side wall length parallal to road | cum | 1 | 3.400 | 0.360 | | 1.22 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 2.30 |

| | | | | | | | |
|----|-------------------------|-----|---|-------|------|--------------|-------------|
| 13 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 2.800 | 1.50 | 0.30 | 1.26 |
| | | cum | 1 | 3.666 | 1.50 | 0.30 | 1.65 |
| | | | | | | Total | 2.91 |

| | | | | | | | |
|----|-------------------------------|-----|---|-------|------|--------------|-------------|
| 14 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/3 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 15 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 8.727 | 0.95 | 0.150 | 1.24 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 4.184 | 0.35 | 1.000 | 1.46 |
| | | cum | 1 | 5.569 | 0.35 | 1.600 | 3.12 |
| | | cum | 1 | 6.955 | 0.35 | 1.600 | 3.89 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 4.384 | 0.55 | 0.100 | 0.24 |
| | | cum | 1 | 5.769 | 0.55 | 0.100 | 0.32 |
| | | cum | 1 | 7.155 | 0.55 | 0.100 | 0.39 |
| | On trades | | | | | | |
| | | cum | 1 | 3.491 | 0.85 | 0.100 | 0.30 |
| | | cum | 1 | 4.876 | 0.85 | 0.100 | 0.41 |
| | | cum | 1 | 6.262 | 0.85 | 0.100 | 0.53 |
| | | cum | 1 | 7.734 | 1.00 | 0.100 | 0.77 |
| | | | | | | Total | 12.69 |
| 16 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 9.327 | 1.55 | 1.95 | 28.19 |
| | Stone Pitching and side wall | cum | 1 | 6.014 | 3.320 | | 19.96 |
| | | | | | | Total | 48.16 |
| 17 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 8.427 | 1.003 | | 8.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 10.44 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 3.491 | 0.85 | 0.300 | 0.89 |
| | | cum | 1 | 4.876 | 0.85 | 0.300 | 1.24 |
| | | cum | 1 | 6.262 | 0.85 | 0.300 | 1.60 |
| | | cum | 1 | 7.734 | 1.00 | 0.300 | 2.32 |
| | | | | | | Total | 6.05 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/3 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|----------|-------------------|-----|---|-------|--------|--------------|---------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 7.760 | 12.000 | 1.120 | 104.29 |
| | Shear Key | cum | 2 | 7.960 | 1.630 | 0.730 | 18.94 |
| | Return Wall II | cum | 4 | 7.820 | 5.300 | 0.950 | 157.49 |
| | | | | | | Total | 280.73 |

| | | | | | | | |
|----------|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 6.760 | 8.940 | 0.150 | 9.07 |
| | Shear Key | cum | 2 | 6.960 | 1.432 | 0.150 | 2.99 |
| | Return Wall II | cum | 4 | 7.420 | 4.500 | 0.150 | 20.03 |
| | | | | | | Total | 32.09 |

SUBSTRUCTURE

| | | | | | | | |
|----------|-----------------------------|-----|---|--------|---------|---------------|---------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 6.760 | 11.000 | 0.470 | 34.95 |
| | Box Side Wall | cum | 2 | 11.00 | 4.000 | 0.480 | 42.24 |
| | Base slab of Return wall II | cum | 4 | 7.320 | 4.300 | 0.450 | 56.66 |
| | Return wall I | cum | 4 | 1.400 | 4.390 | 0.300 | 7.37 |
| | Return wall II | cum | 4 | 7.320 | 0.375 | 5.128 | 56.31 |
| | Shear Key | cum | 2 | 6.760 | 0.48545 | | 6.56 |
| | Haunch | cum | 2 | 11.000 | 0.01125 | | 0.25 |
| | | | | | | Total= | 204.34 |

| | | | | | | | |
|----------|-----------------------------|-----|--|--|--|--------------|--------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 16.35 |
| | | | | | | Total | 16.35 |

| | | | | | | | |
|----------|--|--|--|--|--|----|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment =10.4/2 = | | | | | 5 | |
| | No of weep holes in vertical direction per abutment =3.7/1 = | | | | | 4 | |
| | No of weep holes in horizontal direction per return wall =6/2 = | | | | | 5 | |
| | No of weep holes in vertical direction per return wall =3.5/1 = | | | | | 4 | |
| | Total no of Weep holes per abutment = 5 x 4 | | | | | 20 | |
| | Total no of Weep holes per return wall = 5 x 4 | | | | | 20 | |
| | Total mtrs of weep holes = 20 x 2 + 20 x 4 | | | | | | 60.00 |

| | | | | | | | |
|----------|---------------------|-----|---|--------|-------|--------------|---------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 10.400 | 0.600 | 3.520 | 43.93 |
| | Behind Return Wall | cum | 4 | 8.720 | 0.600 | 4.608 | 96.44 |
| | | | | | | Total | 140.37 |

| | | | | | | | |
|----------|--|-----|---|-------|--------|--------------|---------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 280.73 |
| | Less for PCC | cum | | | | | 32.09 |
| | Less for Bottom Slab RCC | cum | | | | | 34.95 |
| | Less for Shear Key RCC | cum | | | | | 6.56 |
| | Less for Return Wall-I RCC | cum | 4 | 1.400 | 0.300 | 0.500 | 0.84 |
| | Less for Return Wall-II Base Slab | cum | | | | | 56.66 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 7.320 | 0.500 | 0.520 | 7.61 |
| | Less for Box above Invert upto EGL | cum | 1 | 3.96 | 12.000 | 0.500 | 23.76 |
| | | | | | | Total | 118.26 |

SUPERSTRUCTURE

| | | | | | | | |
|----------|-------------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 3.960 | 11.000 | 0.390 | 16.98 |
| | (+)Haunch | cum | 2 | 11.00 | 0.01125 | | 0.25 |
| | (+)RCC Wall | cum | 2 | 6.760 | 1.987 | 0.300 | 8.06 |
| | (+)RCC Column | cum | 4 | 0.600 | 0.900 | 1.087 | 2.35 |
| | | | | | | Total | 27.63 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/3 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|-------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 2.21 |
| | | | | | | Total | 2.21 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--------------------------|-----|---|-------|------|--------------|-------------|
| 10 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 4.400 | 2.00 | 0.50 | 4.40 |
| | | | | | | Total | 4.40 |

| | | | | | | | |
|----|--------------------------|-----|---|-------|------|--------------|-------------|
| 11 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 3.400 | 1.50 | 0.30 | 1.53 |
| | | | | | | Total | 1.53 |

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 12 | Catch Pit Stone Masonry/PCC M15 | | | | | | |
| | Side wall length parallal to road | cum | 1 | 3.400 | 0.360 | | 1.22 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 2.30 |

| | | | | | | | |
|----|-------------------------|-----|---|-------|------|--------------|-------------|
| 13 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 2.800 | 1.50 | 0.30 | 1.26 |
| | | cum | 1 | 3.666 | 1.50 | 0.30 | 1.65 |
| | | | | | | Total | 2.91 |

| | | | | | | | |
|----|-------------------------------|-----|---|-------|------|--------------|-------------|
| 14 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/3 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 15 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 8.727 | 0.95 | 0.150 | 1.24 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 4.184 | 0.35 | 1.000 | 1.46 |
| | | cum | 1 | 5.569 | 0.35 | 1.600 | 3.12 |
| | | cum | 1 | 6.955 | 0.35 | 1.600 | 3.89 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 4.384 | 0.55 | 0.100 | 0.24 |
| | | cum | 1 | 5.769 | 0.55 | 0.100 | 0.32 |
| | | cum | 1 | 7.155 | 0.55 | 0.100 | 0.39 |
| | On trades | | | | | | |
| | | cum | 1 | 3.491 | 0.85 | 0.100 | 0.30 |
| | | cum | 1 | 4.876 | 0.85 | 0.100 | 0.41 |
| | | cum | 1 | 6.262 | 0.85 | 0.100 | 0.53 |
| | | cum | 1 | 7.734 | 1.00 | 0.100 | 0.77 |
| | | | | | | Total | 12.69 |
| 16 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 9.327 | 1.55 | 1.95 | 28.19 |
| | Stone Pitching and side wall | cum | 1 | 6.014 | 3.320 | | 19.96 |
| | | | | | | Total | 48.16 |
| 17 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 8.427 | 1.003 | | 8.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 10.44 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 3.491 | 0.85 | 0.300 | 0.89 |
| | | cum | 1 | 4.876 | 0.85 | 0.300 | 1.24 |
| | | cum | 1 | 6.262 | 0.85 | 0.300 | 1.60 |
| | | cum | 1 | 7.734 | 1.00 | 0.300 | 2.32 |
| | | | | | | Total | 6.05 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/43/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|----------|-------------------|-----|---|-------|--------|--------------|---------------|
| 1 | Excavation | | | | | | |
| | Box culvert | cum | 1 | 6.800 | 12.000 | 0.950 | 77.52 |
| | Shear Key | cum | 2 | 7.000 | 1.600 | 0.700 | 15.68 |
| | Return Wall II | cum | 4 | 6.310 | 5.150 | 0.700 | 90.99 |
| | | | | | | Total | 184.19 |

| | | | | | | | |
|----------|----------------|-----|---|-------|-------|--------------|--------------|
| 2 | PCC-M15 | | | | | | |
| | Box culvert | cum | 1 | 5.800 | 9.000 | 0.150 | 7.83 |
| | Shear Key | cum | 2 | 6.000 | 1.390 | 0.150 | 2.50 |
| | Return Wall II | cum | 4 | 5.910 | 4.350 | 0.150 | 15.43 |
| | | | | | | Total | 25.76 |

