

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 – V

DESIGN CH:

101+280 KM TO 131+280 KM

SURVEY CH:

103+557 KM TO 134+821 KM

FINAL DETAILED PROJECT REPORT

VOLUME – V: TECHNICAL SPECIFICATION

VOLUME – VI: RATE ANALYSIS

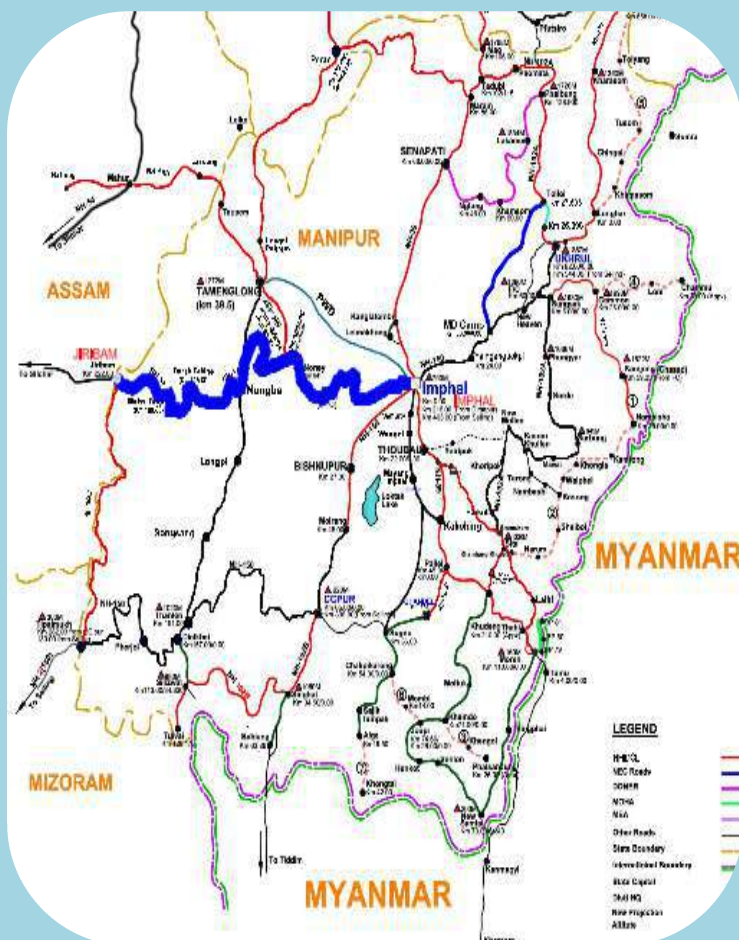
VOLUME – VII: COST ESTIMATE

VOLUME – VIII: BILL OF QUANTITY



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CET/4047/NHIDCL/NH-37/FDPR

Rev: R0

JULY, 2021

Road name- IMPHAL-JIRIBAM ROAD SECTION OF NH-53 (OLD NH-37)
PKG-V
(FROM DESIGN CH KM 101+280 TO KM 131+280)
GENERAL ABSTRACT OF COST

Length of Road (KM) : 30.000

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	2.17	0.07	0.87%
2	Earth work ,Subgrade and Erosion control	70.09	2.34	28.08%
3	Sub-Base & Base	57.54	1.92	23.05%
4	Bituminous Courses	45.30	1.51	18.15%
5	Junction Improvement	0.14	0.00	0.06%
6	Traffic signs, Road marking & other road appurtenances	3.75	0.13	1.50%
7	Passenger Shelter	0.12	0.00	0.05%
8	Busbay	0.83	0.03	0.33%
	Drainage and Protective Works			
9	Longitudinal Drains	11.35	0.38	4.55%
10	Retaining wall	4.52	0.15	1.81%
11	Breast wall	17.82	0.59	7.14%
B.	BRIDGES & CULVERTS			
12	Culvert	31.97	1.07	12.81%
13	Minor Bridge	3.11	0.10	1.25%
C.	Utility Shifting			
	Utility Shifting(Electrical+PHE)	0.91	0.03	0.36%
D.	COST OF CIVIL WORKS IN LAKHS (AS PER SOR 2018)	249.62		
E.	Escalation @ 3% WPI	7.49		
F.	Total Civil Cost including Escalation@3%	257.11	8.57	
G.	Maintenance for 5 years, i.e 2.5% on civil cost (F-C)	6.41		
H.	GST @ 12% of (F-C)	30.74		
I.	Contingencies @ 1% over Civil Cost (F-C)	2.56		
J.	Supervision Charges @ 3% of (F-C)	7.69		
K.	Agency Charges @3% of (F-C)	7.69		
L.	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)	6.43		
M.	TOTAL CONSTRUCTION COST (F+G+H+I+J+K+L)=M	318.63	10.62	
N.	DEPARTMENTAL COST			
a.	LA & Structure Cost(Tentative)	85.14		
b.	Forest Clearance & Environment Cost (Forest+Environmental Budget+Muck Disposal)(Tentative)	6.71		
c.	Utility Shifting Miscellaneous Cost (Agency Charge, GST etc.)	0.27		
	Sub Total (N)	92.12		
O.	TOTAL PROJECT COST (N+M)=O	410.75	13.69	

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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.

The project road stretch falls under Noney district of Manipur.

1.2.2 District Details

Imphal West is one of the sixteen districts of Manipur state in northeastern India. As of 2011 it is the most populous district in the state. Lamphelpat city is the administrative headquarters of the district. The district occupies an area of 558 km². The district ranks first on the basis of "District Infrastructure Index" calculated under the patronage of Ministry of North East Region (DoNER).

1.2.4 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 (Bituminous)	500, 501, 502, 503, 505, 507, 509, and 516
6.	800	Traffic signs, Markings and other Road Appurtenances	801, 802, 803, 804, 805, 807 and 811



Sr. No.	Section No.	Section Title	Clause No.
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 conform 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 requirement



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 maintains a



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	• 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
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	1



S. No.	Sub No.	Item, Specifications	Nos. required
		operated with time switch assembly (As per BIS)	
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
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

B: For Soils and Aggregates			
	(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



C: For Bitumen and Bituminous Mixes			
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
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
	(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

D: For Cement, Cement Concrete and Materials			
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.
	(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 standard.



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

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 i



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. excluding Sub Clause (i) & (x) after the suitable material has been received as provided i



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 1st 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 color as per sign details. The sign plate shall be fixed with 6mm dia. aluminium rivet



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 i



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.

3. 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 least for 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 an



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 sideway 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 resultin



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	20
f) Any other item	As specified by the Engineer

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/cm ³ at 23 °C
Yield Stress	:	18.0 N/mm ²
Tensile Strength	:	21.0 N/mm ²
Shore Hardness D-3 sec. Value	:	60
-15 sec. Value	:	58
Notch impact strength at 23 °C	:	10 KJ/m ²
- 40 °C	:	4 KJ/m ²

Coefficient of Thermal Expansion for

20 °C - 80 °C	:	1.50 x 10 ⁻⁴ KJ/m ²

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 c



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 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	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



		degree Celsius.		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 special conditions	For bridges having wide decks and large span length involving complex movements/ rotations in different directions/ planes, provision of special type of modular expansion joints such as Swivel joints may be made.	25 Years	Electrometric seal may need replacement 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 or 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 from 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 abroad.



- (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 22 $\pm$



@ 25°C

Operating temperature - -20°C to + 80°C

Shrinkage - Less than 1%

Permanent dynamic - $\pm 25\%$

Movement capability

Polysulphide material shall be approved by the 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 m²) 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 manufacture shall certify the above requirements about solid content & grain size. In order t



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 b



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 co:



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 wall 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 at least 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




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




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



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 Morter 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 Seperately). 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 Seperately). 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	55.19	2	57.19
2	Filling Material	Local	-	-	10.00
3	Stone Metal	Local	-	-	10.00
4	Stone Boulder	Local	-	-	10.00
5	Stone Chips, Aggregate	Local	-	-	10.00
6	Coarse Sand	Noney	55.19	2	57.19
7	Cement	Imphal	119.19	-	119.19
8	Steel	Imphal	119.19	-	119.19
9	Bitumen	Imphal	119.19	-	119.19
10	Bitumen Emulsion	Imphal	119.19	-	119.19
11	Structural Steel	Imphal	119.19	-	119.19
12	RCC Pipe	Imphal	119.19	-	119.19




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 Local
Lead Upto Site (Km)= 10.00

Sl.No.	Lead in km	Kilometer	Unit	Carriage (Km)	Rate (Rs)	Cost of Carriage (In Rs)
2	10.00	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		20.42	0.00
		for Every km beyond 20 km	per m ³		16.51	0.00
					Total	381.44

Sand

Name of Quarries Noney
Lead Upto Site (Km)= 57.19

Sl.No.	Lead in km	Kilometer	Unit	Carriage (Km)	Rate (Rs)	Cost or Carriage (In Rs)
3	57.19	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	37.19	16.51	613.99
					Total	1199.63

Boulder

Name of Quarries Local
Lead Upto Site (Km)= 10.00



Sl.No.	Lead in km	Kilometer	Unit	Carriage	Rate (Rs)	Cost of Carriage (In Rs)
4	10.00	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		22.65	0.00
		for Every km beyond 20 km	per m ³		18.31	0.00
					Total	423.13

Cement, Steel

Name of Quarries

Imphal

Lead Upto Site (Km)=

119.19

Sl.No.	Lead in km	Kilometer	Unit	Carriage	Rate (Rs)	Cost of Carriage (In Rs)
5	119.19	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	99.19	11.84	1174.40
					Total	1594.52

Bitumen

Name of Quarries

Imphal

Lead Upto Site (Km)=

119.19

Sl.No.	Lead in km	Kilometer	Unit	Carriage	Rate (Rs)	Cost of Carriage (In Rs)
6	119.19	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	99.19	11.84	1174.40
					Total	1594.52

PIPE

300 mm Dia RCC Pipe from Imphal

Lead Upto Site (Km)=

119.19

Sl.No.	Lead in km	Kilometer	Unit	Carriage	Rate (Rs)	Cost of Carriage (In Rs)
7	119.19	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	99.19	1.21	120.02
						163.05



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	392.30
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	723.48
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	1,373.64
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	2,576.19

**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	02.01/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					0.00	4,330.68
6	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	59,912.85
7	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	1,756.40
8	02.04/iii/b	Dismantling stone masonry b) Rubble stone masonry in cement mortar	Cum	489.32					0.00	494.21
9	02.04/vii/a	Removing hume pipes class NP-3 a) 300mm to 600mm dia	rm	264.99					0.00	267.64

**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/b	Removing hume pipes class NP-4 b) Above 600mm to 900mm dia	rm	358.77					0.00	362.36
11	02.04/vii/c	Removing hume pipes class NP-5 c) Above 900mm dia	rm	614.08					0.00	620.22
12	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	34.33
13	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					0.00	57.65
14	02/nsc/1	Supplying and laying Hydro Seeding on cutting Surface	sqm	315.00					0.00	318.15

**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	03.13	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	161.80
16	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	248.74
17	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	315.46
18	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	87.52

**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	03.31	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	213.50
20	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	307.61
21	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					795.34	3,830.26
					Course Sand	0.380	cum	1,199.63		
					Stone	0.250	cum	381.44		
					Chips/Aggregate					
					Stone Metal Cat1	0.640	cum	381.44		

**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
22	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	2,083.63
23	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	binder Stone Chips/Aggregate Stone Metal Cat1	0.080 0.240 1.210	Ton cum cum	399.23 381.44 381.44	585.03	2,829.19
24	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					827.50	3,830.77

**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
					Course Sand	0.396	cum	1,199.63		
					Stone Metal Cat1	0.924	cum	381.44		
25	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					164.95	1,554.85
					Cement	0.012	Ton	1,594.52		
					Sand	0.064	cum	1,199.63		
					Stone	0.112	cum	381.44		
					Chips/Aggregate					
					Stone Metal Cat1	0.069	cum	381.44		
26	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					1.12	59.25
					Bitumen Emulsion	0.001	Ton	1,594.52		
27	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					0.32	16.11
					Bitumen Emulsion	0.000	Ton	1,594.52		

**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
28	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	1,594.52	0.40	17.74
29	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 Filler	1.440 0.104 0.040	cum Ton Ton	381.44 1,594.52 399.23	731.07	12,115.02

**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	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	Aggregate Bitumen 30/40 Filler	1.456 0.130 0.030	cum Ton Ton	381.44 1,594.52 399.23	774.64	13,277.10
31	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	Cement Sand Steel Stone Chips/Aggregate	0.108 0.176 0.004 0.353	Ton cum Ton cum	1,594.52 1,199.63 1,594.52 381.44	524.37	5,132.02
32	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	1,594.52	358.49	3,065.08

**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
					Sand	0.121	cum	1,199.63		
					Steel	0.002	Ton	1,594.52		
					Stone Chips/Aggregate	0.242	cum	381.44		
33	08.04	Reinforced Cement Concrete M15 Boundary pillars of standard design, fixed in position including finishing but excluding painting	each	843.03					1,245.21	2,109.12
					Sand	0.566	cum	1,199.63		
					Steel	0.080	Ton	1,594.52		
					Stone Chips/Aggregate	1.150	cum	381.44		
34	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	94.34
35	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					771.91	5,760.29
					Cement	0.033	Ton	1,594.52		
					Sand	0.540	cum	1,199.63		
					Steel	0.019	Ton	1,594.52		

**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	381.44		
36	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					771.91	5,264.84
					Cement	0.033	Ton	1,594.52		
					Sand	0.540	cum	1,199.63		
					Steel	0.019	Ton	1,594.52		
					Stone Chips/Aggregate	0.108	cum	381.44		
37	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					771.91	6,542.92
					Cement	0.033	Ton	1,594.52		
					Sand	0.540	cum	1,199.63		

**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	1,594.52		
					Stone Chips	0.108	cum	381.44		
38	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					771.91	9,026.53
					Cement	0.033	Ton	1,594.52		
					Sand	0.540	cum	1,199.63		
					Steel	0.019	Ton	1,594.52		
					Stone Chips/Aggregate	0.108	cum	381.44		
39	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	1,012.16

**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
40	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	1,073.82
41	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	3,334.08					0.00	3,367.42

**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
42	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	387.48
43	08.22	Lighting on BridgesProviding & 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	21,376.67
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 HYSO 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	6,996.27

**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
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	1,237.23
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 Cement Course Sand	0.400 0.006 0.007	cum Ton cum	381.44 1,594.52 1,199.63	170.14	11,926.22
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	1,594.52	1,674.25	75,404.42
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	1,594.52	1,674.25	75,404.42
49	10.16	Cement Plaster 12mm Thick in Cement Mortar 1:3	sqm	223.49					0.00	225.72
50	10.19	Dry Boulder pitching	cum	1,701.75					507.76	2,231.61

**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 Bolder	1.200	cum	423.13		
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	381.44	457.73	1,648.36
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	Stone Chips/Aggregate	1.200	cum	381.44	457.73	1,631.16
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	381.44	1,390.25	8,975.47
					Cement	0.330	Ton	1,594.52		
					Sand	0.450	cum	1,199.63		
54	24/i/b	Galvanised Mild steel J /L hook	kg	120.00					0.00	121.20
55	40	Gextextile material (fine net)	sqm	25.50					0.00	25.76