SUBSTRUCTURE

| | | | | | | | |
|----------|-----------------------------|-----|---|--------|---------|---------------|---------------|
| 3 | RCC-Substructure | | | | | | |
| | Bottom Slab | cum | 1 | 5.800 | 11.000 | 0.500 | 31.90 |
| | Box Side Wall | cum | 2 | 11.00 | 3.350 | 0.500 | 36.85 |
| | Base slab of Return wall II | cum | 4 | 5.810 | 4.150 | 0.400 | 38.58 |
| | Return wall I | cum | 4 | 0.400 | 3.800 | 0.250 | 1.52 |
| | Return wall II | cum | 4 | 5.810 | 0.325 | 3.900 | 29.46 |
| | Shear Key | cum | 2 | 5.800 | 0.45500 | | 5.28 |
| | Haunch | cum | 2 | 11.000 | 0.01125 | | 0.25 |
| | | | | | | Total= | 143.83 |

| | | | | | | | |
|----------|-----------------------------|-----|--|--|--|--------------|--------------|
| 4 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 11.51 |
| | | | | | | Total | 11.51 |

| | | | | | | | |
|----------|--|--|--|--|--|--------------|--------------|
| 5 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment = $10.5/2 =$ | | | | | 5 | |
| | No of weep holes in vertical direction per abutment = $3.1/1 =$ | | | | | 4 | |
| | No of weep holes in horizontal direction per return wall = $4.5/2 =$ | | | | | 4 | |
| | No of weep holes in vertical direction per return wall = $3.1/1 =$ | | | | | 4 | |
| | Total no of Weep holes per abutment = 5×4 | | | | | 20 | |
| | Total no of Weep holes per return wall = 4×4 | | | | | 16 | |
| | Total mtrs of weep holes = $20 \times 2 + 16 \times 4$ | | | | | | |
| | | | | | | Total | 52.00 |

| | | | | | | | |
|----------|---------------------|-----|---|--------|-------|--------------|--------------|
| 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 10.500 | 0.600 | 3.050 | 38.43 |
| | Behind Return Wall | cum | 4 | 6.210 | 0.600 | 3.500 | 52.16 |
| | | | | | | Total | 90.59 |

| | | | | | | | |
|----------|--|-----|---|-------|--------|--------------|--------------|
| 7 | Sand Filling in Foundation Trenches | | | | | | |
| | Total Cutting Volume | cum | | | | | 184.19 |
| | Less for PCC | cum | | | | | 25.76 |
| | Less for Bottom Slab RCC | cum | | | | | 31.90 |
| | Less for Shear Key RCC | cum | | | | | 5.28 |
| | Less for Return Wall-I RCC | cum | 4 | 0.400 | 0.250 | 0.300 | 0.12 |
| | Less for Return Wall-II Base Slab | cum | | | | | 38.58 |
| | Less for Return Wall-II Stem Wall | cum | 4 | 5.810 | 0.450 | 0.400 | 4.18 |
| | Less for Box above Invert upto EGL | cum | 1 | 5.00 | 12.000 | 0.300 | 18.00 |
| | | | | | | Total | 60.37 |

SUPERSTRUCTURE

| | | | | | | | |
|----------|-------------------------------------|-----|---|-------|---------|--------------|--------------|
| 8 | RCC-Superstructure(up to 5m) | | | | | | |
| | Top Slab | cum | 1 | 5.000 | 11.000 | 0.450 | 24.75 |
| | (+)Haunch | cum | 2 | 11.00 | 0.01125 | | 0.25 |
| | | | | | | Total | 25.00 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/43/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-----------------------------|------|-----|------------|-------------|--------------|--------------|
| 9 | Steel | | | | | | |
| | @ 80 Kg per cum of concrete | ton | | | | | 2.00 |
| | | | | | | Total | 2.00 |
| 10 | Bituminous Concrete | | | | | | |
| | | cum | 1 | 5.00 | 10.00 | 0.04 | 2.00 |
| | | | | | | Total | 2.00 |
| 11 | Mastic Asphalt | | | | | | |
| | | sqm | 1 | 5.00 | 10.00 | | 50.00 |
| | | | | | | Total | 50.00 |
| 12 | Tack Coat | | | | | | |
| | | sqm | 1 | 5.00 | 10.00 | | 50.00 |
| | | | | | | Total | 50.00 |
| 13 | RCC M-40 Crash Barrier | m | 2 | 5.00 | | | 10.00 |
| | | | | | | Total | 10.00 |
| 14 | Drainage Spout | nos. | 2 | | | | 2.0 |

PROTECTION WORK

Upstream side

| | | | | | | | |
|----|--|-----|---|-------|-------|--------------|-------------|
| 15 | Earthwork for excavation | | | | | | |
| | | cum | 1 | 5.400 | 2.00 | 0.30 | 3.24 |
| | | | | | | Total | 3.24 |
| 16 | PCC M 15 below Catch Pit | | | | | | |
| | | cum | 1 | 4.400 | 1.50 | 0.30 | 1.98 |
| | | | | | | Total | 1.98 |
| 17 | Curtain Wall PCC M-20 | | | | | | |
| | Side wall length parallal to road | cum | 1 | 4.400 | 0.360 | | 1.58 |
| | Side wall length perpendicular to road | cum | 2 | 1.500 | 0.360 | | 1.08 |
| | | | | | | Total | 2.66 |
| 18 | 300 mm Boulder Pitching | | | | | | |
| | | cum | 1 | 3.800 | 1.50 | 0.30 | 1.71 |
| | | cum | 1 | 4.666 | 1.50 | 0.30 | 2.10 |
| | | | | | | Total | 3.81 |
| 19 | Guide wall-Stone Masonry/ PCC | | | | | | |
| | | cum | 2 | 3.232 | 0.60 | 0.30 | 1.16 |
| | | | | | | Total | 1.16 |



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/43/0 (W =11 m)

Catch Pit and Stepped Protection

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|------------------------|--|------|-----|------------|-------------|--------------|--------------|
| Downstream side | | | | | | | |
| 20 | PCC M15 Downstream side | | | | | | |
| | Below curtain wall | cum | 1 | 9.727 | 0.95 | 0.150 | 1.39 |
| | For PCC wall | | | | | | |
| | | cum | 1 | 5.184 | 0.35 | 1.000 | 1.81 |
| | | cum | 1 | 6.569 | 0.35 | 1.600 | 3.68 |
| | | cum | 1 | 7.955 | 0.35 | 1.600 | 4.45 |
| | Below PCC Wall | | | | | | |
| | | cum | 1 | 5.384 | 0.55 | 0.100 | 0.30 |
| | | cum | 1 | 6.769 | 0.55 | 0.100 | 0.37 |
| | | cum | 1 | 8.155 | 0.55 | 0.100 | 0.45 |
| | On trades | | | | | | |
| | | cum | 1 | 4.491 | 0.85 | 0.100 | 0.38 |
| | | cum | 1 | 5.876 | 0.85 | 0.100 | 0.50 |
| | | cum | 1 | 7.262 | 0.85 | 0.100 | 0.62 |
| | | cum | 1 | 8.734 | 1.00 | 0.100 | 0.87 |
| | | | | | | Total | 14.82 |
| 21 | Earth work for excavation | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 10.327 | 1.55 | 1.95 | 31.21 |
| | Stone Pitching and side wall | cum | 1 | 7.014 | 3.320 | | 23.28 |
| | | | | | | Total | 54.50 |
| 22 | Curtain Wall & Guide wall-Stone Masonry/PCC | | | | | | |
| | Curtain Wall Down stream side | cum | 1 | 9.427 | 1.003 | | 9.45 |
| | Guide Wall | cum | 2 | 5.543 | 0.60 | 0.300 | 2.00 |
| | | | | | | Total | 11.45 |
| 23 | 300 mm Boulder Pitching | | | | | | |
| | Below trades | cum | 1 | 4.491 | 0.85 | 0.300 | 1.15 |
| | | cum | 1 | 5.876 | 0.85 | 0.300 | 1.50 |
| | | cum | 1 | 7.262 | 0.85 | 0.300 | 1.85 |
| | | cum | 1 | 8.734 | 1.00 | 0.300 | 2.62 |
| | | | | | | Total | 7.12 |
| Miscellaneous | | | | | | | |
| 24 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 5.00 | 2.558 | | 25.58 |
| | | | | | | Total | 25.58 |