**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

****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	221.12
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	221.12
3	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	211.31
4	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	381.44	457.73	1,480.25
5	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					1,439.56	2,077.15

**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	1.200	cum	1,199.63		
6	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	381.44	457.73	1,749.70
7	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	11,968.37
8	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	1,594.52	1,073.43	7,453.59
					Sand	0.300	cum	1,199.63		
					Stone Metal Cat1	1.160	cum	381.44		
9	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	381.44	1,390.25	9,835.84
					Cement	0.330	Ton	1,594.52		
					Sand	0.450	cum	1,199.63		
10	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					1,489.05	10,931.03

**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
					Aggregate	0.900	cum	381.44		
					Cement	0.380	Ton	1,594.52		
					Sand	0.450	cum	1,199.63		
11	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	381.44	1,536.88	10,720.27
					Cement	0.410	Ton	1,594.52		
					Sand	0.450	cum	1,199.63		
12	14.08	HYSD bar reinforcement in foundation complete as per drawing and technical specification	MT	77,427.65	Steel	1.050	Ton	1,594.52	1,674.25	79,892.92
13	14/nsc2	Brick Flat Soling at Foundation	Sqm	1,077.89	Brick	1.000	Sqm	40.00	40.00	1,129.07
14	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	12,081.21
15	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					1,073.43	7,939.89

**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	0.170	Ton	1,594.52		
					Sand	0.300	cum	1,199.63		
					Stone Metal Cat1	1.160	cum	381.44		
16	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					1,431.64	10,603.96
					Cement	0.344	Ton	1,594.52		
					Sand	0.450	cum	1,199.63		
					Stone	0.900	cum	381.44		
					Chips/Aggregate					
17	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					1,525.72	11,578.61
					Cement	0.403	Ton	1,594.52		
					Sand	0.450	cum	1,199.63		
					Stone	0.900	cum	381.44		
					Chips/Aggregate					
18	15.03/i/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 M40 Grade upto 5m height	cum	11,992.30					0.00	12,112.22

**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
19	15.05	HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification	MT	77,427.65	Steel	1.050	Ton	1,594.52	1,674.25	79,892.92
20	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	0.001	Ton	1,594.52	3.59	453.83
					Sand	0.002	cum	1,199.63		
21	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	1,594.52	1,523.34	12,089.40
					Course Sand	0.452	cum	1,199.63		
					Stone Chips/Aggregate	0.900	cum	381.44		
22	16.03	HYSD bar reinforcement in super-structure complete as per drawing and technical specifications	MT	85,183.86	Steel	1.050	Ton	1,594.52	1,674.25	87,726.69
23	16.11	Drainage Spouts complete as per drawing and Technical specification	each	2,158.99					4.78	2,185.41

**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
					Structural Steel	0.004	Ton	1,195.98		
24	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	532.56					11.61	549.61
					Bitumen	0.003	Ton	1,594.52		
					Lime	0.005	Ton	399.23		
					Stone	0.014	cum	381.44		
					Chips/Aggregate					
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	9,067.33					1,431.64	10,603.96
					Cement	0.344	Ton	1,594.52		
					Sand	0.450	cum	1,199.63		
					Stone	0.900	cum	381.44		
					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

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
26	17.02	Filter material underneath pitching in slopes complete as per drawing and Technical specification	cum	2,426.95	Aggregate	1.200	cum	381.44	457.73	2,913.53

**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



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	25878.51
			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	<u>36.40</u>	
							<u>36.00</u>	
		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)

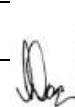
Sr No	Ref. to MoRTH Spec.	Description	Unit	Quantity	Rate Rs	Cost Rs	Remarks/ Input ref.
5.6	507	Dense Graded Bituminous Macadam					
		Providing and laying dense graded bituminous macadam with 100-120 TPH batch type HMP producing an average output of 75 tonnes per hour using crushed aggregates of specified 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-V
(FROM DESIGN CH KM 101+280 TO KM 131+280)
GENERAL ABSTRACT OF COST

Length of Road (KM) : 30.000

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	2.17	0.07	0.87%
2	Earth work ,Subgrade and Erosion control	70.09	2.34	28.08%
3	Sub-Base & Base	57.54	1.92	23.05%
4	Bituminous Courses	45.30	1.51	18.15%
5	Junction Improvement	0.14	0.00	0.06%
6	Traffic signs, Road marking & other road appurtenances	3.75	0.13	1.50%
7	Passenger Shelter	0.12	0.00	0.05%
8	Busbay	0.83	0.03	0.33%
	Drainage and Protective Works			
9	Longitudinal Drains	11.35	0.38	4.55%
10	Retaining wall	4.52	0.15	1.81%
11	Breast wall	17.82	0.59	7.14%
B.	BRIDGES & CULVERTS			
12	Culvert	31.97	1.07	12.81%
13	Minor Bridge	3.11	0.10	1.25%
C.	Utility Shifting			
	Utility Shifting(Electrical+PHE)	0.91	0.03	0.36%
D.	COST OF CIVIL WORKS IN LAKHS (AS PER SOR 2018)	249.62		
E.	Escalation @ 3% WPI	7.49		
F.	Total Civil Cost including Escalation@3%	257.11	8.57	
G.	Maintenance for 5 years, i.e 2.5% on civil cost (F-C)	6.41		
H.	GST @ 12% of (F-C)	30.74		
I.	Contingencies @ 1% over Civil Cost (F-C)	2.56		
J.	Supervision Charges @ 3% of (F-C)	7.69		
K.	Agency Charges @3% of (F-C)	7.69		
L.	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)	6.43		
M.	TOTAL CONSTRUCTION COST (F+G+H+I+J+K+L)=M	318.63	10.62	
N.	DEPARTMENTAL COST			
a.	LA & Structure Cost(Tentative)	85.14		
b.	Forest Clearance & Environment Cost (Forest+Environmental Budget+Muck Disposal)(Tentative)	6.71		
c.	Utility Shifting Miscellaneous Cost (Agency Charge, GST etc.)	0.27		
	Sub Total (N)	92.12		
O.	TOTAL PROJECT COST (N+M)=O	410.75	13.69	

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	16.00	392.30	6,277
2	02.01/ii	Cutting of Girth 600-900mm	Each	25.00	723.48	18,087
3	02.01/iii	Cutting of Girth 900-1800mm	Each	59.00	1,373.64	81,045
4	02.01/iv	Cutting of Girth 1800-2700mm	Each	8.00	2,576.19	20,610
5	02.01/v	Cutting of Girth 2700mm more	Each	4.00	4,330.68	17,323
6	02.03/b	Clearing & grubbing(Mechanical - Light Jungle)	Ha	45.21	59,912.85	2,708,660
7	02.04/i/c	Dismantling Structure RCC	cum	371.00	1,756.40	651,624
8	02.04/iii/b	Dismantling Structure Rubble Stone Masonry Cement	Cum	9,842.00	494.21	4,864,015
9	02.04/vii/a	Mortar Dismantle HP (300-600)	rm	192.00	267.64	51,387
10	02.04/vii/b	Dismantle HP (upto 600 - 900 mm dia)	rm	689.00	362.36	249,666
11	02.04/vii/c	Dismantle HP (above 900 mm dia)	rm	552.00	620.22	342,361
12	02.04/viii/e	Dismantle Flexible Pavement Granular	sqm	98,610.00	34.33	3,385,281
13	02.04/viii/f/ii	Dismantle Flexible Pavement Bituminous(Roller & Scarifier)	sqm	161,365.00	57.65	9,302,692
Total of Bill						21,699,028

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	30,638.00	318.15	9,747,480
2	03.13	Embankment fill from Roadway Cutting	cum	241,411.00	161.80	39,060,300
3	03.14	Subgrade and Earthen Shoulder Fill From Borrow Pit	cum	7,449.44	315.46	2,349,999
4	03.15	Compacting original ground supporting sub-grade	cum	82,328.40	87.52	7,205,382
5	03.31	Excavation in Hill in Soil For Roadway	cum	2,212,600.00	213.50	472,390,100
6	03.32	Excavation for Roadway Ordinary Rock Mechanical (Without Blasting)	cum	553,150.00	307.61	170,154,472
Total of Bill						700,907,731

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	66,573.02	3,830.26	254,991,972
2	04/nsc1	GSB Reuse	Cum	8,641.83	2,083.63	18,006,380
3	05.02	WMM	Cum	78,934.05	3,830.77	302,378,183
Total of Bill						575,376,535



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	311,302.00	59.25	18,444,644
2	06.02/ii	Tack Coat(Granular Layer)	sqm	293,940.00	17.74	5,214,496
3	06/Nsc1	DBM GR II	cum	21,791.14	12,115.02	264,000,097
4	06/Nsc2	BC GR II	cum	12,452.08	13,277.10	165,327,511
Total of Bill						452,986,747

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	78.77	3,830.26	301,721
2	04/nsc1	GSB Reuse	Cum	10.43	2,083.63	21,726
3	05.02	WMM	Cum	111.50	3,830.77	427,131
4	06.01/a	Prime Coat	sqm	446.00	59.25	26,426
5	06.02/i	Tack Coat(Bituminous Layer)	sqm	446.00	16.11	7,185
6	06/Nsc1	DBM GR II	cum	31.22	12,115.02	378,231
7	06/Nsc2	BC GR II	cum	17.84	13,277.10	236,863
Total of Bill						1,399,283

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	7.00	5,132.02	35,924
2	08.02/b	Ordinary km Stone	each	28.00	3,065.08	85,822
3	08.04	Boundary Stone	each	354.00	2,109.12	746,628
4	08.11/i	90 cm equilateral triangle	each	381.00	5,760.29	2,194,670
5	08.11/iii	60 cm circular	each	56.00	5,264.84	294,831
6	08.11/iv	80 cm x 60 cm rectangular	each	4.00	6,542.92	26,172
7	08.11/vii	90 cm high octagon	each	14.00	9,026.53	126,371
8	08.14	Paint on Bituminous Surface	sqm	9,800.60	1,012.16	9,919,775
9	08.15/c/v	Road Delineators(100 cm long above Road)	each	3,290.00	1,073.82	3,532,868
10	08.18/A/b	Type-A, "W" Metal Beam Crash Barrier	Rm	2,820.00	3,367.42	9,496,124
11	08.20/ii	Road Stud/Road Markers	nos	16,491.00	387.48	6,389,933
12	08.22	Lighting on Bridges	nos	190.00	21,376.67	4,061,567
13	08/nsc/6	Rumble Strip	sqm	500.00	1,237.23	618,615

Item Rate Analysis has been done considering



Summary of Bill of Quantity

Total of Bill

37,529,302

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	396.41	94.34	37,397
2	10.16	Sub Structure Plaster with 1:3 Cement Morter	sqm	396.41	225.72	89,477
3	13.01/a/i	Foundation Earthwork Ordinary Soil (0 -3m)	cum	59.45	221.12	13,146
4	14.01	Foundation Brick Work C.M. 1:3	cum	9.11	11,968.37	109,068
5	14.03/a	Foundation PCC M15	cum	6.04	9,835.84	59,389
6	14.03/e/II	Foundation RCC M25	cum	4.16	10,720.27	44,628
7	14.08	Foundation Steel (HYSD)	MT	0.50	79,892.92	39,946
8	14/nsc2	Brick Flat Soling	Sqm	80.63	1,129.07	91,031
9	15.01	Sub Structure Brick Work	cum	19.43	12,081.21	234,774
10	16.01/a/i	Super Structure RCC M25 - Solid Slab Super	cum	24.91	12,089.40	301,135
11	16.03	Structure(Upto 5m) Super Structure Steel(HYSD)	MT	2.49	87,726.69	218,527
Total of Bill						1,238,518

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	1,062.00	248.74	264,162
2	04.01/Nsc1	Cutting GSB Close Graded GR V	Cum	375.14	3,830.26	1,436,888
3	04/nsc1	GSB Reuse	Cum	49.66	2,083.63	103,471
4	05.02	WMM	Cum	531.00	3,830.77	2,034,139
5	05.03	Foothpath Area	sqm	885.00	1,554.85	1,376,042
6	06.01/a	Prime Coat	sqm	2,124.00	59.25	125,847
7	06.02/i	Tack Coat(Bituminous Layer)	sqm	2,124.00	16.11	34,218
8	06/Nsc1	DBM GR II	cum	148.68	12,115.02	1,801,261
9	06/Nsc2	BC GR II	cum	84.96	13,277.10	1,128,022
Total of Bill						8,304,050

Bill No : 09. Longitudinal Drains

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
1		Filling in Foundation by Sandy Soil		46,538.89		
2	13.01/a/i	Foundation Earthwork Ordinary Soil (0 -3m)	cum	11,229.65	221.12	2,483,099



Summary of Bill of Quantity

Bill No : 09. Longitudinal Drains

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
3	14.02/b	Foundation Random Rubble Masonry (coursed/uncoursed) Cement Morter(1:3)	cum	2,822.20	7,453.59	21,035,522
4	14.03/a	Foundation PCC M15	cum	2,967.18	9,835.84	29,184,727
5	14.03/b	Foundation PCC M20	cum	193.05	10,931.03	2,110,235
6	15.03/b/i	Sub Structure PCC M20	cum	447.53	10,603.96	4,745,537
7	15.03/f/i	Sub Structure RCC M25 (Upto 5m)	cum	3,401.17	11,578.61	39,380,867
8	15.05	Sub Structure Steel (HYSD)	MT	170.06	79,892.92	13,586,510
9	15.12	Sub Structure Weepholes per Meter	Rm	2,022.50	453.83	917,871
10	24/i/b	MS Hook(300gm each)	kg	323.44	121.20	39,201
11	40	Geotextile filter(75mm sqm)	sqm	363.87	25.76	9,373
Total of Bill						113,492,944

Bill No : 10. Retaining wall

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
1	13.01/a/i	Foundation Earthwork Ordinary Soil (0 -3m)	cum	2,757.64	221.12	609,770
2	13.01/b/ii	Foundation Earthwork Ordinary Rock(0-3m)	cum	683.71	211.31	144,475
3	13.04	Sub Structure Filter Media	cum	2,370.48	1,749.70	4,147,622
4	14.02/b	Foundation Random Rubble Masonry (coursed/uncoursed) Cement Morter(1:3)	cum	1,486.18	7,453.59	11,077,384
5	14.03/a	Foundation PCC M15	cum	842.85	9,835.84	8,290,118
6	15.02/b	Sub Structure Random Rubble Masonry Cement Morter(1:3)	cum	2,118.90	7,939.89	16,823,833
7	15.03/b/i	Sub Structure PCC M20	cum	230.87	10,603.96	2,448,083
8	15.12	Sub Structure Weepholes per Meter	Rm	3,576.00	453.83	1,622,896
Total of Bill						45,164,180

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	14,647.33	221.12	3,238,817
2	13.01/b/ii	Foundation Earthwork Ordinary Rock(0-3m)	cum	3,661.83	211.31	773,782
3	13.03/a	Sub Structure Backfill Granular Material	cum	2,561.69	1,480.25	3,791,934
4	13.03/b	Sub Structure Backfill Sandy Material	cum	743.72	2,077.15	1,544,808
5	14.02/b	Foundation Random Rubble Masonry (coursed/uncoursed) Cement Morter(1:3)	cum	6,882.34	7,453.59	51,298,133



Summary of Bill of Quantity

Bill No : 11. Breast wall

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
6	14.03/a	Foundation PCC M15	cum	3,194.67	9,835.84	31,422,253
7	15.02/b	Sub Structure Random Rubble Masonry Cement	cum	10,531.37	7,939.89	83,617,935
8	15.12	Mortar(1:3) Sub Structure Weepholes per Meter	Rm	5,463.09	453.83	2,479,315
Total of Bill						178,166,977



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	16.00	392.30	6,276.80
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	25.00	723.48	18,087.00
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	59.00	1,373.64	81,044.76
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	8.00	2,576.19	20,609.52
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	4.00	4,330.68	17,322.72
6	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	45.21	59,912.85	2,708,659.95



Bill No : 01. Site Clearance and Dismantling

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
7	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	371.00	1,756.40	651,624.40
8	02.04/iii/b	Dismantling stone masonry b) Rubble stone masonry in cement mortar	Cum	9,842.00	494.21	4,864,014.82
9	02.04/vii/a	Removing hume pipes class NP-3 a) 300mm to 600mm dia	rm	192.00	267.64	51,386.88
10	02.04/vii/b	Removing hume pipes class NP-4 b) Above 600mm to 900mm dia	rm	689.00	362.36	249,666.04
11	02.04/vii/c	Removing hume pipes class NP-5 c) Above 900mm dia	rm	552.00	620.22	342,361.44
12	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	98,610.00	34.33	3,385,281.30
13	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	161,365.00	57.65	9,302,692.25
Total of Bill 01. Site Clearance and Dismantling						21,699,027.88

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	30,638.00	318.15	9,747,479.70
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	241,411.00	161.80	39,060,299.80
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	7,449.44	315.46	2,349,998.77
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	82,328.40	87.52	7,205,381.57
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	2,212,600.00	213.50	472,390,100.00
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	553,150.00	307.61	170,154,471.50
Total of Bill 02. Earth work,Subgrade and Erosion control						700,907,731.33



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	66,573.02	3,830.26	254,991,971.75
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	8,641.83	2,083.63	18,006,380.41
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	78,934.05	3,830.77	302,378,183.06
Total of Bill 03. Sub-Base & Base Courses						575,376,535.22



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	311,302.00	59.25	18,444,643.50
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	293,940.00	17.74	5,214,495.60
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	21,791.14	12,115.02	264,000,096.92

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	12,452.08	13,277.10	165,327,511.37
Total of Bill 04. Bituminous Courses						452,986,747.39



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

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	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	78.77	3,830.26	301,721.07
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	10.43	2,083.63	21,726.01
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	111.50	3,830.77	427,130.86
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	446.00	59.25	26,425.50

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	446.00	16.11	7,185.06
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	31.22	12,115.02	378,230.92
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	17.84	13,277.10	236,863.46
Total of Bill 05. Junction Improvement (Major & Minor)						1,399,282.88

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	7.00	5,132.02	35,924.14
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	28.00	3,065.08	85,822.24
3	08.04	Reinforced Cement Concrete M15 Boundary pillars of standard design, fixed in position including finishing but excluding painting	each	354.00	2,109.12	746,628.48
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	381.00	5,760.29	2,194,670.49
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	56.00	5,264.84	294,831.04

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	4.00	6,542.92	26,171.68
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	14.00	9,026.53	126,371.42
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	9,800.60	1,012.16	9,919,775.30

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	3,290.00	1,073.82	3,532,867.80
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	2,820.00	3,367.42	9,496,124.40
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	16,491.00	387.48	6,389,932.68
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	190.00	21,376.67	4,061,567.30

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/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	500.00	1,237.23	618,615.00
Total of Bill 06. Traffic signs, Road marking & other road appurtenances						37,529,301.97



Item Rate Analysis has been done considering

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	396.41	94.34	37,396.85
2	10.16	Cement Plaster 12mm Thick in Cement Mortar 1:3	sqm	396.41	225.72	89,476.54
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	59.45	221.12	13,145.58
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	9.11	11,968.37	109,067.76
5	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	6.04	9,835.84	59,388.80
6	14.03/e/l	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M25Grade	cum	4.16	10,720.27	44,628.48
7	14.08	HYSD bar reinforcement in foundation complete as per drawing and technical specification	MT	0.50	79,892.92	39,946.46
8	14/nsc2	Brick Flat Soling at Foundation	Sqm	80.63	1,129.07	91,031.27
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	19.43	12,081.21	234,774.15
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	24.91	12,089.40	301,134.86
11	16.03	HYSD bar reinforcement in super-structure complete as per drawing and technical specifications	MT	2.49	87,726.69	218,527.18
		Total of Bill 07. Passenger Shelter				1,238,517.94



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	1,062.00	248.74	264,161.88
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	375.14	3,830.26	1,436,887.57
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	49.66	2,083.63	103,470.98
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	531.00	3,830.77	2,034,138.87

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	885.00	1,554.85	1,376,042.25
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	2,124.00	59.25	125,847.00
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	2,124.00	16.11	34,217.64
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	148.68	12,115.02	1,801,261.17

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	84.96	13,277.10	1,128,022.42
Total of Bill 08. Bus Bay						8,304,049.78



Bill No : 09. Longitudinal Drains

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1				46,538.89		
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	11,229.65	221.12	2,483,099.32
3	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	2,822.20	7,453.59	21,035,521.70
4	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	2,967.18	9,835.84	29,184,727.40
5	14.03/b	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M20 Grade	cum	193.05	10,931.03	2,110,235.34
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	447.53	10,603.96	4,745,537.20
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	3,401.17	11,578.61	39,380,867.29
8	15.05	HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification	MT	170.06	79,892.92	13,586,510.08



Bill No : 09. Longitudinal Drains

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
9	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	2,022.50	453.83	917,871.18
10	24/i/b	Galvanised Mild steel J /L hook	kg	323.44	121.20	39,200.93
11	40	Gextextile material (fine net)	sqm	363.87	25.76	9,373.29
Total of Bill 09. Longitudinal Drains						113,492,943.73



Item Rate Analysis has been done considering

Bill No : 10. 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	2,757.64	221.12	609,769.58
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	683.71	211.31	144,474.76
3	13.04	Filter medium behind abutment, wing wall and return wall complete as per drawing and technical specification .	cum	2,370.48	1,749.70	4,147,621.86
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	1,486.18	7,453.59	11,077,383.84
5	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	842.85	9,835.84	8,290,118.07
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	2,118.90	7,939.89	16,823,832.92
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	230.87	10,603.96	2,448,083.23
8	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications				



Bill No : 10. Retaining wall

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
			Rm	3,576.00	453.83	1,622,896.08
Total of Bill 10. Retaining wall						45,164,180.33



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	14,647.33	221.12	3,238,817.39
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	3,661.83	211.31	773,781.72
3	13.03/a	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials	cum	2,561.69	1,480.25	3,791,934.22
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	743.72	2,077.15	1,544,807.61
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	6,882.34	7,453.59	51,298,133.15
6	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	3,194.67	9,835.84	31,422,253.14
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	10,531.37	7,939.89	83,617,935.23
8	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	5,463.09	453.83	2,479,315.04



		Total of Bill 11. Breast wall	178,166,977.50



BILL

(STRUCTURE PART)



Summary of Bill of Quantity

Bill No : 12. Culvert

Sl No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
Foundation						
1	10.20	Foundation Culvert PCC M15	cum	1,528.00	8,975.47	13,714,518
2	13.01/a/i	Foundation Earthwork Ordinary Soil (0 -3m)	cum	13,900.00	221.12	3,073,568
End of Sub Total Foundation						16,788,086
Sub Structure						
3	10.06/a	Steel culvert for Sub-Structure	Ton	797.00	75,404.42	60,097,323
4	10.20/b	Culvert Backfilling culvert by Gravelly materials	cum	4,701.00	1,648.36	7,748,940
5	10.20/c	Filter Media culvert behind abutment, wing and return wall	cum	12,407.00	1,631.16	20,237,802
6	15.03/f/i	Sub Structure RCC M25 (Upto 5m)	cum	9,956.00	11,578.61	115,276,641
7	15.12	Sub Structure Weepholes per Meter	Rm	6,120.00	453.83	2,777,440
End of Sub Total Sub Structure						206,138,146
Super Structure						
8	06.02/i	Tack Coat(Bituminous Layer)	sqm	5,116.00	16.11	82,419
9	06/Nsc2	BC GR II	cum	205.00	13,277.10	2,721,806
10	08.05	Paint on Concrete Surface(2 Coat)	sqm	2,679.00	94.34	252,737
11	08/nsc/5	Crash Barrier RCC M40	m	1,047.00	6,996.27	7,325,095
12	10.06/b	Steel culvert for Super-Structure	Ton	226.00	75,404.42	17,041,399
13	16.01/a/i	Super Structure RCC M25 - Solid Slab Super Structure(Upto 5m)	cum	2,819.00	12,089.40	34,080,019
14	16.11	Super Structure Drainage Spout	each	346.00	2,185.41	756,152
15	16.17	Super Structure Mastic Asphalt	sqm	5,116.00	549.61	2,811,805
End of Sub Total Super Structure						65,071,430
Protection Work						
16	10.19	Stone Pitching Culvert	cum	1,410.00	2,231.61	3,146,570
17	13.01/a/i/Nsc	Excavation For Protection work	cum	8,340.00	221.12	1,844,141
18	16/nsc	Protection Work Curtain Wall- PCC (M-15)	cum	2,462.00	10,603.96	26,106,950
End of Sub Total Protection Work						31,097,660
Miscellaneous Work						
19	08.05	Paint on Concrete Surface(2 Coat)	sqm	2,679.00	94.34	252,737
20	09.01/nsc1	Hume Pipe(NP4 1200 dia Single ROW)	Rm	32.00	11,926.22	381,639
End of Sub Total Miscellaneous Work						634,376
Total						319,729,698

Bill No : 13. Minor Bridge

Sl No	SOR Ref No	Description	Unit	Quantity	Rate	Cost



Summary of Bill of Quantity

Bill No : 13. Minor Bridge

Sl No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
Foundation						
1	13.01/a/i	Foundation Earthwork Ordinary Soil (0 -3m)	cum	810.00	221.12	179,107
2	13.01/a/ii	Foundation Earthwork Ordinary Soil (3m-6m)	cum	198.00	297.22	58,850
3	14.03/a	Foundation PCC M15	cum	34.00	9,835.84	334,419
4	14.03/g	Foundation RCC M30	cum	225.00	12,652.74	2,846,867
5	14.08	Foundation Steel (HYSD)	MT	27.00	79,892.92	2,157,109
End of Sub Total Foundation						5,576,351
Sub Structure						
6	13.03/a	Sub Structure Backfill Granular Material	cum	60.00	1,480.25	88,815
7	13.03/b	Sub Structure Backfill Sandy Material	cum	345.00	2,077.15	716,617
8	13.04	Sub Structure Filter Media	cum	113.00	1,749.70	197,716
9	15.03/g/i	Sub Structure RCC M30 (Upto 5m)	cum	160.00	13,451.36	2,152,218
10	15.03/i/i	Super Structure RCC M40 (5m to 10m)	cum	7.00	12,112.22	84,786
11	15.05	Sub Structure Steel (HYSD)	MT	26.00	79,892.92	2,077,216
12	15.09	Sub Structure Elastometric Bearing	cc	51,960.00	3.22	167,311
13	15.10	Sub Structure POT Cum PTFE Bearing	Ton	1,440.00	510.32	734,861
14	15.12	Sub Structure Weepholes per Meter	Rm	118.00	453.83	53,552
End of Sub Total Sub Structure						6,273,091
Super Structure						
15	06.02/i	Tack Coat(Bituminous Layer)	sqm	456.00	16.11	7,346
16	06/Nsc2	BC GR II	cum	18.00	13,277.10	238,988
17	14/nsc1/i	Super Structure Filler (Copper Plate)	m	45.00	2,080.60	93,627
18	14/nsc1/ii	Super Structure Filler (Fibre Board)	m	45.00	704.98	31,724
19	14/nsc1/iii	Super Structure Filler (Premoulder Joint)	m	45.00	225.23	10,135
20	14/nsc1/iv	Super Structure Filler (Sealing Compound)	m	45.00	36.36	1,636
21	16.01/b/i/c2/i	Super Structure RCC M30 (T Beam & Slab)	cum	209.00	13,420.02	2,804,784
22	16.03	(Upto 5m) Super Structure Steel(HYSD)	MT	42.00	87,726.69	3,684,521
23	16.05	Cement concrete wearing coat M30	cum	8.00	20,547.36	164,379
24	16.11	Super Structure Drainage Spout	each	12.00	2,185.41	26,225
25	16.12/Nsc	Super Structure Approach Slab (M30)	cum	58.00	18,705.38	1,084,912
26	16.13	Super Structure PCC M15 Levelling Course	cum	23.00	9,526.35	219,106
27	16.16	Below Approach Slab Super Structure Strip Seal Expansion Joint	Rm	48.00	42,282.41	2,029,556
28	16.17	Super Structure Mastic Asphalt	sqm	456.00	549.61	250,622
End of Sub Total Super Structure						10,647,562
Protection Work						
29	08/nsc/5	Crash Barrier RCC M40	m	83.00	6,996.27	580,690

Item Rate Analysis has been done considering

Summary of Bill of Quantity

Bill No : 13. Minor Bridge

Sl No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
30	16/nsc	Protection Work Curtain Wall- PCC (M-15)	cum	43.00	10,603.96	455,970
31	17.01/a	Protection Work Boulder Apron Laid in Wire	cum	189.00	2,815.89	532,203
32	17.02	Crates Protection Work Filter material underneath	cum	92.00	2,913.53	268,045
		pitching in slopes				
End of Sub Total Protection Work						1,836,909
		Miscellaneous Work				
33	08.05	Paint on Concrete Surface(2 Coat)	sqm	211.00	94.34	19,906
End of Sub Total Miscellaneous Work						19,906
		Diversion Work				
34	03.13	Embankment fill from Roadway Cutting	cum	3,101.00	161.80	501,742
35	04.01/Nsc1	GSB Close Graded GR V	Cum	61.00	3,830.26	233,646
36	05.01/b/a	WBM GR-II	cum	20.00	2,829.19	56,584
37	06/Nsc1	DBM GR II	cum	20.00	12,115.02	242,300
38	06/Nsc2	BC GR II	cum	409.00	13,277.10	5,430,334
39	09.01/nsc1	Hume Pipe(NP4 1200 dia Single ROW)	Rm	20.00	11,926.22	238,524
End of Sub Total Diversion Work						6,703,130
Total						31,056,948

Item Rate Analysis has been done considering



Bill No : 12. 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	1,528.00	8,975.47	13,714,518.16
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	13,900.00	221.12	3,073,568.00
Sub Total of Foundation						16,788,086.16
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	797.00	75,404.42	60,097,322.74
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	4,701.00	1,648.36	7,748,940.36
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	12,407.00	1,631.16	20,237,802.12
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	9,956.00	11,578.61	115,276,641.16

Bill No : 12. 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	6,120.00	453.83	2,777,439.60
Sub Total of Sub Structure						206,138,145.98
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	5,116.00	16.11	82,418.76
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	205.00	13,277.10	2,721,805.50
10	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.	sqm	2,679.00	94.34	252,736.86