| Summary sheet of Minor Bridges (Quantities & amount) | | | SL. 1 | SL. 2 | |
|--|---|-------------------------|---------------------------------|---------------------------------|-------------------|
| | | CHAINAGE | | | |
| | | Span(m) x Height(m)= | Ch-36.568 1x8.0m RCC SLAB | Ch-42.381 1x8.0m RCC SLAB | Total Quantity |
| | No. of Bridge = | | | | |
| ITEM NO. | Description | Unit | | | |
| | A. Foundation | | | | |
| Item no 1 | Excavation (upto 3 m depth) in Soil | cum | 361.857 | 461.435 | 823.292 |
| Item no 2 | R.C.C M30 (Foundation Slab) | cum | 64.650 | 76.827 | 141.477 |
| Item no 3 | P.C.C (M-15) (Levelling Course) | cum | 21.600 | 28.242 | 49.842 |
| Item no 4 | Steel (Foundation) | ton | 7.758 | 9.219 | 16.977 |
| | B. SubStructure | | | | |
| Item no 1(a) | R.C.C M30 (Substructure) upto 5m | cum | 70.712 | 80.859 | 151.571 |
| Item no 1(b) | R.C.C M30 (Substructure) from 5m to 10m | cum | 9.844 | 9.844 | 19.688 |
| Item no 3 | Steel (Substructure) | ton | 11.278 | 12.698 | 23.976 |
| Item no 4 | Weep Holes | each | 120.000 | 156.000 | 276.000 |
| Item no 5 | Backfilling - Granular Material | cum | 19.310 | 23.000 | 42.310 |
| Item no 6 | Backfilling - Sandy Material | cum | 704.842 | 1052.128 | 1756.970 |
| Item no 7 | Filter Media | cum | 66.453 | 86.111 | 152.564 |
| | C. Super Structure | | | | |
| Item no 1 | R.C.C M30 (Superstructure) upto 5m | cum | 77.515 | 77.515 | 155.030 |
| Item no 2 | Steel (Superstructure) | ton | 13.953 | 13.953 | 27.906 |
| Item no 3(a) | Bituminous Concrete Wearing Coat(40mm) | cum | 7.128 | 7.128 | 14.256 |
| Item no 3(b) | Mastic Asphalt (25mm) | sqm | 178.200 | 178.200 | 356.400 |
| Item no 3(c) | Tack Coat | sqm | 178.200 | 178.200 | 356.400 |
| Item no 4 | Crash Barrier | metre | 32.400 | 32.400 | 64.800 |
| Item no 5 | Drainage Spout | each | 4.000 | 4.000 | 8.000 |
| Item no 6 | PCC below approach slab | cum | 10.752 | 10.752 | 21.504 |
| Item no 7 | R.C.C. Approach Slab with steel | cum | 28.930 | 28.930 | 57.860 |
| Item no 8 | Filler Joint | | | | 0.000 |
| | (i) copper plate | metre | 24.000 | 24.000 | 48.000 |
| | (ii) fibar board | metre | 24.000 | 24.000 | 48.000 |
| | (iii) 20mm thick premoulded joint filler | metre | 24.000 | 24.000 | 48.000 |
| | (iv) joint sealing compound | metre | 24.000 | 24.000 | 48.000 |
| | D. Protection Work | | | | |
| Item no 1 | Boulder Pitching (Stone Blanket) in slope | cum | 35.816 | 36.261 | 72.077 |
| Item no 2 | Filter Blanket | cum | 17.908 | 18.130 | 36.038 |



| | | CHAINAGE | | | Total Quantity |
|-----------|---|-------------------------|---------------------------------|---------------------------------|-------------------|
| | | Span(m) x Height(m)= | Ch-36.568 1x8.0m RCC SLAB | Ch-42.381 1x8.0m RCC SLAB | |
| | No. of Bridge = | | | | |
| ITEM NO. | Description | Unit | | | |
| Item no 3 | Boulder Pitching (Stone Blanket) Floor Apron | cum | 5.714 | 5.769 | 11.483 |
| Item no 4 | PCC(M15) Toe Wall | cum | 6.529 | 6.591 | 13.120 |
| | MISCELLANEOUS | | | | |
| Item no 1 | Painting | sqm | 101.410 | 101.410 | 202.820 |
| Item no 2 | Confirmatory Boring in soil | m | 6.000 | 6.000 | 12.000 |
| | Confirmatory Boring in rock | m | 10.000 | 10.000 | 20.000 |
| Item no 3 | Citizen information Board NH Project | no. | 2.000 | 2.000 | 4.000 |
| Item no 4 | Dismantle of Existing Bridge | | | | 0.000 |
| | Foundation | cum | 86.250 | 105.070 | 191.320 |
| | RCC | cum | 158.070 | 168.220 | 326.290 |
| | | | | | 0.000 |
| | DIVERSION ROAD | | | | |
| Item no 1 | Earth cutting for Approach Road | cum | 2880.000 | 2400.000 | 5280.000 |
| Item no 2 | EARTH FILLING UNDER ROAD GRANULAR MATERIAL | cum | 3200.000 | 3200.000 | 6400.000 |
| Item no 3 | Hume Pipe (1.2m Dia) | m | 40.000 | 40.000 | 80.000 |
| Item no 4 | Pavement Composition BC | cum | 24.000 | 20.000 | 44.000 |
| | DBM | cum | 48.000 | 40.000 | 88.000 |
| | WMM | cum | 240.000 | 200.000 | 440.000 |
| | GSB | cum | 144.000 | 120.000 | 264.000 |



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 36.568 Km

1 span of 8 m Slab

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

A. FOUNDATION

| | | | | | | | |
|--------------|--|-----|---|--------|-------|-------|----------------|
| Item no 1 | Excavation (up to 3m) in Soil | | | | | | |
| | Foundation A1 | cum | 1 | 13.300 | 4.000 | 1.992 | 105.974 |
| | Foundation A2 | cum | 1 | 13.300 | 4.000 | 1.856 | 98.739 |
| | Return Wall-I at A1 | cum | 1 | 3.500 | 1.400 | 1.442 | 7.066 |
| | Return Wall-I at A2 | cum | 1 | 3.500 | 1.400 | 1.306 | 6.399 |
| | Return Wall II at A1 | cum | 1 | 5.500 | 4.300 | 1.992 | 47.111 |
| | Return Wall II at A2 | cum | 1 | 12.100 | 4.300 | 1.856 | 96.568 |
| Total | | | | | | | 361.857 |

| | | | | | | | |
|--------------|--------------------------------|-----|---|--------|-------|-------|---------------|
| Item no 2 | Foundation Slab RCC-M30 | | | | | | |
| | Abutment Foundation Slab | cum | 2 | 12.300 | 1.100 | 0.600 | 16.236 |
| | | cum | 2 | 12.300 | 1.100 | 0.600 | 16.236 |
| | | cum | 2 | 12.300 | 0.800 | 0.800 | 15.744 |
| | Return Wall II | cum | 1 | 16.600 | 3.300 | 0.300 | 16.434 |
| Total | | | | | | | 64.650 |

| | | | | | | | |
|--------------|-----------------------------|-----|---|--------|-------|-------|---------------|
| Item no 3 | Levelling Course M15 | | | | | | |
| | Foundation Slab | cum | 2 | 12.600 | 3.300 | 0.150 | 12.474 |
| | Return Wall II | cum | 1 | 16.900 | 3.600 | 0.150 | 9.126 |
| Total | | | | | | | 21.600 |

| | | | | | | | |
|--------------|---|-----|--|-------|--|--|--------------|
| Item no 4 | Steel Reinforcement (HYSD) for Foundation Slab | | | | | | |
| | @120 kg/cum | ton | | 7.758 | | | 7.758 |
| Total | | | | | | | 7.758 |



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 36.568 Km

1 span of 8 m Slab

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

B. SUBSTRUCTURE

| | | | | | | | |
|---------------|--------------------------|-----|---|--------|--------|-------|---------------|
| Item no 1(a) | RCC-M30(up to 5m) | | | | | | |
| | Abutment | cum | 2 | 12.000 | 0.800 | 1.200 | 23.040 |
| | Abutment Cap | cum | 2 | 12.000 | 0.800 | 0.600 | 11.520 |
| | Return wall-I | cum | 2 | 4.600 | 0.400 | 2.675 | 9.844 |
| | Return wall II | cum | 1 | 16.900 | 0.825 | | 13.943 |
| | Dirt wall | cum | 2 | 12.000 | 0.400 | 0.838 | 8.045 |
| | Bracket | cum | 2 | 12.000 | 0.1800 | | 4.320 |
| Total= | | | | | | | 70.712 |

| | | | | | | | |
|--------------|---|-----|--|--------|--|--|---------------|
| Item no 2 | Steel reinforcement (HYSD Bars) for substructure | | | | | | |
| | @ 140 kg/cum | ton | | 11.278 | | | 11.278 |
| Total | | | | | | | 11.278 |