Item Rate Analysis has been done considering



Bill No : 12. 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	1,047.00	6,996.27	7,325,094.69
12	10.06/b	Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Super-Structure	Ton	226.00	75,404.42	17,041,398.92
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	2,819.00	12,089.40	34,080,018.60
14	16.11	Drainage Spouts complete as per drawing and Technical specification	each	346.00	2,185.41	756,151.86

Bill No : 12. 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 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	5,116.00	549.61	2,811,804.76
Sub Total of Super Structure						65,071,429.95
Protection Work						
16	10.19	Dry Boulder pitching	cum	1,410.00	2,231.61	3,146,570.10
17	13.01/a/i/Nsc	Earth work in excavation Ordinary soil For Protection Work	cum	8,340.00	221.12	1,844,140.80
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	2,462.00	10,603.96	26,106,949.52
Sub Total of Protection Work						31,097,660.42
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	2,679.00	94.34	252,736.86
20	09.01/ns c1	Laying Reinforced Cement Concrete Pipe NP4 / Prestressed Concrete Pipe on First Class Bedding in Single Row . B)1200 mm dia				



Item Rate Analysis has been done considering

Bill No : 12. Culvert

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
			Rm	32.00	11,926.22	381,639.04
Sub Total of Miscellaneous Work						634,375.90
		Total of Bill 12. Culvert				319,729,698.41



Item Rate Analysis has been done considering

Bill No : 13. 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	810.00	221.12	179,107.20
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	198.00	297.22	58,849.56
3	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	34.00	9,835.84	334,418.56
4	14.03/g	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M30 Grade	cum	225.00	12,652.74	2,846,866.50
5	14.08	HYSD bar reinforcement in foundation complete as per drawing and technical specification	MT	27.00	79,892.92	2,157,108.84
Sub Total of Foundation						5,576,350.66
Sub Structure						
6	13.03/a	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials	cum	60.00	1,480.25	88,815.00
7	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	345.00	2,077.15	716,616.75
8	13.04	Filter medium behind abutment, wing wall and return wall complete as per drawing and technical specification .	cum	113.00	1,749.70	197,716.10



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
9	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	160.00	13,451.36	2,152,217.60
10	15.03/i/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 M40 Grade upto 5m height	cum	7.00	12,112.22	84,785.54
11	15.05	HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification	MT	26.00	79,892.92	2,077,215.92
12	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	51,960.00	3.22	167,311.20
13	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	1,440.00	510.32	734,860.80
14	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications				



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
			Rm	118.00	453.83	53,551.94
Sub Total of Sub Structure						6,273,090.85
Super Structure						
15	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	456.00	16.11	7,346.16
16	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	18.00	13,277.10	238,987.80
17	14/nsc1 /i	Filler joint i)Providing & fixing 2 mm thick corrugated copper plate in expansion joint complete as per drawing & Technical Specification.	m	45.00	2,080.60	93,627.00
18	14/nsc1 /ii	Filler joint Providing & fixing 20 mm thick compressible fibre board in expansion joint complete as per drawing & Technical Specification.	m	45.00	704.98	31,724.10
19	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	45.00	225.23	10,125.65



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
20	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	45.00	36.36	1,636.20
21	16.01/b/i/c2/ii	RCC Grade M30 For solid slab super-structure Approach Slab	cum	209.00	13,420.02	2,804,784.18
22	16.03	HYSD bar reinforcement in super-structure complete as per drawing and technical specifications	MT	42.00	87,726.69	3,684,520.98
23	16.05	Cement concrete wearing coat M-30 grade including reinforcement complete as per drawing and Technical Specifications	cum	8.00	20,547.36	164,378.88
24	16.11	Drainage Spouts complete as per drawing and Technical specification	each	12.00	2,185.41	26,224.92
25	16.12/Nsc	Reinforced cement concrete approach slab M-30 including reinforcement and formwork complete as per drawing and Technical specification	cum	58.00	18,705.38	1,084,912.04
26	16.13	PCC M15 ordinary Grade leveling course below approach slab complete as per drawing and Technical specification Below Approach Slab	cum	23.00	9,526.35	219,106.05
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	48.00	42,282.41	2,029,555.68

Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
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	456.00	549.61	250,622.16
Sub Total of Super Structure						10,647,561.50
		Protection Work				
29	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	83.00	6,996.27	580,690.41
30	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	43.00	10,603.96	455,970.28
31	17.01/a	laying apron complete as per drawing and Technical specification. Boulder				



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
			cum	189.00	2,815.89	532,203.21
32	17.02	Filter material underneath pitching in slopes complete as per drawing and Technical specification	cum	92.00	2,913.53	268,044.76
Sub Total of Protection Work						1,836,908.66
		Miscellaneous Work				
33	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.	sqm	211.00	94.34	19,905.74
Sub Total of Miscellaneous Work						19,905.74
		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	3,101.00	161.80	501,741.80
35	04.01/N sc1	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	61.00	3,830.26	233,645.86

Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
36	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	20.00	2,829.19	56,583.80
37	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	20.00	12,115.02	242,300.40
38	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	409.00	13,277.10	5,430,333.90

Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
39	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	20.00	11,926.22	238,524.40
Sub Total of Diversion Work						6,703,130.16
Total of Bill 13. Minor Bridge						31,056,947.57



Item Rate Analysis has been done considering

**VARIABLE NOTATION
&
CHAINAGE DETAILS
(ROAD PART)**



TCS Number	TCS Description	Length (km)
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)	15.549
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)	4.430
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)	1.725
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)	1.675
TCS-5A	Typical Cross Section of Two Lane Carriageway In Rural Area With Breast Wall on Hill Side And Earthen Shoulder on Valley side (New Construction)	0.725
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)	1.055
TCS-6A	Typical Cross Section of Two Lane Carriageway In Built Up Area With Both Side Footpath Cum RCC Rectangular Covered Drain in Hilly Terrain (New Construction)	0.050
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)	0.895
TCS-7A	Typical Cross Section of Two Lane Carriageway In Rural Area With Breast Wall on Hill Side And Trapezoidal Open Drain on Valley side (New Construction)	1.640
TCS-7B	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 (New Construction)	0.575
TCS-11	Typical Cross Section of Two Lane Carriageway In Rural Area With Retaining Wall on Valley Side And Breast Wall on Hill side (Reconstruction)	0.075
TCS-12	Typical Cross Section of Two Lane Carriageway In Rural Area With Both Side Trapezoidal Open Drain (New Construction)	1.175
TCS-13	Typical Cross Section of Two Lane Carriageway In Built-up Area With Trapezoidal Open Drain on Hill Side and RCC Rectangular Covered Drain on Valley side (Reconstruction)	0.430
Total =		29.999

Typical Cross Section

List of TCS

Design Chainage (m)		Length of CD (m)	Net Length (m)	TCS No.
From	To			
101280	101350	2.7	67	TCS-3
101350	101480		130	TCS-3A
101480	101530		50	TCS-4
101530	101675		145	TCS-3
101675	101750	6.06	69	TCS-3A
101750	101800		50	TCS-3
101800	101875		75	TCS-3A
101875	101950	5.3	70	TCS-4
101950	102000		50	TCS-5
102000	102125	2.6	122	TCS-5A
102125	102210	5.26	80	TCS-3
102210	102250		40	TCS-3A
102250	102350	7.96	92	TCS-3
102350	102400		50	TCS-4
102400	102450		50	TCS-3A
102450	102625		175	TCS-3
102625	102700		75	TCS-11
102700	102750	2.6	47	TCS-3
102750	102800		50	TCS-3A
102800	102940	2.6	137	TCS-3
102940	103020		80	TCS-3A
103020	103075		55	TCS-3
103075	103275	3.96	196	TCS-3A
103275	103350	2.7	72	TCS-3
103350	103450		100	TCS-3A
103450	103580	7.7	122	TCS-3
103580	103640		60	TCS-3A
103640	103700		60	TCS-4
103700	103775		75	TCS-3A
103775	103875	9	91	TCS-3
103875	103925		50	TCS-3A
103925	104000	2.6	72	TCS-3
104000	104050	2.6	47	TCS-4
104050	104270	5	215	TCS-3
104270	104320		50	TCS-4
104320	104470	5	145	TCS-3
104470	104625	3.96	151	TCS-3A
104625	104875	2.6	247	TCS-3
104875	105025	2.6	147	TCS-3
105025	105120	2.6	92	TCS-5
105120	105170		50	TCS-7A



Design Chainage (m)		Length of CD (m)	Net Length (m)	TCS No.
From	To			
105170	105220	5	45	TCS-3A
105220	105270		50	TCS-7A
105270	105360	2.6	87	TCS-3
105360	105485		125	TCS-12
105485	105550	6.06	59	TCS-3
105550	105725	2.6	172	TCS-13
105725	105900	2.7	172	TCS-7B
105900	106030	2.6	127	TCS-13
106030	106100		70	TCS-7B
106100	106225	6.4	119	TCS-13
106225	106300	5.4	70	TCS-3
106300	106350		50	TCS-12
106350	106450	2.6	97	TCS-3
106450	106525	5.26	70	TCS-3A
106525	106600	2.6	72	TCS-3
106600	106675		75	TCS-3A
106675	106775		100	TCS-5
106775	106850		75	TCS-5A
106850	107600	19.24	731	TCS-3
107600	107680		80	TCS-4
107680	107740	2.6	57	TCS-3A
107740	107790	2.7	47	TCS-4
107790	108025	13.06	222	TCS-3
108025	108175		150	TCS-3A
108175	108825	14.3	636	TCS-3
108825	108920	2.6	92	TCS-3A
108920	109235	14.04	301	TCS-3
109235	109275		40	TCS-3A
109275	109610	5.12	330	TCS-3
109610	109670		60	TCS-12
109670	109825	8.66	146	TCS-3
109825	109875		50	TCS-3A
109875	109930	2.6	52	TCS-3
109930	109980	2.6	47	TCS-4
109980	110100		120	TCS-12
110100	110325	3.96	221	TCS-3A
110325	110400	2.6	72	TCS-4
110400	110475		75	TCS-7A
110475	110700	9	216	TCS-3
110700	110750		50	TCS-3A
110750	110800	8	42	TCS-3
110800	110950		150	TCS-3A
110950	111050	2.6	97	TCS-3
111050	111125		75	TCS-3A
111125	111225	2.7	97	TCS-7A




Design Chainage (m)		Length of CD (m)	Net Length (m)	TCS No.
From	To			
111225	111280		55	TCS-5
111280	111400	2.6	117	TCS-3
111400	111460		60	TCS-3A
111460	111800	5.3	335	TCS-7
111800	112150	2.6	347	TCS-3
112150	112550	3.84	396	TCS-5
112550	112925	8	367	TCS-3
112925	113000		75	TCS-3A
113000	113050	2.6	47	TCS-3
113050	113100		50	TCS-3A
113100	113480	5.2	375	TCS-5
113480	113530		50	TCS-3
113530	113625	3.84	91	TCS-4
113625	113800	6.14	169	TCS-3A
113800	113900	2.7	97	TCS-4
113900	113975		75	TCS-3
113975	114150		175	TCS-5
114150	114225		75	TCS-5A
114225	114880	14.56	640	TCS-3
114880	114960		80	TCS-5A
114960	115010	2.6	47	TCS-7A
115010	115725	10.5	705	TCS-3
115725	115790		65	TCS-3A
115790	115850		60	TCS-4
115850	115900	2.7	47	TCS-3A
115900	115950		50	TCS-7A
115950	116030		80	TCS-3
116030	116085	2.6	52	TCS-4
116085	116280		195	TCS-7A
116280	116325	3.84	41	TCS-3A
116325	116375		50	TCS-5A
116375	116465		90	TCS-5
116465	116515		50	TCS-5A
116515	116650	2.6	132	TCS-3
116650	116700		50	TCS-3A
116700	116775	2.6	72	TCS-3
116775	116825		50	TCS-4
116825	117000	2.6	172	TCS-3
117000	117050	2.7	47	TCS-5
117050	117100		50	TCS-7A
117100	117550	5.2	445	TCS-3
117550	117780	2.6	227	TCS-5
117780	117825		45	TCS-5A
117825	118175	2.6	347	TCS-3
118175	118460		285	TCS-6




Design Chainage (m)		Length of CD (m)	Net Length (m)	TCS No.
From	To			
118460	118525		65	TCS-7B
118525	118575	2.6	47	TCS-7
118575	118630		55	TCS-7B
118630	118700	2.6	67	TCS-7
118700	118760		60	TCS-7B
118760	118820		60	TCS-7
118820	118870		50	TCS-7B
118870	118925		55	TCS-7
118925	119000		75	TCS-6
119000	119050	2.6	47	TCS-7B
119050	119100	2.6	47	TCS-7
119100	119150		50	TCS-7B
119150	119200		50	TCS-7
119200	119250		50	TCS-3
119250	119375	2.6	122	TCS-5A
119375	119530	2.6	152	TCS-3A
119530	119570		40	TCS-3
119570	119790	2.7	217	TCS-7A
119790	120010	7.8	212	TCS-7
120010	120110	2.6	97	TCS-3A
120110	120300	2.6	187	TCS-3
120300	120400	5.2	95	TCS-5A
120400	120475		75	TCS-3A
120475	120650	5.3	170	TCS-3
120650	120700		50	TCS-3A
120700	120750	2.6	47	TCS-3
120750	120810		60	TCS-12
120810	121450	16.84	623	TCS-3
121450	121500		50	TCS-4
121500	121650	5.2	145	TCS-3
121650	121750		100	TCS-7A
121750	122000	5.2	245	TCS-3
122000	122050		50	TCS-4
122050	122100	2.6	47	TCS-3A
122100	122315	2.6	212	TCS-3
122315	122435	2.6	117	TCS-4
122435	122550	2.7	112	TCS-3
122550	122600		50	TCS-3A
122600	122645	2.7	42	TCS-3
122645	122705		60	TCS-12
122705	122805		100	TCS-4
122805	122945	2.6	137	TCS-3
122945	123000		55	TCS-3A
123000	123100		100	TCS-3
123100	123155		55	TCS-12




Design Chainage (m)		Length of CD (m)	Net Length (m)	TCS No.
From	To			
123155	123200	2.6	42	TCS-3
123200	123255		55	TCS-12
123255	123310	6.06	49	TCS-3
123310	123375		65	TCS-12
123375	123425		50	TCS-3
123425	123675		250	TCS-7A
123675	124025		350	TCS-12
124025	124125		100	TCS-4
124125	124200	2.7	72	TCS-3
124200	124250		50	TCS-7A
124250	124305		55	TCS-3
124305	124375	2.6	67	TCS-3A
124375	124425		50	TCS-5
124425	125015	10.6	579	TCS-3
125015	125065		50	TCS-4
125065	125125	2.6	57	TCS-3A
125125	125725	9.14	591	TCS-3
125725	125775		50	TCS-3A
125775	126575	10.6	789	TCS-3
126575	126625		50	TCS-4
126625	126775	2.7	147	TCS-3
126775	126850		75	TCS-3A
126850	126975	9.26	116	TCS-3
126975	127025		50	TCS-12
127025	127125	2.6	97	TCS-3A
127125	127205	2.6	77	TCS-3
127205	127325		120	TCS-7A
127325	127475	2.6	147	TCS-3A
127475	127550	6.56	68	TCS-3
127550	127700		150	TCS-7A
127700	127800	2.6	97	TCS-3
127800	128045		245	TCS-3A
128045	128195	2.7	147	TCS-4
128195	128595	7.96	392	TCS-3
128595	128645		50	TCS-3A
128645	128695	2.7	47	TCS-3
128695	128745		50	TCS-3A
128745	128775	2.7	27	TCS-4
128775	128825		50	TCS-3A
128825	128945		120	TCS-3
128945	129025	3.96	76	TCS-3A
129025	129150		125	TCS-12
129150	129515	33.94	331	TCS-3
129515	129550		35	TCS-3A
129550	129775	2.6	222	TCS-3