| | | | | | | | |
|--|--|--|--|--|--|----|----------------|
| Item no 3 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment = $11/2+1 =$ | | | | | 7 | |
| | No of weep holes in vertical direction per abutment = $1.2/1 +1 =$ | | | | | 3 | |
| | No of weep holes in horizontal direction per return wall-I = $1.2/1+1 =$ | | | | | 2 | |
| | No of weep holes in horizontal direction per return wall-II = $4.6/2+1 =$ | | | | | 6 | |
| | No of weep holes in vertical direction per return wall-II = $2.7/1+1 =$ | | | | | 3 | |
| | No of weep holes in horizontal direction per return wall-II = $16.9/2+1 =$ | | | | | 18 | |
| | Total no of Weep holes per abutment = 7×3 | | | | | 21 | |
| | Total no of Weep holes per return wall-I = 2×6 | | | | | 12 | |
| | Total no of Weep holes per return wall-II = 3×18 | | | | | 54 | |
| Total no of weep holes = $21 \times 2 + 12 \times 2 + 54 \times 1$ | | | | | | | 120.000 |

| | | | | | | | |
|--------------|---------------------------------------|-----|---|--------|--|-------|---------------|
| Item no 4 | Backfilling(Granular Material) | | | | | | |
| | Foundation | cum | 2 | 16.300 | | 0.400 | 13.040 |
| | Return Wall-II | cum | 1 | 20.900 | | 0.300 | 6.270 |
| Total | | | | | | | 19.310 |

| | | | | | | | |
|--------------|------------------------------------|-----|---|--------|--------|-------|----------------|
| Item no 5 | Backfilling(Sandy Material) | | | | | | |
| | Behind Abutment & Return wall-I | cum | 2 | 4.600 | 11.200 | 2.675 | 275.632 |
| | Behind Return wall-II | cum | 1 | 16.600 | 11.200 | 2.666 | 495.663 |
| | Deduct for filter media | cum | | | | | 66.453 |
| Total | | | | | | | 704.842 |

| | | | | | | | |
|--------------|-----------------------|-----|---|--------|-------|-------|---------------|
| Item no 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 11.000 | 0.600 | 2.050 | 27.060 |
| | Behind Return Wall-I | cum | 2 | 4.000 | 0.600 | 2.675 | 12.840 |
| | Behind Return Wall-II | cum | 1 | 16.600 | 0.600 | 2.666 | 26.553 |
| Total | | | | | | | 66.453 |



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 36.568 Km

1 span of 8 m Slab

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

C. SUPERSTRUCTURE

| | | | | | | | |
|--------------|------------------------------------|-----|---|-------|--------|-------|---------------|
| Item no 1 | RCC-M30(Up to 5M) | | | | | | |
| | Superstructure Slab supported part | cum | 1 | 8.400 | 12.000 | 0.769 | 77.515 |
| Total | | | | | | | 77.515 |

| | | | | | | | |
|--------------|----------------------------------|-----|--|--|--------|--|---------------|
| Item no 2 | Superstructure Steel (HYSD Bars) | | | | | | |
| | @ 180 kg/cum | Ton | | | 13.953 | | 13.953 |
| Total | | | | | | | 13.953 |

| | | | | | | | |
|---------------|-------------------------------------|-----|---|--------|--------|-------|--------------|
| Item no 3(a) | Wearing Course (Bituminus Concrete) | | | | | | |
| | | cum | 1 | 16.200 | 11.000 | 0.040 | 7.128 |
| Total= | | | | | | | 7.128 |

| | | | | | | | |
|---------------|---------------------------------|-----|---|--------|--------|--|----------------|
| Item no 3(b) | Wearing Course (Mastic Asphalt) | | | | | | |
| | | sqm | 1 | 16.200 | 11.000 | | 178.200 |
| Total= | | | | | | | 178.200 |

| | | | | | | | |
|---------------|-----------|-----|---|--------|--------|--|----------------|
| Item no 3(c) | Tack Coat | | | | | | |
| | | sqm | 1 | 16.200 | 11.000 | | 178.200 |
| Total= | | | | | | | 178.200 |

| | | | | | | | |
|--------------|---------------|---|---|--------|--|--|---------------|
| Item no 4 | Crash Barrier | m | 2 | 16.200 | | | 32.400 |
| Total | | | | | | | 32.400 |

| | | | | | | | |
|-----------|----------------|------|---|--|--|--------------|----------|
| Item no 5 | Drainage Spout | nos. | 4 | | | Total | 4 |
|-----------|----------------|------|---|--|--|--------------|----------|

| | | | | | | | |
|--------------|-------------------------|-----|---|--------|-------|-------|---------------|
| Item no 6 | PCC below Approach Slab | | | | | | |
| | | cum | 2 | 11.200 | 3.200 | 0.150 | 10.752 |
| Total | | | | | | | 10.752 |

| | | | | | | | |
|--------------|---------------|-----|---|--------|-------|-------|---------------|
| Item no 7 | Approach Slab | | | | | | |
| | | cum | 2 | 11.200 | 3.500 | 0.369 | 28.930 |
| Total | | | | | | | 28.930 |

| | | | | | | | |
|-----------|--|---|---|--------|--|--|--------|
| Item no 8 | Filler Joint | | | | | | |
| | (i) copper plate | m | 2 | 12.000 | | | 24.000 |
| | (ii) fibar board | m | 2 | 12.000 | | | 24.000 |
| | (iii) 20mm thick premoulded joint filler | m | 2 | 12.000 | | | 24.000 |
| | (iv) joint sealing compound | m | 2 | 12.000 | | | 24.000 |



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 36.568 Km

1 span of 8 m Slab

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

D. MISCELLANNEOUS

| | | | | | | | |
|--------------|---------------------|-----|---|-------|----|-------|----------------|
| Item no 1 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 2.204 | | 16.20 | 71.41 |
| | Flood Level Marking | sqm | 1 | | 30 | | 30.00 |
| Total | | | | | | | 101.410 |

| | | | | | | | |
|--------------|----------------------------------|---|---|--|------|--|-----------|
| Item no 2 | Confirmatory Boring | | | | | | |
| | Confirmatory Boring in soil | m | 2 | | 3.00 | | 6 |
| | Confirmatory Boring in Hard rock | m | 2 | | 5.00 | | 10 |
| Total | | | | | | | 16 |

| | | | | | | | |
|-----------|---------------------------|-----|---|--|--|--|------|
| Item no 3 | Citizen information board | no. | 2 | | | | 2.00 |
|-----------|---------------------------|-----|---|--|--|--|------|

| | | | | | | | |
|-----------|-------------------------------------|-----|---|--|--|--|--------|
| Item no 4 | Dismantle of Existing Bridge | | | | | | |
| 4.1 | Foundation | cum | 1 | | | | 86.25 |
| 4.2 | RCC | cum | 1 | | | | 158.07 |

E.PROTECTION WORK

| | | | | | | | |
|--------------|-------------------------|-----|---|--------|--|-------|---------------|
| Item no 1 | Boulder Pitching | | | | | | |
| | A1 side | cum | 1 | 56.521 | | 0.300 | 16.956 |
| | A2 side | cum | 1 | 62.865 | | 0.300 | 18.860 |
| Total | | | | | | | 35.816 |

| | | | | | | | |
|--------------|---------------------------|-----|---|--------|--|-------|---------------|
| Item no 2 | Filter Blanket | | | | | | |
| | In slope pitching A1 side | cum | 1 | 56.521 | | 0.150 | 8.478 |
| | In slope pitching A2 side | cum | 1 | 62.865 | | 0.150 | 9.430 |
| Total | | | | | | | 17.908 |

| | | | | | | | |
|--------------|-------------------------|-----|---|-------|-------|--|--------------|
| Item no 3 | Falling Apron | | | | | | |
| | Parabollic part A1 side | cum | 1 | 5.218 | 0.526 | | 2.745 |
| | Parabollic part A2 side | cum | 1 | 5.645 | 0.526 | | 2.969 |
| Total | | | | | | | 5.714 |

| | | | | | | | |
|--------------|--------------------------|-----|---|-------|-------|--|--------------|
| Item no 4 | PCC(M15) Toe Wall | | | | | | |
| | Parabollic part A1 side | cum | 1 | 5.218 | 0.601 | | 3.136 |
| | Parabollic part A2 side | cum | 1 | 5.645 | 0.601 | | 3.393 |
| Total | | | | | | | 6.529 |



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 36.568 Km

1 span of 8 m Slab

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|---------------|----------------|---------------|----------|
|----------|-------------|------|-----|---------------|----------------|---------------|----------|

F. Diversion Work

| Item SI No. | Description | Unit | nos | Length | Breadth | Height | Quantity |
|-------------|---------------------------------|------|-----|--------|---------|--------|----------|
| Item no 1 | Earth cutting for Approach Road | | | | | | |
| | | cum | 1 | 120 | 3.00 | 8.00 | 2880 |
| Item no 2 | EARTH FILLING UNDER ROAD | | | | | | |
| | GRANULAR MATERIAL | cum | 1 | 100 | 8 | 4.00 | 3200 |
| Item no 3 | Hume Pipe | m | 4 | | 10 | | 40.00 |
| Item no 4 | Pavement Composition | | | | | | |
| 4.1 | BC | cum | 1 | 120 | 8 | 0.025 | 24.000 |
| 4.2 | DBM | cum | 1 | 120 | 8 | 0.05 | 48.000 |
| 4.3 | WBM | cum | 1 | 120 | 8 | 0.25 | 240.000 |
| 4.4 | GSB | cum | 1 | 120 | 8 | 0.15 | 144.000 |



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 42.381 Km

1 span of 8 m Slab

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

A. FOUNDATION

| | | | | | | | |
|--------------|--|-----|---|--------|-------|-------|----------------|
| Item no 1(a) | Excavation (up to 3m) in Soil | | | | | | |
| | Foundation A1 | cum | 1 | 13.300 | 4.000 | 1.915 | 101.878 |
| | Foundation A2 | cum | 1 | 13.300 | 4.000 | 1.900 | 101.080 |
| | Return Wall-I at A1 | cum | 1 | 3.500 | 1.400 | 1.365 | 6.689 |
| | Return Wall-I at A2 | cum | 1 | 3.500 | 1.400 | 1.350 | 6.615 |
| | Return Wall II at A1 | cum | 1 | 13.800 | 4.300 | 1.915 | 113.636 |
| | Return Wall II at A2 | cum | 1 | 16.100 | 4.300 | 1.900 | 131.537 |
| Total | | | | | | | 461.435 |

| | | | | | | | |
|--------------|--------------------------------|-----|---|--------|-------|-------|---------------|
| Item no 2 | Foundation Slab RCC-M30 | | | | | | |
| | Abutment Foundation Slab | cum | 2 | 12.300 | 1.100 | 0.600 | 16.236 |
| | | cum | 2 | 12.300 | 1.100 | 0.600 | 16.236 |
| | | cum | 2 | 12.300 | 0.800 | 0.800 | 15.744 |
| | Return Wall II | cum | 1 | 28.900 | 3.300 | 0.300 | 28.611 |
| Total | | | | | | | 76.827 |

| | | | | | | | |
|--------------|-----------------------------|-----|---|--------|-------|-------|---------------|
| Item no 3 | Levelling Course M15 | | | | | | |
| | Foundation Slab | cum | 2 | 12.600 | 3.300 | 0.150 | 12.474 |
| | Return Wall II | cum | 1 | 29.200 | 3.600 | 0.150 | 15.768 |
| Total | | | | | | | 28.242 |

| | | | | | | | |
|--------------|---|-----|--|--|-------|--|--------------|
| Item no 4 | Steel Reinforcement (HYSD) for Foundation Slab | | | | | | |
| | @120 kg/cum | ton | | | 9.219 | | 9.219 |
| Total | | | | | | | 9.219 |



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 42.381 Km

1 span of 8 m Slab

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

B. SUBSTRUCTURE

| | | | | | | | |
|---------------|--------------------------|-----|---|--------|--------|-------|---------------|
| Item no 1(a) | RCC-M30(up to 5m) | | | | | | |
| | Abutment | cum | 2 | 12.000 | 0.800 | 1.200 | 23.040 |
| | Abutment Cap | cum | 2 | 12.000 | 0.800 | 0.600 | 11.520 |
| | Return wall-I | cum | 2 | 4.600 | 0.400 | 2.675 | 9.844 |
| | Return wall II | cum | 1 | 29.200 | 0.825 | | 24.090 |
| | Dirt wall | cum | 2 | 12.000 | 0.400 | 0.838 | 8.045 |
| | Bracket | cum | 2 | 12.000 | 0.1800 | | 4.320 |
| Total= | | | | | | | 80.859 |

| | | | | | | | |
|--------------|---|-----|--|--------|--|--|---------------|
| Item no 2 | Steel reinforcement (HYSD Bars) for substructure | | | | | | |
| | @ 140 kg/cum | ton | | 12.698 | | | 12.698 |
| Total | | | | | | | 12.698 |

| | | | | | | | |
|--|--|--|--|--|--|----|----------------|
| Item no 3 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment = $11/2+1 =$ | | | | | 7 | |
| | No of weep holes in vertical direction per abutment = $1.2/1 +1 =$ | | | | | 3 | |
| | No of weep holes in horizontal direction per return wall-I = $1.3/1+1 =$ | | | | | 2 | |
| | No of weep holes in horizontal direction per return wall-II = $4.6/2+1 =$ | | | | | 6 | |
| | No of weep holes in vertical direction per return wall-II = $2.7/1+1 =$ | | | | | 3 | |
| | No of weep holes in horizontal direction per return wall-II = $29.2/2+1 =$ | | | | | 30 | |
| | Total no of Weep holes per abutment = 7×3 | | | | | 21 | |
| | Total no of Weep holes per return wall-I = 2×6 | | | | | 12 | |
| | Total no of Weep holes per return wall-II = 3×30 | | | | | 90 | |
| Total no of weep holes = $21 \times 2 + 12 \times 2 + 90 \times 1$ | | | | | | | 156.000 |

| | | | | | | | |
|--------------|---------------------------------------|-----|---|--------|--|-------|---------------|
| Item no 4 | Backfilling(Granular Material) | | | | | | |
| | Foundation | cum | 2 | 16.300 | | 0.400 | 13.040 |
| | Return Wall-II | cum | 1 | 33.200 | | 0.300 | 9.960 |
| Total | | | | | | | 23.000 |

| | | | | | | | |
|--------------|------------------------------------|-----|---|--------|--------|-------|-----------------|
| Item no 5 | Backfilling(Sandy Material) | | | | | | |
| | Behind Abutment & Return wall-I | cum | 2 | 4.600 | 11.200 | 2.675 | 275.632 |
| | Behind Return wall-II | cum | 1 | 28.900 | 11.200 | 2.665 | 862.607 |
| | Deduct for filter media | cum | | | | | 86.111 |
| Total | | | | | | | 1052.128 |

| | | | | | | | |
|--------------|-----------------------|-----|---|--------|-------|-------|---------------|
| Item no 6 | Filter media | | | | | | |
| | Behind Abutment | cum | 2 | 11.000 | 0.600 | 2.050 | 27.060 |
| | Behind Return Wall-I | cum | 2 | 4.000 | 0.600 | 2.675 | 12.840 |
| | Behind Return Wall-II | cum | 1 | 28.900 | 0.600 | 2.665 | 46.211 |
| Total | | | | | | | 86.111 |



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 42.381 Km

1 span of 8 m Slab

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|---------------|----------------|---------------|----------|
|----------|-------------|------|-----|---------------|----------------|---------------|----------|

C. SUPERSTRUCTURE

| | | | | | | | |
|--------------|------------------------------------|-----|---|-------|--------|-------|---------------|
| Item no 1 | RCC-M30(Up to 5M) | | | | | | |
| | Superstructure Slab supported part | cum | 1 | 8.400 | 12.000 | 0.769 | 77.515 |
| Total | | | | | | | 77.515 |

| | | | | | | | |
|--------------|----------------------------------|-----|--|--|--------|--|---------------|
| Item no 2 | Superstructure Steel (HYSD Bars) | | | | | | |
| | @ 180 kg/cum | Ton | | | 13.953 | | 13.953 |
| Total | | | | | | | 13.953 |

| | | | | | | | |
|---------------|-------------------------------------|-----|---|--------|--------|-------|--------------|
| Item no 3(a) | Wearing Course (Bituminus Concrete) | | | | | | |
| | | cum | 1 | 16.200 | 11.000 | 0.040 | 7.128 |
| Total= | | | | | | | 7.128 |

| | | | | | | | |
|---------------|---------------------------------|-----|---|--------|--------|--|----------------|
| Item no 3(b) | Wearing Course (Mastic Asphalt) | | | | | | |
| | | sqm | 1 | 16.200 | 11.000 | | 178.200 |
| Total= | | | | | | | 178.200 |

| | | | | | | | |
|---------------|-----------|-----|---|--------|--------|--|----------------|
| Item no 3(c) | Tack Coat | | | | | | |
| | | sqm | 1 | 16.200 | 11.000 | | 178.200 |
| Total= | | | | | | | 178.200 |

| | | | | | | | |
|--------------|---------------|---|---|--------|--|--|---------------|
| Item no 5 | Crash Barrier | m | 2 | 16.200 | | | 32.400 |
| Total | | | | | | | 32.400 |

| | | | | | | | |
|-----------|----------------|------|---|--|--|--------------|----------|
| Item no 6 | Drainage Spout | nos. | 4 | | | Total | 4 |
|-----------|----------------|------|---|--|--|--------------|----------|

| | | | | | | | |
|--------------|-------------------------|-----|---|--------|-------|-------|---------------|
| Item no 7 | PCC below Approach Slab | | | | | | |
| | | cum | 2 | 11.200 | 3.200 | 0.150 | 10.752 |
| Total | | | | | | | 10.752 |

| | | | | | | | |
|--------------|---------------|-----|---|--------|-------|-------|---------------|
| Item no 8 | Approach Slab | | | | | | |
| | | cum | 2 | 11.200 | 3.500 | 0.369 | 28.930 |
| Total | | | | | | | 28.930 |

| | | | | | | | |
|-----------|--|---|---|--------|--|--|--------|
| Item no 9 | Filler Joint | | | | | | |
| | (i) copper plate | m | 2 | 12.000 | | | 24.000 |
| | (ii) fibar board | m | 2 | 12.000 | | | 24.000 |
| | (iii) 20mm thick premoulded joint filler | m | 2 | 12.000 | | | 24.000 |
| | (iv) joint sealing compound | m | 2 | 12.000 | | | 24.000 |