Design Chainage (m)		Length of CD (m)	Net Length (m)	TCS No.
From	To			
129775	129850		75	TCS-3A
129850	129925	3.96	71	TCS-4
129925	130100	3.96	171	TCS-3
130100	130325	2.7	222	TCS-6
130325	130375	2.7	47	TCS-6A
130375	130465		90	TCS-6
130465	130595	14.5	116	TCS-7A
130595	130875	5.3	275	TCS-6
130875	131125	2.6	247	TCS-3
131125	131225	3.96	96	TCS-6
131225	131279		54	TCS-3
Total Length =		606	29393	

Summary of TCS Length :

TCS No.	Net Length (m)	CD Length (m)	Total Length (m)
TCS-3	15151	398	15549
TCS-3A	4362	68	4430
TCS-4	1688	37	1725
TCS-5	1658	17	1675
TCS-5A	715	10	725
TCS-6	1043	12	1055
TCS-6A	47	3	50
TCS-7	874	21	895
TCS-7A	1618	23	1640
TCS-7B	570	5	575
TCS-11	75	0	75
TCS-12	1175	0	1175
TCS-13	418	12	430
Total =	29393	606	29999



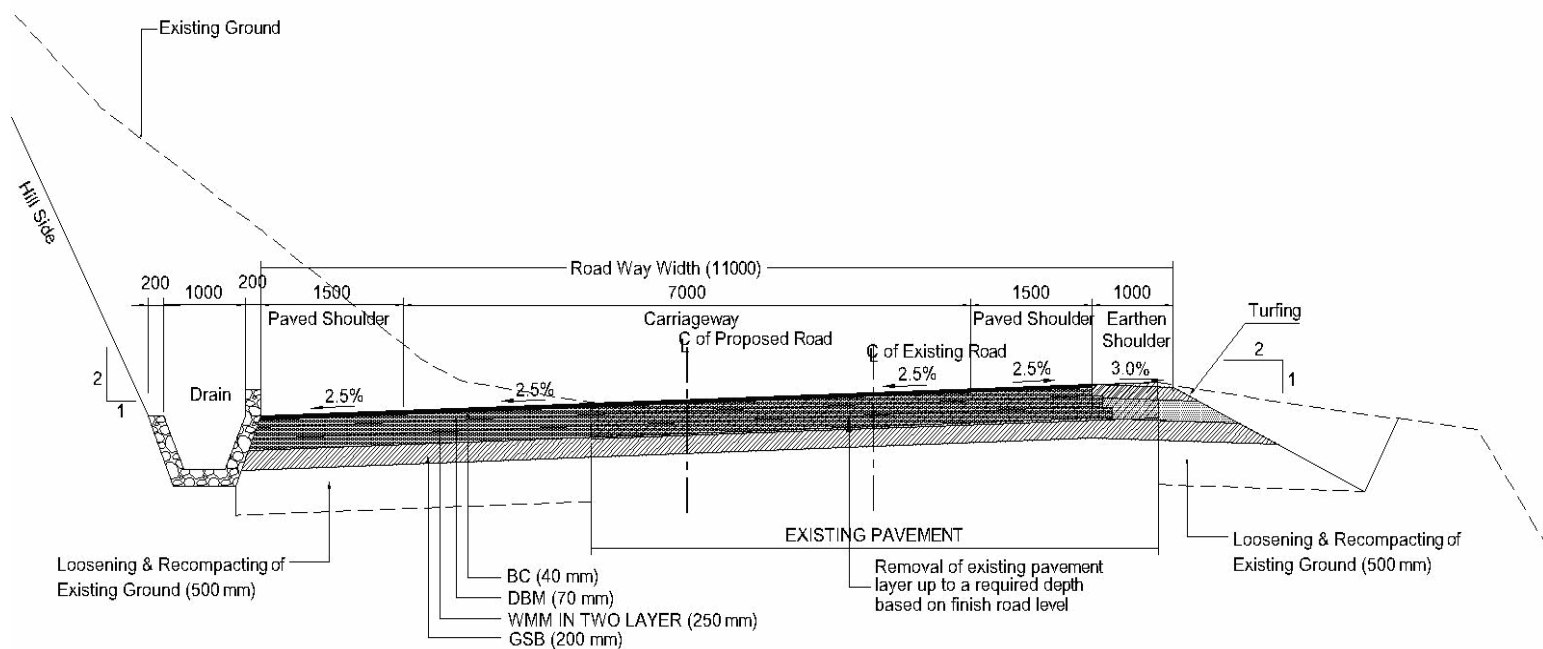
Variable Declaration

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	15151.000	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	11.690	
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)

[Signature]

KOLKATA
700 092

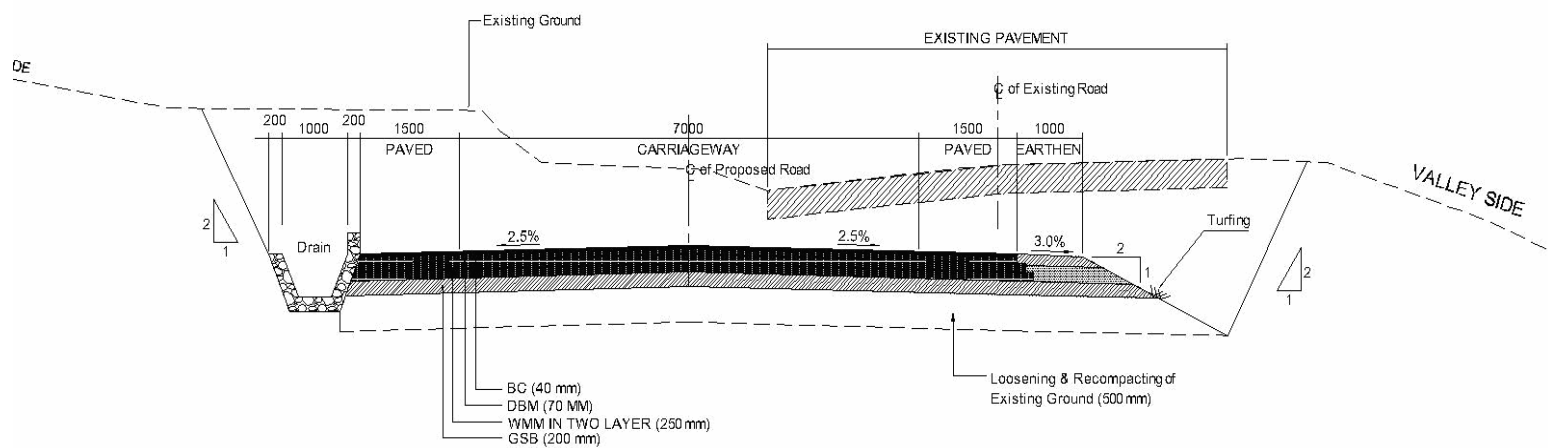
Variable Declaration

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	4362.000	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	11.690	
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)

[Signature]

CETEST
KOLKATA
700 092

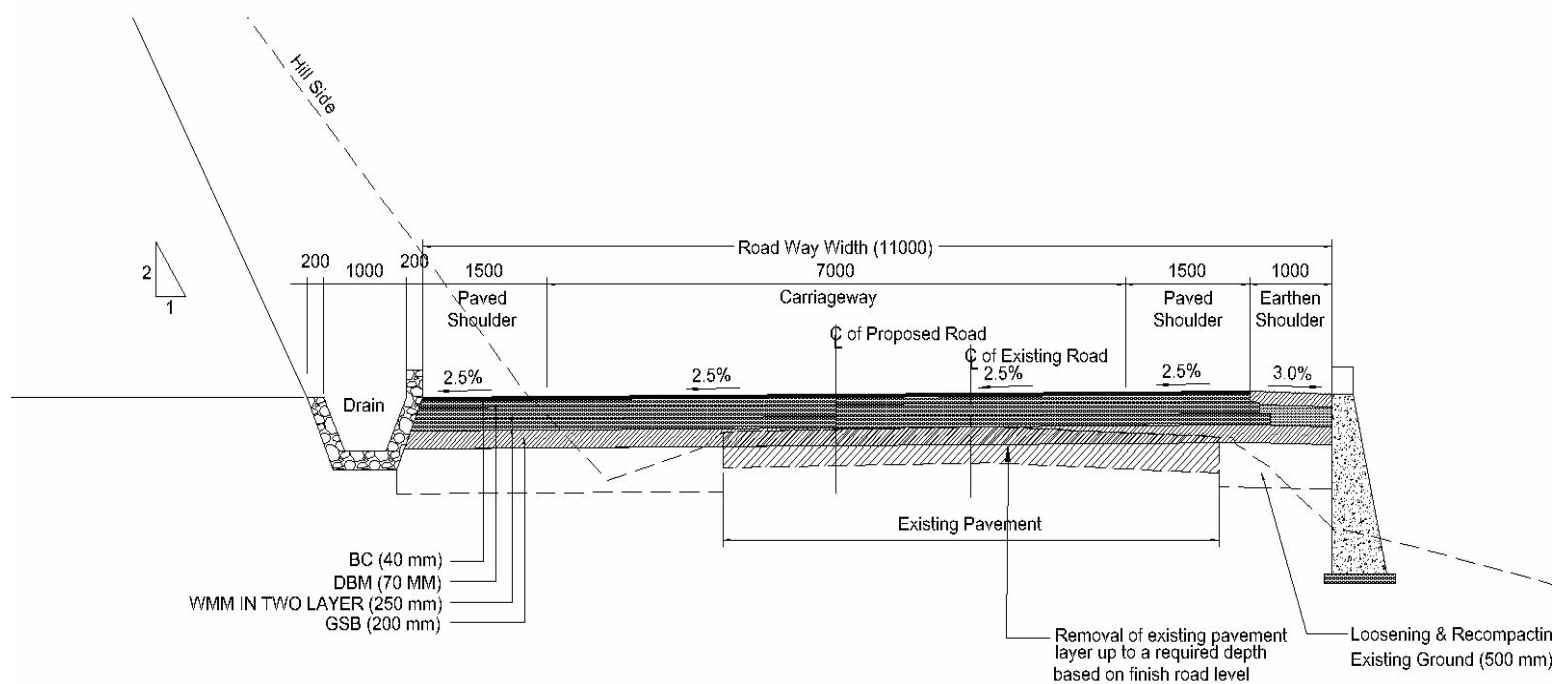
Variable Declaration

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	1688.000	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	11.690	
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)

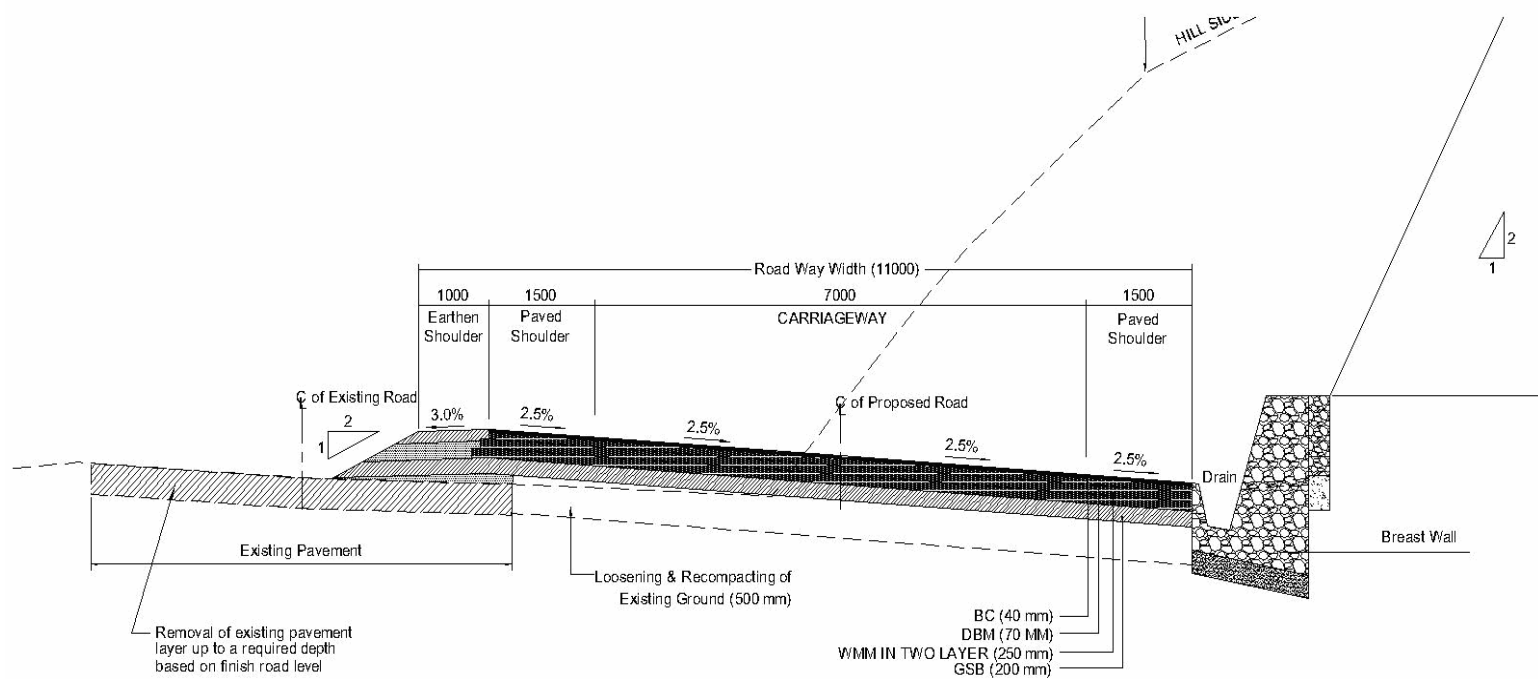
Variable Declaration

TCS-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	1658.000	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	11.690	
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-5 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN RURAL AREA WITH BREAST WALL ON HILL SIDE AND EARTHEN SHOULDER ON VALLEY SIDE (RECONSTRUCTION)

[Signature]