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 42.381 Km

1 span of 8 m Slab

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|------------|-------------|------------|----------|
|----------|-------------|------|-----|------------|-------------|------------|----------|

D. MISCELLANNEOUS

| | | | | | | | |
|--------------|---------------------|-----|---|-------|----|-------|----------------|
| Item no 1 | Painting | | | | | | |
| | Crash Barrier | sqm | 2 | 2.204 | | 16.20 | 71.41 |
| | Flood Level Marking | sqm | 1 | | 30 | | 30.00 |
| Total | | | | | | | 101.410 |

| | | | | | | | |
|--------------|----------------------------------|---|---|------|--|--|-----------|
| Item no 2 | Confirmatory Boring | | | | | | |
| | Confirmatory Boring in soil | m | 2 | 3.00 | | | 6 |
| | Confirmatory Boring in Hard rock | m | 2 | 5.00 | | | 10 |
| Total | | | | | | | 16 |

| | | | | | | | |
|-----------|---------------------------|-----|---|--|--|--|------|
| Item no 3 | Citizen information board | no. | 2 | | | | 2.00 |
|-----------|---------------------------|-----|---|--|--|--|------|

| | | | | | | | |
|-----------|-------------------------------------|-----|---|--|--|--|--------|
| Item no 4 | Dismantle of Existing Bridge | | | | | | |
| 4.1 | Foundation | cum | 1 | | | | 105.07 |
| 4.2 | RCC | cum | 1 | | | | 168.22 |

E.PROTECTION WORK

| | | | | | | | |
|--------------|-------------------------|-----|---|--------|--|-------|---------------|
| Item no 1a | Boulder Pitching | | | | | | |
| | A1 side | cum | 1 | 60.082 | | 0.300 | 18.025 |
| | A2 side | cum | 1 | 60.785 | | 0.300 | 18.236 |
| Total | | | | | | | 36.261 |

| | | | | | | | |
|--------------|---------------------------|-----|---|--------|--|-------|---------------|
| Item no 1b | Filter Blanket | | | | | | |
| | In slope pitching A1 side | cum | 1 | 60.082 | | 0.150 | 9.012 |
| | In slope pitching A2 side | cum | 1 | 60.785 | | 0.150 | 9.118 |
| Total | | | | | | | 18.130 |

| | | | | | | | |
|--------------|-------------------------|-----|---|-------|-------|--|--------------|
| Item no 2 | Falling Apron | | | | | | |
| | Parabollic part A1 side | cum | 1 | 5.460 | 0.526 | | 2.872 |
| | Parabollic part A2 side | cum | 1 | 5.507 | 0.526 | | 2.897 |
| Total | | | | | | | 5.769 |

| | | | | | | | |
|--------------|--------------------------|-----|---|-------|-------|--|--------------|
| Item no 3 | PCC(M15) Toe Wall | | | | | | |
| | Parabollic part A1 side | cum | 1 | 5.460 | 0.601 | | 3.281 |
| | Parabollic part A2 side | cum | 1 | 5.507 | 0.601 | | 3.310 |
| Total | | | | | | | 6.591 |



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 42.381 Km

1 span of 8 m Slab

| Item No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|----------|-------------|------|-----|---------------|----------------|---------------|----------|
|----------|-------------|------|-----|---------------|----------------|---------------|----------|

F. Diversion Work

| Item SI No. | Description | Unit | nos | Length | Breadth | Height | Quantity |
|-------------|---------------------------------|------|-----|--------|---------|--------|----------|
| Item no 1 | Earth cutting for Approach Road | | | | | | |
| | | cum | 1 | 100 | 3.00 | 8.00 | 2400 |
| Item no 2 | EARTH FILLING UNDER ROAD | | | | | | |
| | GRANULAR MATERIAL | cum | 1 | 100 | 8 | 4.00 | 3200 |
| Item no 3 | Hume Pipe | m | 4 | | 10 | | 40.00 |
| Item no 4 | Pavement Composition | | | | | | |
| 4.1 | BC | cum | 1 | 100 | 8 | 0.025 | 20.000 |
| 4.2 | DBM | cum | 1 | 100 | 8 | 0.05 | 40.000 |
| 4.3 | WBM | cum | 1 | 100 | 8 | 0.25 | 200.000 |
| 4.4 | GSB | cum | 1 | 100 | 8 | 0.15 | 120.000 |



Summary sheet of Major Bridge(Quantities & amount)

SL 1

| | | Span(m) | (18+72+18M) BRIDGE CW=11.0m | Total Quantity |
|---------------------------|---|---------------|-----------------------------------|-------------------|
| | | Chainage (Km) | 34.561 | |
| No. of Bridge = | | | | |
| SI No. | Description | Unit | Major Bridge | |
| A. Foundation | | | | |
| Item no 1(a) | Excavation (upto 3 m depth) in Soil | cum | 1297.24 | 1297.240 |
| Item no 1(b) | Excavation (3 m to 6 m depth) | cum | 983.58 | 983.580 |
| Item no 1(c) | Excavation (above 6 m depth) | cum | 555.72 | 555.720 |
| Item no 2 | R.C.C M35 Foundation Slab | cum | 56.09 | 56.090 |
| Item no 3 | Bored cast-in-situ M35 grade R.C.C. Piles | m | 450.00 | 450.000 |
| Item no 4 | R.C.C M35 Pile Cap | cum | 497.99 | 497.990 |
| Item no 5 | P.C.C (M-15) (Levelling Course) | cum | 80.77 | 80.770 |
| Item no 6 | Steel (Foundation) | ton | 139.53 | 139.530 |
| B. SubStructure | | | | |
| Item no 7 | R.C.C M35 (Substructure) upto 5m | cum | 420.90 | 420.900 |
| Item no 8 | R.C.C M40 (Substructure) Pedestal | cum | 12.93 | 12.930 |
| Item no 9 | Steel (Substructure) | ton | 65.07 | 65.070 |
| Item no 10 | Weep Holes | each | 120.00 | 120.000 |
| Item no 11 | Backfilling - Granular Material | cum | 129.91 | 129.910 |
| Item no 12 | Backfilling - Sandy Material | cum | 193.20 | 193.200 |
| Item no 13 | Filter Media | cum | 63.68 | 63.680 |
| Item no 14 (i) | POT-PTFE | ton capacity | 8400.00 | 8400.000 |
| Item no 14 (ii) | Elastomeric Bearing | cc | 524418.00 | 524418.000 |
| C. Super Structure | | | | |
| Item no 15 | R.C.C M35 (Superstructure) | cum | 283.13 | 283.130 |
| Item no 16 | R.C.C M40 (Superstructure) | cum | 258.41 | 258.410 |
| Item no 17 | Steel (Superstructure) | ton | 119.14 | 119.140 |
| Item no 18 | Supply, fabrication, delivery at bridge site and erection of structural steel works | ton | 600.00 | 600.000 |
| Item no 19 | Bituminous Concrete Wearing Coat | cum | 50.62 | 50.620 |
| Item no 20 | Mastic Asphalt | sqm | 1265.44 | 1265.440 |
| Item no 21 | Tack Coat | sqm | 1265.44 | 1265.440 |
| Item no 22 | R.C.C (M30)- APPROACH SLAB | cum | 31.92 | 31.920 |
| Item no 23 | Crash Barrier | metre | 230.08 | 230.080 |



| | | Span(m) | (18+72+18M) BRIDGE CW=11.0m | Total Quantity |
|---------------------------|--|---------------|-----------------------------------|-------------------|
| | | Chainage (Km) | 34.561 | |
| No. of Bridge = | | | | |
| SI No. | Description | Unit | Major Bridge | |
| Item no 24 | Drainage Spout | each | 88.00 | 88.000 |
| Item no 25 | Strip Seal Expansion Joint | metre | 48.00 | 48.000 |
| Item no 26 | Filler Joint | | | 0.000 |
| | (i) copper plate | metre | 24.00 | 24.000 |
| | (ii) fibar board | metre | 24.00 | 24.000 |
| | (iii) 20mm thick premoulded joint filler | metre | 24.00 | 24.000 |
| | (iv) joint sealing compound | metre | 24.00 | 24.000 |
| Item no 27 | Receiver Pipe for drainage spout | metre | 152.00 | 152.000 |
| D. Protection Work | | | | |
| Item no 28 | Boulder Pitching (Stone Blanket) in slope | cum | 127.42 | 127.420 |
| Item no 29 | Filter Blanket | cum | 63.71 | 63.710 |
| Item no 30 | Boulder Pitching (Stone Blanket) Floor Apron | cum | 17.22 | 17.220 |
| Item no 31 | PCC(M15) Toe Wall | cum | 19.67 | 19.670 |
| MISCELLANNEOUS | | | | |
| Item no 32 | Painting for concrete surface | sqm | 617.30 | 617.300 |
| Item no 33 | Initial Pile load test | nos | 2.00 | 2.000 |
| Item no 34 | Routine Pile load test | | | 0.000 |
| | vertical load test | nos | 30.00 | 30.000 |
| | Lateral load test | | | |
| Item no 35 | Confirmatory Boring in soil | metre | 6.00 | 6.000 |
| | Confirmatory Boring in rock | metre | 10.00 | 10.000 |
| Item no 36 | Citizen information Board NH Project | nos | 2.00 | 2.000 |