CETEST
ENGINEERING CONSULTANTS
KOLKATA
700 092

Variable Declaration

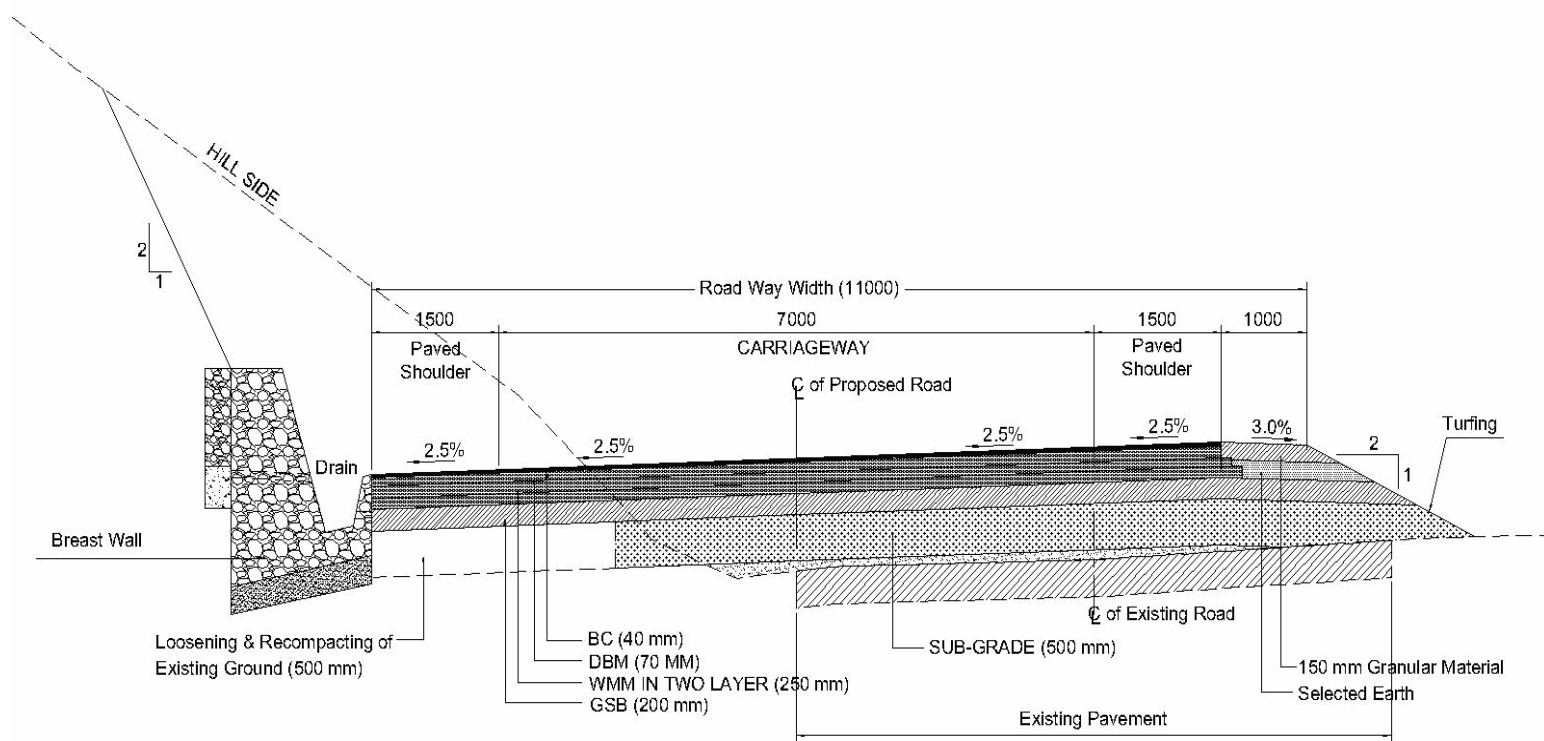
TCS-05A

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	715.000	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	11.690	
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)

Signature: *[Signature]*

Stamp: *[Circular Stamp: KOLKATA 700 692]*

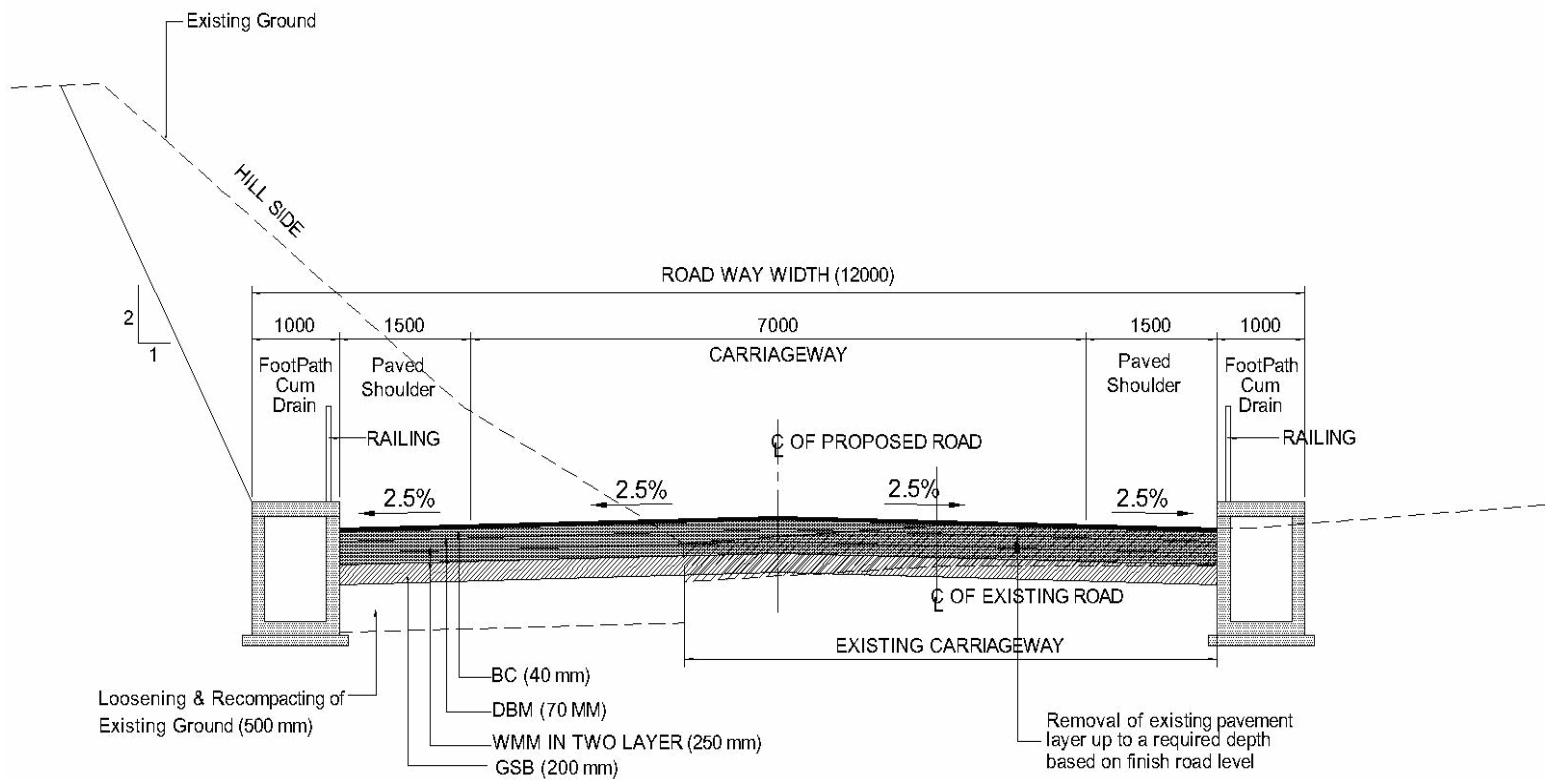
Variable Declaration

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	1043.000	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	11.690	



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)**

[Signature]

CETEST
KOLKATA
700 092

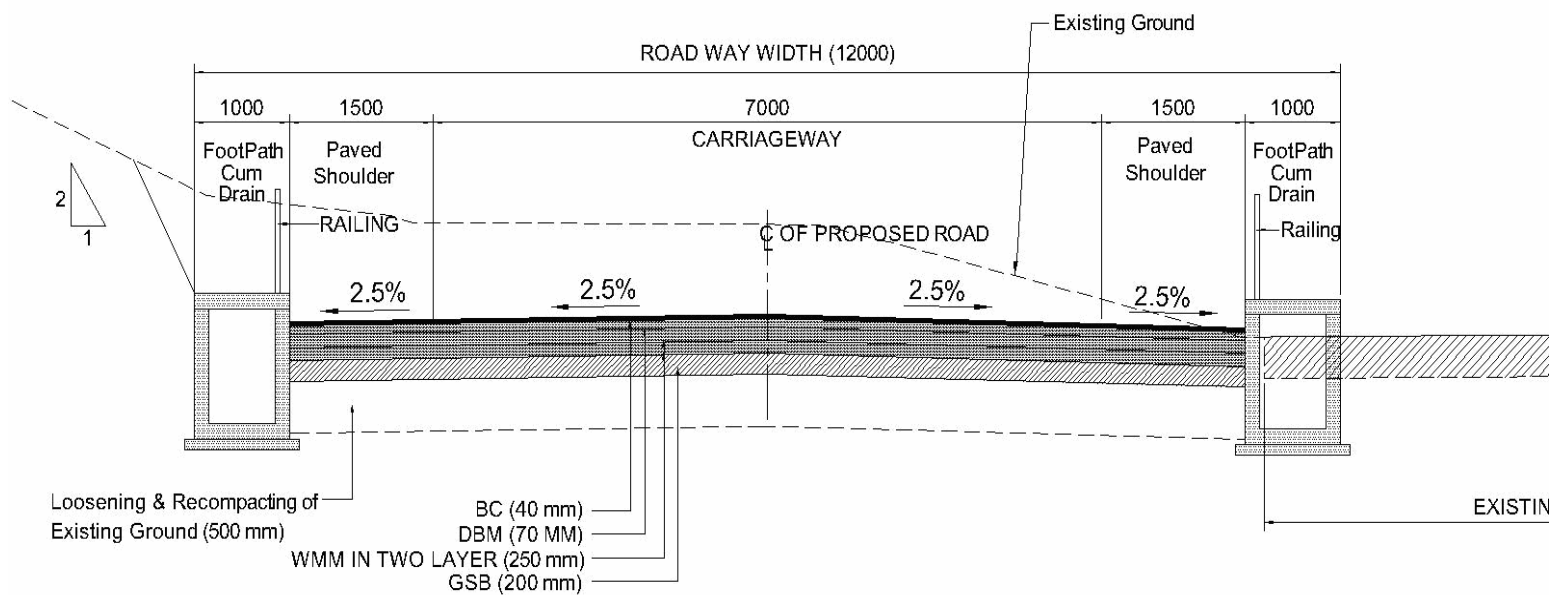
Variable Declaration

TCS-06A

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	47.000	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	11.690	



Variable Declaration



**TCS-6A : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN BUILT UP AREA
WITH BOTH SIDE FOOTPATH CUM RCC RECTANGULAR COVERED DRAIN IN HILLY TERRAIN (NEW CONSTRUCTION)**

[Signature]

CETEST
KOLKATA
700 092

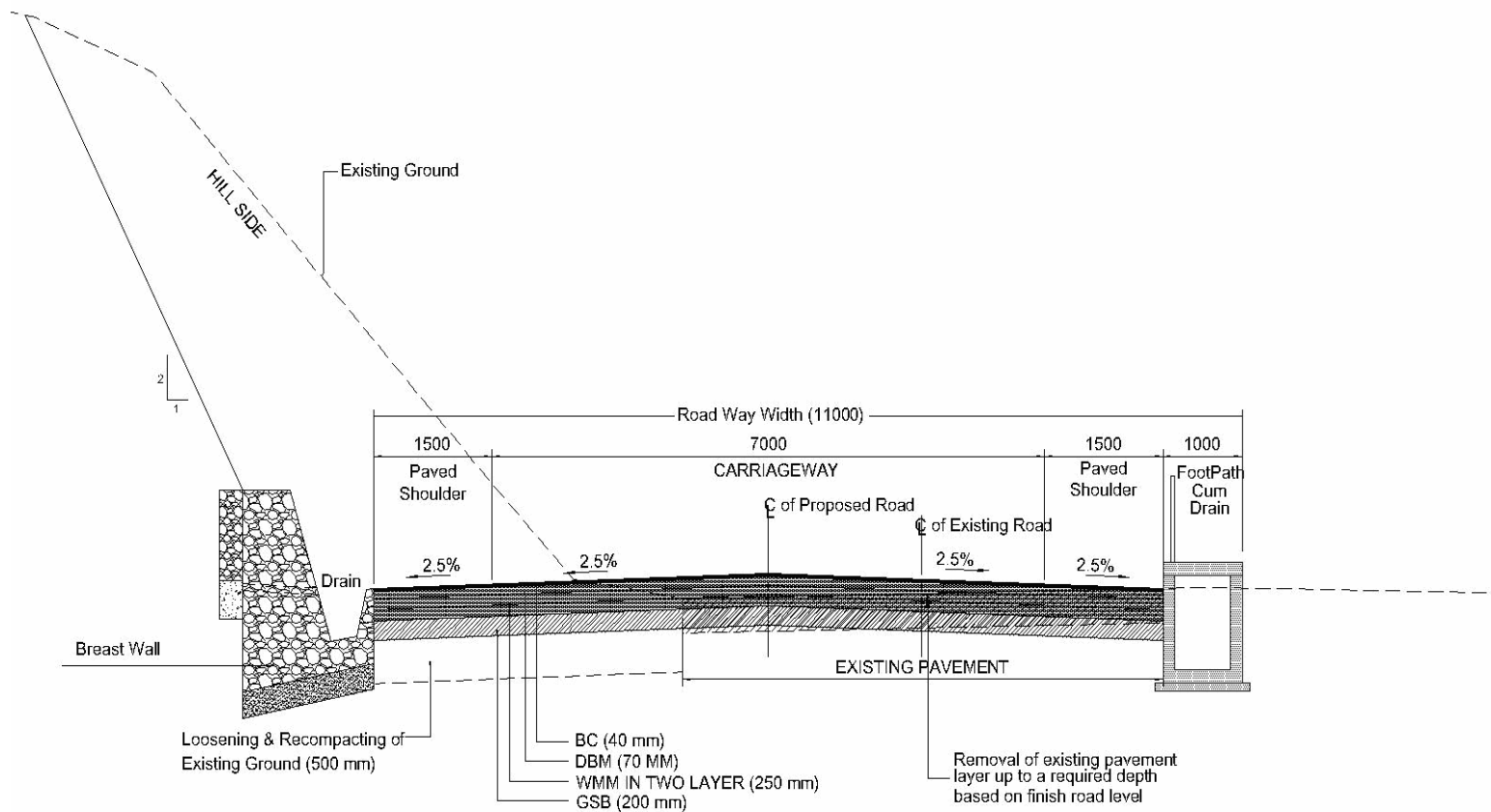
Variable Declaration

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	874.000	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	11.690	



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)

Signature: *[Signature]*

Stamp: *[Circular Stamp: KOLKATA 700 692]*

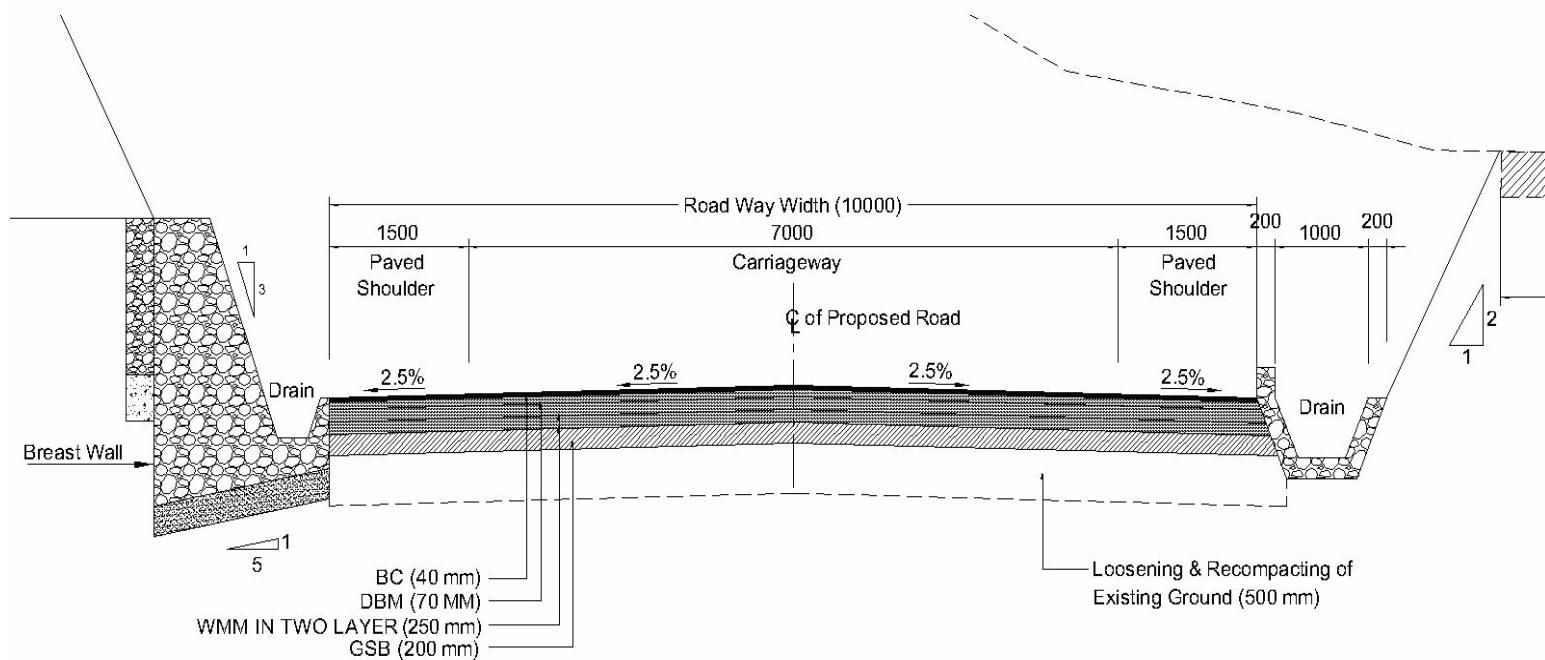
Variable Declaration

TCS-07A

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	1618.000	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	11.690	



Variable Declaration



TCS-7A : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN BUILT-UP AREA WITH BREAST WALL ON HILL SIDE AND TRAPEZOIDAL OPEN DRAIN ON VALLEY SIDE (NEW CONSTRUCTION)

[Signature]

KOLKATA
700 092

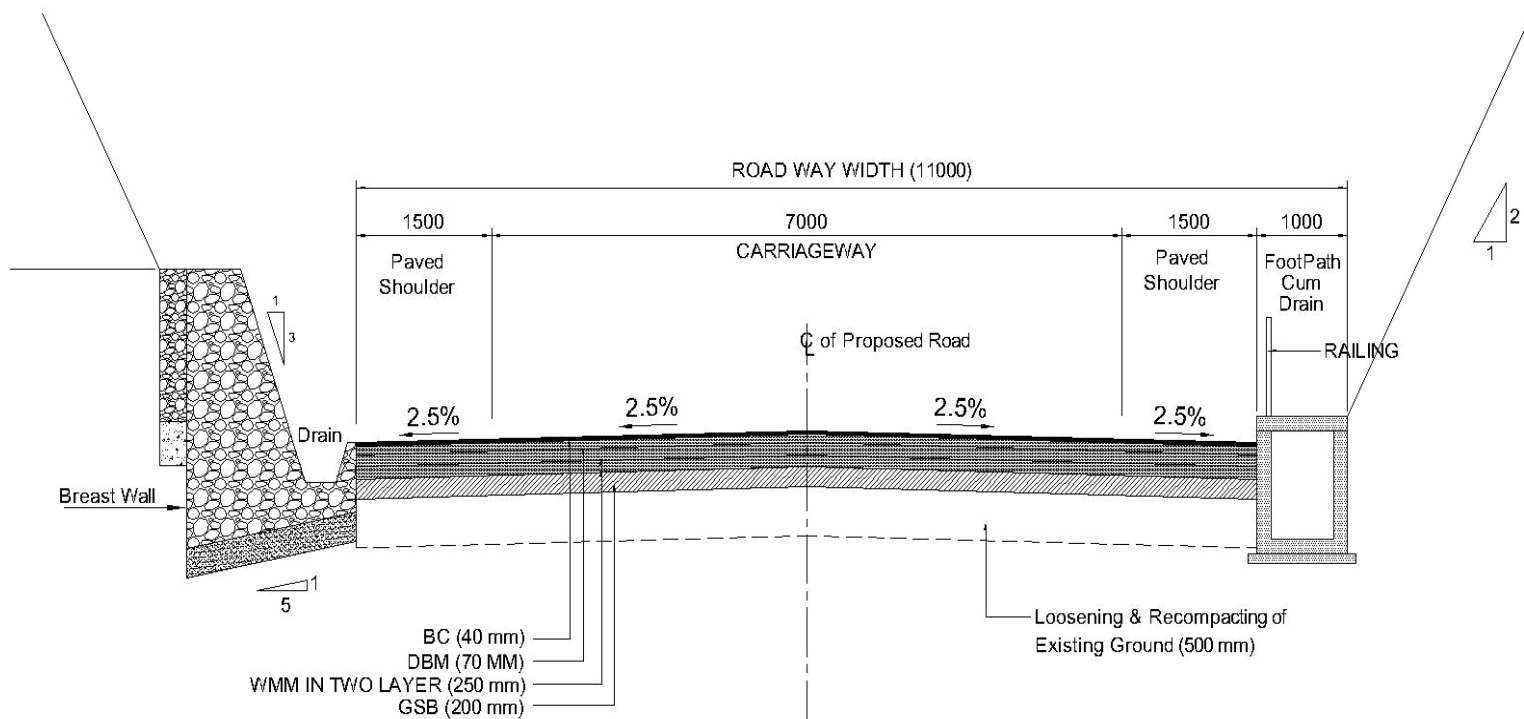
Variable Declaration

TCS-07B

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	570.000	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	11.690	



Variable Declaration



TCS-7B : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN BUILT-UPAREA WITH BREAST WALL ON HILL SIDE AND FOOTPATH CUM RCC RECTANGULAR COVERED DRAIN ON VALLEY SIDE (NEW CONSTRUCTION)

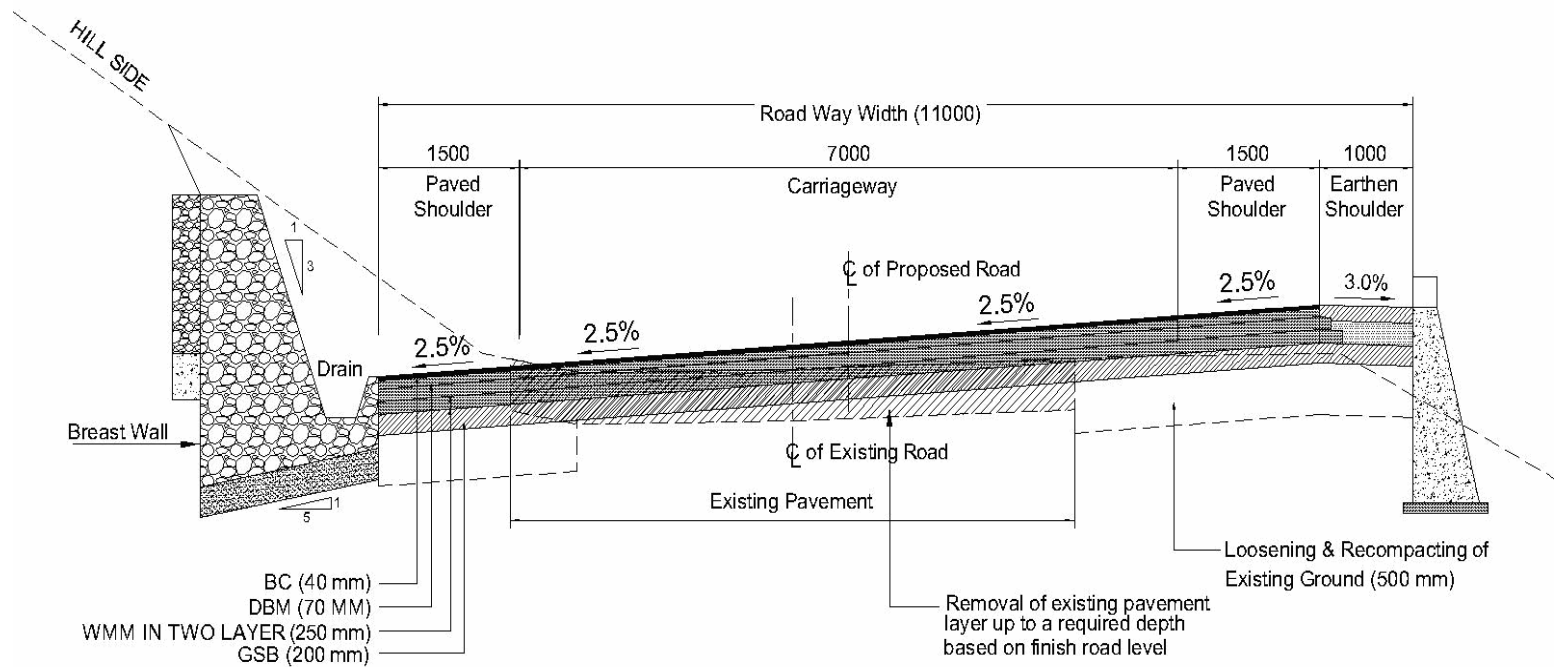
Variable Declaration

TCS-11

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	75.000	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	11.690	
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-11 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN
RURAL AREA WITH RETAINING WALL ON VALLEY SIDE
AND BREAST WALL ON HILL SIDE (RECONSTRUCTION)



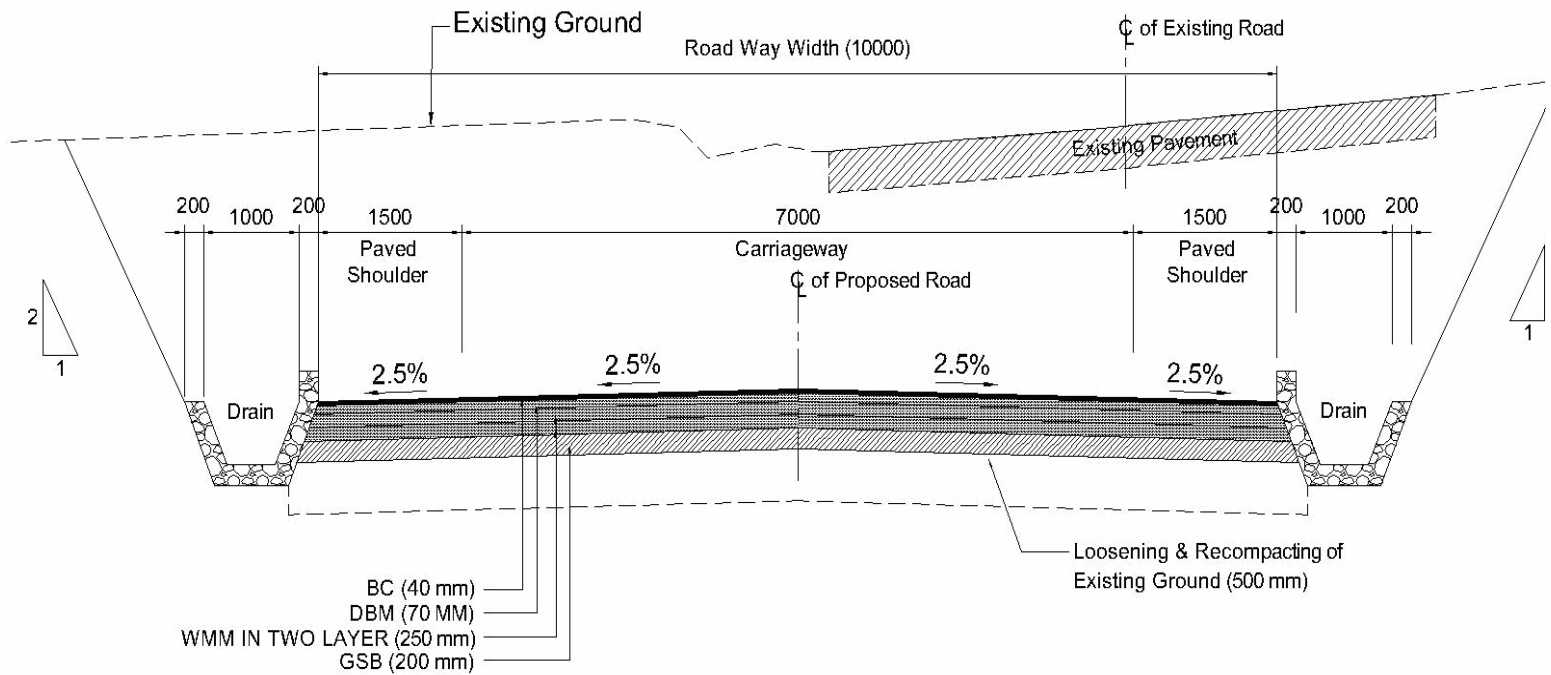
Variable Declaration

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	1175.000	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	11.690	



Variable Declaration



TCS-12 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN RURAL AREA WITH BOTH SIDE TRAPEZOIDAL OPEN DRAIN (NEW CONSTRUCTION)

[Signature]