ESTIMATE OF QUANTITY OF BRIDGE

Chainage - **34.561 Km**

(1 x 18.0 + 1 x 72.0 + 1 x 18.0) M

| SI No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|--------|-------------|------|-----|------------|-------------|------------|----------|
|--------|-------------|------|-----|------------|-------------|------------|----------|

FOUNDATION

| | | | | | | | |
|--------------|-----------------------------------|-----|---|-------|------|------|----------------|
| 1(i) | Excavation upto 3.0m depth | | | | | | |
| | A1 | cum | 1 | 13.30 | 4.40 | 2.95 | 172.63 |
| | P1 | cum | 1 | 16.90 | 9.70 | 3.00 | 491.79 |
| | P2 | cum | 1 | 16.90 | 9.70 | 3.00 | 491.79 |
| | A2 | cum | 1 | 13.30 | 4.40 | 2.41 | 141.03 |
| Total | | | | | | | 1297.24 |

| | | | | | | | |
|--------------|--------------------------------------|-----|---|-------|-------|-------|---------------|
| 1(ii) | Excavation 3.0m to 6.0m depth | | | | | | |
| | P1 | cum | 1 | 16.90 | 9.700 | 3.000 | 491.79 |
| | P2 | cum | 1 | 16.90 | 9.700 | 3.000 | 491.79 |
| Total | | | | | | | 983.58 |

| | | | | | | | |
|---------------|------------------------------------|-----|---|-------|-------|-------|---------------|
| 1(iii) | Excavation above 6.0m depth | | | | | | |
| | P1 | cum | 1 | 16.90 | 9.700 | 0.090 | 14.75 |
| | P2 | cum | 1 | 16.90 | 9.700 | 3.300 | 540.97 |
| Total | | | | | | | 555.72 |

| | | | | | | | |
|---------------|--------------------------------|-----|---|-------|------|------|--------------|
| 2 | RCC M35 Foundation Slab | | | | | | |
| | For Abutment A1 & A2 | cum | 2 | 12.30 | 2.20 | 0.60 | 32.47 |
| | For Abutment A1 & A2 | cum | 2 | 12.30 | 1.20 | 0.80 | 23.62 |
| Total= | | | | | | | 56.09 |

| | | | | | | | |
|--------------|------------------------------------|---|----|--|--|-------|---------------|
| 3 | Bored Cast-in-situ Pile M35 | | | | | | |
| | For P1 & P2 | m | 30 | | | 15.00 | 450.00 |
| Total | | | | | | | 450.00 |

| | | | | | | | |
|---------------|-------------------------|-----|---|-------|------|------|---------------|
| 4 | RCC M35 Pile Cap | | | | | | |
| | For P1 & P2 | cum | 2 | 15.90 | 8.70 | 1.80 | 497.99 |
| Total= | | | | | | | 497.99 |

| | | | | | | | |
|---------------|--|-----|---|-------|-------|------|--------------|
| 5 | Levelling Course for M15 below pile cap & Foundation Slab | | | | | | |
| | For Abutment A1 & A2 | cum | 2 | 12.60 | 3.70 | 0.15 | 13.99 |
| | For P1 & P2 | cum | 2 | 16.20 | 9.00 | 0.15 | 43.74 |
| | Below approach slab | cum | 2 | 6.40 | 12.00 | 0.15 | 23.04 |
| Total= | | | | | | | 80.77 |

| | | | | | | | |
|---------------|----------------------------|---|--|--|--|--|---------------|
| 6 | Steel Reinforcement | | | | | | |
| | 130kg/cum for pile cap & @ | t | | | | | 139.53 |
| | 150kg/m for pile | | | | | | |
| Total= | | | | | | | 139.53 |



ESTIMATE OF QUANTITY OF BRIDGE

Chainage - **34.561 Km**

(1 x 18.0 + 1 x 72.0 + 1 x 18.0) M

| SI No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|--------|-------------|------|-----|------------|-------------|------------|----------|
|--------|-------------|------|-----|------------|-------------|------------|----------|

SUBSTRUCTURE

| | | | | | | | |
|----------|--------------------------------------|-----|---|-------|------|---------------|---------------|
| 7 | RCC M35 upto 5 m(ROB Portion) | | | | | | |
| | For Abutment shaft A1 & A2 | cum | 2 | 12.30 | 1.20 | 1.500 | 44.28 |
| | For Pier shaft P1 & P2 | cum | 2 | | 9.42 | 5.000 | 94.20 |
| | For Abutment cap A1 & A2 | cum | 2 | 12.30 | 1.79 | 0.800 | 35.23 |
| | For Dirt Wall | cum | 2 | 12.30 | 0.40 | 2.138 | 21.04 |
| | For Bracket | cum | 2 | 12.30 | 0.18 | | 4.43 |
| | Return Wall - I | cum | 4 | 12.49 | | 4.438 | 221.72 |
| | | | | | | Total= | 420.90 |

| | | | | | | | |
|----------|--------------------------------------|-----|----|-------|-------|---------------|--------------|
| 8 | RCC M40 upto 5 m for pedestal | | | | | | |
| | For Bowstring girder | cum | 4 | 1.120 | 1.120 | 0.150 | 0.75 |
| | For RCC T girder | cum | 20 | 0.750 | 0.750 | 0.150 | 1.69 |
| | Reaction block (RB1) | cum | 20 | 0.700 | 0.315 | 1.000 | 4.41 |
| | Reaction block (RB2) | cum | 8 | 1.000 | 0.760 | | 6.08 |
| | | | | | | Total= | 12.93 |

| | | | | | | | |
|----------|----------------------------|---|--|--|--|---------------|--------------|
| 9 | Steel Reinforcement | | | | | | |
| | 150kg/cum for Substructure | t | | | | | 65.07 |
| | | | | | | Total= | 65.07 |

| | | | | | | | |
|-----------|--|--|--|--|--|--------------|---------------|
| 10 | Weep holes | | | | | | |
| | Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction | | | | | | |
| | No of weep holes in horizontal direction per abutment = $12.3/2+1 =$ | | | | | 8 | |
| | No of weep holes in vertical direction per abutment = $1.5+1 =$ | | | | | 3 | |
| | No of weep holes in horizontal direction per return wall = $3.5/2+1 =$ | | | | | 3 | |
| | No of weep holes in vertical direction per return wall = $4.438/1+1 =$ | | | | | 6 | |
| | Total no of Weep holes per abutment = 8×3 | | | | | 24 | |
| | Total no of Weep holes per return wall = 3×6 | | | | | 18 | |
| | Total no of weep holes = $24 \times 2 + 18 \times 4$ | | | | | Total | 120.00 |

| | | | | | | | |
|-----------|--|-----|---|-------|--|--------------|---------------|
| 11 | Backfilling (Granular Material) | | | | | | |
| | Abutment | cum | 2 | 31.46 | | 0.60 | 37.75 |
| | Pier | cum | 2 | 25.60 | | 1.800 | 92.16 |
| | | | | | | Total | 129.91 |

| | | | | | | | |
|-----------|-------------------------------------|-----|---|------|-------|--------------|---------------|
| 12 | Backfilling (Sandy Material) | | | | | | |
| | Behind Abutment & Return Wall - I | cum | 2 | 2.90 | 11.10 | 3.99 | 256.876 |
| | Deduct for filter media | cum | | | | | 63.680 |
| | | | | | | Total | 193.20 |

| | | | | | | | |
|-----------|------------------------|-----|---|-------|------|--------------|--------------|
| 13 | Filter Media | | | | | | |
| | Behind Abutment | cum | 2 | 11.30 | 3.99 | 0.60 | 54.10 |
| | Behind Return Wall - I | cum | 4 | 2.90 | 3.99 | 0.600 | 9.58 |
| | | | | | | Total | 63.68 |



ESTIMATE OF QUANTITY OF BRIDGE

Chainage - **34.561 Km**

(1 x 18.0 + 1 x 72.0 + 1 x 18.0) M

| SI No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|---------------|-----------------------------|--------------------|-----|------------|-------------|------------|----------------|
| 14 (i) | POT CUM PTFE Bearing | | | | | | |
| | For 72m bow sting | one tonne capacity | 4 | 1200.000 | | | 4800.00 |
| | for 18m RCC T Girder | one tonne capacity | 20 | 180.000 | | | 3600.00 |
| Total | | | | | | | 8400.00 |

| | | | | | | | |
|----------------|----------------------------|----|----|-------|-------|------|---------------|
| 14 (ii) | Elastomeric Bearing | | | | | | |
| | | cc | 20 | 54.80 | 37.00 | 9.80 | 397410 |
| | | cc | 8 | 42.00 | 42.00 | 9.00 | 127008 |
| Total | | | | | | | 524418 |

SUPERSTRUCTURE

| | | | | | | | |
|--------------|------------------------------|-----|---|--------|-------|------|---------------|
| 15 | RCC M35 | | | | | | |
| | Deck Slab T Beam 18(End) | cum | 2 | 1.800 | 8.29 | | 29.84 |
| | Deck Slab T Beam 18(Middle) | cum | 2 | 14.480 | 6.76 | | 195.77 |
| | Deck Slab T Beam 18(Varying) | cum | 2 | 2.400 | 7.53 | | 36.14 |
| | Cantilever of Deck | cum | 2 | 0.840 | 12.00 | 0.31 | 6.25 |
| | Intermediate Cross Girder | cum | 2 | 0.300 | 7.696 | | 4.62 |
| | End Cross Girder | cum | 4 | 0.400 | 6.570 | | 10.51 |
| Total | | | | | | | 283.13 |



ESTIMATE OF QUANTITY OF BRIDGE

Chainage - **34.561 Km**

(1 x 18.0 + 1 x 72.0 + 1 x 18.0) M

| SI No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|--------------|--|------|-----|------------|-------------|------------|---------------|
| 16 | RCC M40 | | | | | | |
| | For 72 m Bowstring superstructure deck | cum | 1 | 76.004 | 11.80 | 0.25 | 224.21 |
| | For footpath slab | cum | 2 | 76.004 | 1.50 | 0.15 | 34.20 |
| Total | | | | | | | 258.41 |

| | | | | | | | |
|---------------|----------------------------|---|--|--|--|--|---------------|
| 17 | Steel Reinforcement | | | | | | |
| | | t | | | | | 119.14 |
| Total= | | | | | | | 119.14 |

| | | | | | | | |
|---------------|--|---|---|--|--|--------|---------------|
| 18 | Supply, fabrication, delivery at bridge site and erection of structural steel works | | | | | | |
| | For 72m span | t | 1 | | | 600.00 | 600.00 |
| Total= | | | | | | | 600.00 |

| | | | | | | | |
|---------------|--|-----|---|-------|-------|-------|--------------|
| 19 | Bituminas Concrete Wearing Coat | | | | | | |
| | For 72m span | cum | 1 | 76.00 | 11.00 | 0.040 | 33.44 |
| | For 18 m span | cum | 2 | 19.52 | 11.00 | 0.040 | 17.18 |
| Total= | | | | | | | 50.62 |

| | | | | | | | |
|---------------|------------------|-----|---|-------|-------|--|----------------|
| 20 | Tack Coat | | | | | | |
| | For 72m span | sqm | 1 | 76.00 | 11.00 | | 836.00 |
| | For 18 m span | sqm | 2 | 19.52 | 11.00 | | 429.44 |
| Total= | | | | | | | 1265.44 |

| | | | | | | | |
|---------------|-----------------------|-----|---|-------|-------|--|----------------|
| 21 | Mastic Asphalt | | | | | | |
| | For 72m span | sqm | 1 | 76.00 | 11.00 | | 836.00 |
| | For 18 m span | sqm | 2 | 19.52 | 11.00 | | 429.44 |
| Total= | | | | | | | 1265.44 |

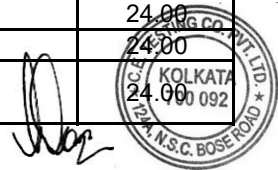
| | | | | | | | |
|---------------|------------------------------|-----|---|------|-------|------|--------------|
| 22 | RCC M30 approach slab | | | | | | |
| | | cum | 2 | 3.50 | 12.00 | 0.38 | 31.92 |
| Total= | | | | | | | 31.92 |

| | | | | | | | |
|--------------|----------------------|---|---|--------|--|--|---------------|
| 23 | Crash Barrier | m | 2 | 115.04 | | | 230.08 |
| Total | | | | | | | 230.08 |

| | | | | | | | |
|-----------|-----------------------|------|----|--|--|--|--------------|
| 24 | Drainage Spout | nos. | 88 | | | | 88.00 |
|-----------|-----------------------|------|----|--|--|--|--------------|

| | | | | | | | |
|--------------|-----------------------------------|---|---|--------|--|--|--------------|
| 25 | Strip Seal Expansion Joint | m | 4 | 12.000 | | | 48.00 |
| Total | | | | | | | 48.00 |

| | | | | | | | |
|-----------|--|---|---|-------|--|--|-------|
| 26 | Filler Joint | | | | | | |
| | (i) copper plate | m | 2 | 12.00 | | | 24.00 |
| | (ii) fibar board | m | 2 | 12.00 | | | 24.00 |
| | (iii) 20mm thick premoulded joint filler | m | 2 | 12.00 | | | 24.00 |



ESTIMATE OF QUANTITY OF BRIDGE

Chainage - **34.561 Km**

(1 x 18.0 + 1 x 72.0 + 1 x 18.0) M

| SI No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|--------|-----------------------------|------|-----|------------|-------------|------------|----------|
| | (iv) joint sealing compound | m | 2 | 12.00 | | | 24.00 |



ESTIMATE OF QUANTITY OF BRIDGE

Chainage - **34.561 Km**

(1 x 18.0 + 1 x 72.0 + 1 x 18.0) M

| SI No. | Description | Unit | nos | Length (m) | Breadth (m) | Height (m) | Quantity |
|-----------|---|------|------|------------|-------------|--------------|---------------|
| 27 | Receiver Pipe for drainage spout | | | | | | |
| | For 72 m span | m | 1.00 | | | 76.00 | 76.00 |
| | For 18 m span | m | 2.00 | | | 38.00 | 76.00 |
| | | | | | | Total | 152.00 |

Miscellaneous

| | | | | | | | |
|-----------|-----------------------------------|-----|---|--------|-------|---------------|---------------|
| 28 | Paint for concrete surface | | | | | | |
| | For crash barrier | sqm | 2 | 115.04 | 2.683 | | 617.30 |
| | | | | | | Total= | 617.30 |

| | | | | | | | |
|-----------|-------------------------------|----|---|--|--|---------------|-------------|
| 29 | Initial Pile load test | | | | | | |
| | | no | 2 | | | Total= | 2.00 |

| | | | | | | | |
|-----------|-------------------------------|-------|---|--------|--|---------------|---------------|
| 30 | Routine Pile load test | | | | | | |
| | a) vertical load test | tonne | 2 | 275.00 | | Total= | 550.00 |
| | b) Lateral load test | tonne | 2 | 40.00 | | Total= | 80.00 |

| | | | | | | | |
|-----------|----------------------------------|---|---|------|--|--------------|--------------|
| 31 | Confirmatory Boring | | | | | | |
| | Confirmatory Boring in soil | m | 2 | 3.00 | | | 6.00 |
| | Confirmatory Boring in Hard rock | m | 2 | 5.00 | | | 10.00 |
| | | | | | | Total | 16.00 |

| | | | | | | | |
|-----------|----------------------------------|-----|---|--|--|--|-------------|
| 32 | Citizen information board | no. | 2 | | | | 2.00 |
|-----------|----------------------------------|-----|---|--|--|--|-------------|

E.PROTECTION WORK

| | | | | | | | |
|-----------|-------------------------|-----|---|---------|--|--------------|----------------|
| 33 | Boulder Pitching | | | | | | |
| | A1 side | cum | 2 | 117.684 | | 0.300 | 70.610 |
| | A2 side | cum | 2 | 94.690 | | 0.300 | 56.814 |
| | | | | | | Total | 127.424 |

| | | | | | | | |
|-----------|---------------------------|-----|---|---------|--|--------------|---------------|
| 34 | Filter Blanket | | | | | | |
| | In slope pitching A1 side | cum | 2 | 117.684 | | 0.150 | 35.305 |
| | In slope pitching A2 side | cum | 2 | 94.690 | | 0.150 | 28.407 |
| | | | | | | Total | 63.712 |

| | | | | | | | |
|-----------|-------------------------|-----|---|-------|-------|--------------|---------------|
| 35 | Falling Apron | | | | | | |
| | Parabollic part A1 side | cum | 2 | 8.796 | 0.526 | | 9.253 |
| | Parabollic part A2 side | cum | 2 | 7.571 | 0.526 | | 7.965 |
| | | | | | | Total | 17.218 |

| | | | | | | | |
|-----------|--------------------------|-----|---|-------|-------|--------------|---------------|
| 36 | PCC(M15) Toe Wall | | | | | | |
| | Parabollic part A1 side | cum | 2 | 8.796 | 0.601 | | 10.573 |
| | Parabollic part A2 side | cum | 2 | 7.571 | 0.601 | | 9.100 |
| | | | | | | Total | 19.673 |