CETEST
KOLKATA
700 092

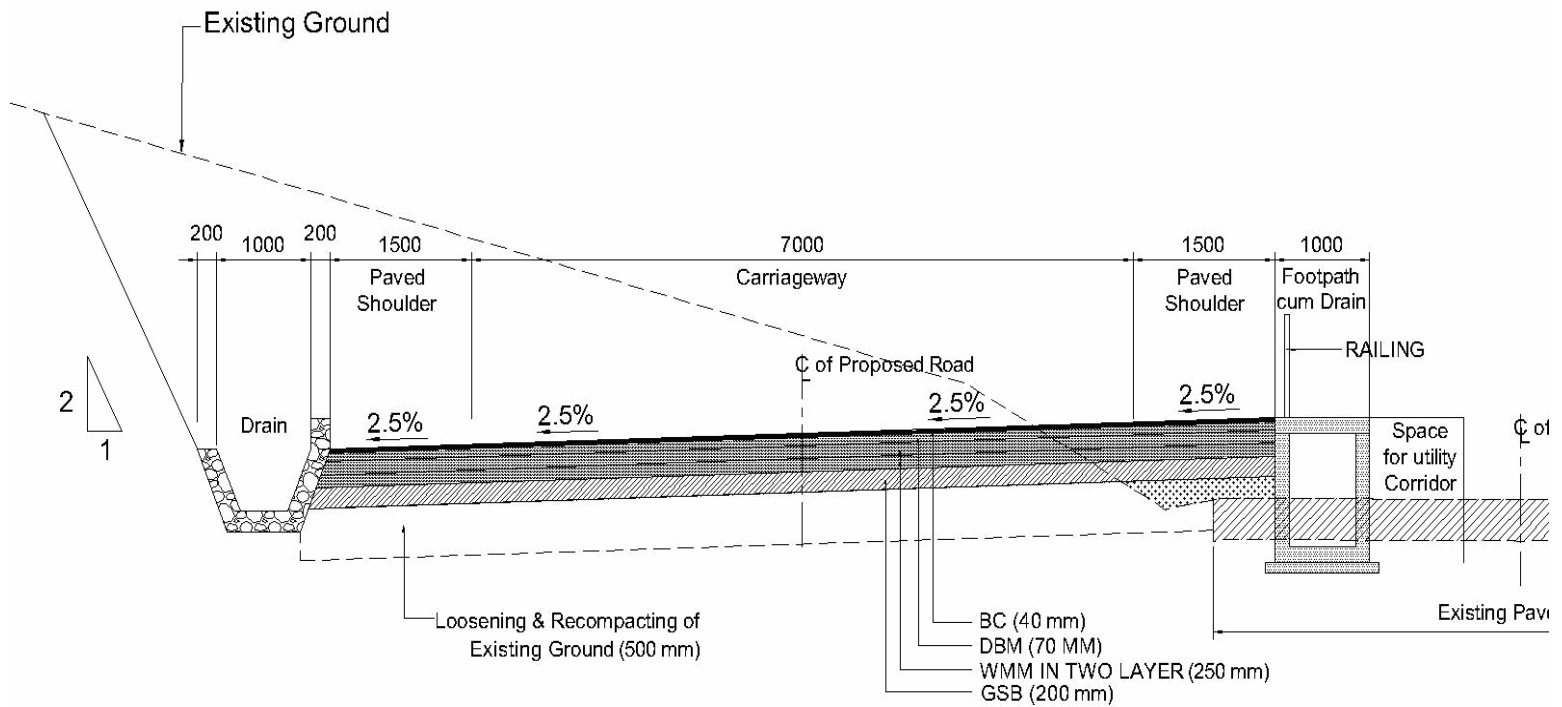
Variable Declaration

TCS-13

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	418.000	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	11.690	



Variable Declaration



TCS-13 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN BUILT-UP AREA WITH TRAPEZOIDAL OPEN DRAIN ON HILL SIDE AND RCC RECTANGULAR COVERED DRAIN ON VALLEY SIDE (RECONSTRUCTION)

[Signature]

KOLKATA
700 092

Site Clearance and Dismantling

A.Tree Cutting

SI No	Girth Details		
1	Girth from 300 mm to 600 mm	16	Each
1	Girth from 600 mm to 900 mm	25	Each
2	Girth from 900 mm to 1800 mm	59	Each
4	Girth from 1800 mm to 2700 mm	8	Each
5	Above 2700 mm	4	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
 Bill No- 01, Sl. No- 5

B.Clearing and grubbing

Clearing and Grubbing Area 45.21 Ha

..... Bill No- 01, Sl. No-6

C. Dismantling

SI No A.Rubble stone masonry in cement mortar

1	Culvert	=	9842	Cum
		Total=	9842	cum

..... Bill No- 01, Sl. No- 8

SI No B.Total Dismantling of Reinforced cement concrete

1	Culvert	=	371	Cum
		Total=	371	cum

..... Bill No- 01, Sl. No- 7

SI No C.Total Dismantling Hume Pipe Culvert

1	up to 600 mm dia=	192	m
2	600-900 mm dia=	689	m
3	above 900 mm dia=	552	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	=	161365	sqm
		Total=	161365	sqm

..... Bill No- 01, Sl. No- 12

SI No E.Total Dismantling of Granular Layer

1	Road	=	98610	sqm
	Refer backup calculation sheet			
		Total=	98610	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	101351.1	548347.165	2745330.692	RHS	0.8
2	101475.9	548255.92	2745306.488	RHS	0.9
3	101481.8	548250.419	2745302.989	RHS	0.5
4	101492.0	548240.367	2745301.848	RHS	1.6
5	101520.2	548213.704	2745288.51	RHS	1.5
6	101538.1	548201.212	2745260.858	LHS	0.9
7	101560.5	548184.452	2745262.406	LHS	1.6
8	101561.6	548168.015	2745273.449	RHS	1.3
9	101565.4	548183.132	2745259.14	LHS	1.5
10	101685.7	548223.136	2745174.403	RHS	0.8
11	101711.2	548195.536	2745154.131	RHS	1.4
12	101736.8	548198.724	2745123.7	RHS	1.6
13	101758.4	548211.529	2745103.655	RHS	0.8
14	101759.9	548212.324	2745102.424	RHS	0.5
15	102105.7	548211.687	2744852.833	RHS	0.5
16	102105.7	548211.687	2744852.833	RHS	0.5
17	102107.9	548213.782	2744852.047	RHS	0.5
18	102107.9	548213.782	2744852.047	RHS	0.5
19	102135.6	548243.765	2744866.916	RHS	1.6
20	102135.6	548243.765	2744866.916	RHS	1.6
21	102727.7	548047.535	2744609.343	RHS	1.4
22	102727.7	548047.535	2744609.343	RHS	1.4
23	102823.7	548127.881	2744557.106	RHS	1.5
24	102823.7	548127.881	2744557.106	RHS	1.5
25	102831.1	548131.994	2744551.967	RHS	1.6
26	102831.1	548131.994	2744551.967	RHS	1.6
27	102867.1	548154.828	2744521.51	RHS	1.5
28	102867.1	548154.828	2744521.51	RHS	1.5
29	102899.5	548194.088	2744515.625	RHS	0.8
30	102899.5	548194.088	2744515.625	RHS	0.8
31	102989.7	548265.584	2744497.545	RHS	1.2
32	102989.7	548265.584	2744497.545	RHS	1.2
33	103231.5	548273.547	2744371.472	RHS	1.5
34	103231.5	548273.547	2744371.472	RHS	1.5
35	103239.9	548263.992	2744372.57	RHS	1.4
36	103239.9	548263.992	2744372.57	RHS	1.4
37	103509.4	548029.301	2744279.68	RHS	0.5
38	103511.7	548027.363	2744281.12	RHS	0.6
39	103515.9	548023.409	2744282.464	RHS	0.5
40	103915.4	548048.53	2744104.709	RHS	1.8
41	105159.9	547759.793	2743543.807	RHS	1.5
42	105317.4	547640.783	2743477.169	RHS	1.6
43	105565.5	547541.768	2743277.814	RHS	1.3
44	106014.9	547303.977	2743098.716	RHS	0.4
45	106020.7	547306.355	2743092.845	RHS	0.5
46	106058.4	547323.638	2743055.804	RHS	0.8
47	106085.5	547353.207	2743047.941	RHS	0.5
48	106172.1	547414.942	2742999.96	LHS	0.8
49	106582.5	547146.126	2742964.804	RHS	0.6M
50	106585.5	547139.718	2742960.178		0.8
		546947.592	2742521.471		1.2



Site Clearance and Dismantling (Tree Cutting List)

SI No	Design Ch	EASTING(M)	NORTHING	Side	GIRTH (M)
52	109437.1	546638.17	2741618.393	RHS	1.5
53	110848.5	545979.13	2740963.411	RHS	1.5
54	111569.0	545727.172	2740433.557	LHS	1.6
55	111741.0	545570.359	2740438.8	RHS	0.7
56	111753.0	545561.881	2740446.345	RHS	1.5
57	112499.9	545089.484	2740602.049	LHS	1.8
58	112776.0	545041.019	2740433.688	LHS	1.8
59	112798.6	545004.463	2740426.969	LHS	1.5
60	112801.4	545001.124	2740426.761	LHS	1.6
61	112809.1	544993.064	2740425.408	LHS	1.7
62	112816.9	544985.287	2740423.071	LHS	1.5
63	112826.1	544976.48	2740419.144	LHS	0.9
64	112830.9	544971.769	2740418.016	LHS	1.6
65	113552.3	544539.977	2740169.513	LHS	0.8
66	117449.6	543336.268	2737456.745	LHS	1.5
67	119883.9	542078.763	2737320.042	RHS	3.2
68	120083.0	542056.4	2737167.591	RHS	1.4
69	122132.1	541318.017	2737905.605	RHS	3.3
70	123272.0	540768.076	2737302.226	RHS	1.6
71	123663.4	540600.365	2737379.894	RHS	1.5
72	125818.5	539137.935	2738230.884	RHS	1.3
73	125828.5	539126.01	2738232.911	RHS	1.5
74	127399.8	539150.213	2737714.461	RHS	0.5
75	127415.6	539166.865	2737714.32	RHS	0.6
76	127425.5	539177.214	2737714.117	RHS	0.8
77	127434.7	539186.743	2737713.624	RHS	1.3
78	127435.4	539187.399	2737713.531	RHS	0.8
79	127792.2	539347.346	2737475.447	LHS	0.9
80	127793.8	539345.748	2737475.234	LHS	0.8
81	127796.9	539341.141	2737474.497	LHS	1.5
82	127921.2	539210.517	2737501.98	RHS	0.8
83	129624.0	539219.007	2736843.65	RHS	0.9
84	130035.4	539026.115	2737174.488	RHS	0.7
85	130075.7	538998.136	2737202.422	RHS	1.6
86	130077.1	538996.495	2737202.855	RHS	0.5
87	130221.1	538873.062	2737282.174	LHS	1.4
88	130264.1	538885.065	2737331.218	RHS	1.9
89	130293.1	538874.14	2737358.287	RHS	0.6
90	130440.4	538770.353	2737452.935	RHS	0.5
91	130440.7	538769.128	2737451.326	LHS	1.5
92	130441.8	538768.629	2737452.673	LHS	1.6.
93	130464.0	538768.853	2737477.418	RHS	1.9
94	130473.1	538771.106	2737482.786	RHS	3.5
95	130493.8	538764.441	2737494.033	RHS	0.8
96	130516.9	538765.012	2737515.087	RHS	0.5
97	130517.1	538764.874	2737515.383	RHS	0.6
98	130517.7	538764.454	2737516.289	RHS	0.4
99	130518.8	538764.303	2737517.67	RHS	0.6
100	130563.5	538775.339	2737563.221	LHS	1.6
101	130628.4	538807.404	2737616.178		0.7
		538823.147	2737629.249		1.6



Site Clearance and Dismantling (Tree Cutting List)

Sl No	Design Ch	EASTING(M)	NORTHING	Side	GIRTH (M)
103	130697.2	538772.572	2737672.63	RHS	0.6
104	130697.6	538761.727	2737653.605	LHS	3.8
105	130718.5	538743.247	2737663.452	LHS	0.6
106	130728.1	538746.069	2737688.606	RHS	2
107	130739.5	538725.103	2737674.127	LHS	0.6
108	130776.7	538696.253	2737698.923	LHS	1.8
109	130779.7	538691.472	2737696.267	LHS	1.6
110	130789.8	538681.478	2737699.111	LHS	1.3
111	130796.5	538685.374	2737720.333	RHS	1.5
112	131084.1	538429.813	2737816.813	LHS	1.5
113	131089.6	538426.064	2737822.285	LHS	1.5
114	131132.6	538393.018	2737854.347	LHS	1.8

Summary:

Girth from 300 mm to 600 mm	16	Nos
Girth from 600 mm to 900 mm	25	Nos
Girth from 900 mm to 1800 mm	59	Nos
Girth from 1800 mm to 2700 mm	8	Nos
Above 2700 mm	4	Nos



Site Clearance and Dismantling
Clearing and Grubbing Road Land

TCS Type	Net Length (m)	Avg.Existing Road Width (m)	Width to be cleared and grubbed (m)	Area to be cleared and grubbed (Ha)
TCS-1	0	8.0	24.0	0.00
TCS-2	0	8.5	24.0	0.00
TCS-2A	75	9.0	24.0	0.11
TCS-3	15129	8.0	24.0	24.21
TCS-3A	4344	10.0	24.0	6.08
TCS-4	1738	8.0	24.0	2.78
TCS-4A	0	7.0	24.0	0.00
TCS-5	1655	7.0	24.0	2.81
TCS-5A	715	10.0	24.0	1.00
TCS-6	1040	11.0	24.0	1.35
TCS-6A	180	8.5	24.0	0.28
TCS-7	662	8.5	24.0	1.03
TCS-7A	1385	9.0	24.0	2.08
TCS-7B	570	8.0	24.0	0.91
TCS-8	0	10.0	24.0	0.00
TCS-9A	0	8.0	24.0	0.00
TCS-10	0	7.0	24.0	0.00
TCS-11	75	7.0	24.0	0.13
TCS-12	1352	10.0	24.0	1.89
TCS-13	418	11.0	24.0	0.54

Total= 45.21

Total area of clearing & grubbing=

45.21 ha



Site Clearance and 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	104.235	2	4.9	1.9	0.8	14.90	
			104.352	2	5.8	2.8	0.8	25.98	
			104.631	2	5.5	2.5	0.8	22.00	
			105.031	2	5.8	2.8	0.8	25.98	
			105.627	2	5.8	2.8	0.8	25.98	
			105.805	2	5.5	2.5	0.8	22.00	
			106.224	2	5.5	2.5	0.8	22.00	
			106.338	2	5.2	2.2	0.8	18.30	
			106.388	2	5.5	2.5	0.8	22.00	
			106.945	2	5.8	2.8	0.8	25.98	
			107.038	2	5.5	2.5	0.8	22.00	
			107.401	2	5.5	2.5	0.8	22.00	
			107.517	2	5.5	2.5	0.8	22.00	
			107.736	2	5.8	2.8	0.8	25.98	
			108.063	2	5.2	2.2	0.8	18.30	
			108.302	2	5.5	2.5	0.8	22.00	
			108.501	2	5.8	2.8	0.8	25.98	
			108.762	2	5.8	2.8	0.8	25.98	
			108.826	2	5.8	2.8	0.8	25.98	
			108.945	2	5.2	2.2	1.8	41.18	
			109.119	2	5.5	2.5	0.8	22.00	
			109.404	2	5.5	2.5	0.8	22.00	
			109.913	2	4.9	1.9	0.8	14.90	
			109.980	2	5.5	2.5	0.8	22.00	
			110.306	2	5.5	2.5	0.8	22.00	
			110.466	2	5.8	2.8	0.8	25.98	
			110.546	2	5.6	2.6	0.8	23.30	
			110.613	2	5.5	2.5	0.8	22.00	
			110.642	2	5.8	2.8	0.8	25.98	
			110.971	2	5.5	2.5	0.8	22.00	
			111.220	2	5.8	2.8	0.8	25.98	
			111.359	2	5.8	2.8	0.8	25.98	
			111.562	2	5.8	2.8	0.8	25.98	
			111.654	2	5.6	2.6	0.8	23.30	
			111.821	2	5.9	2.9	0.8	27.38	
			112.495	2	5.8	2.8	0.8	25.98	
			112.610	2	6.2	3.2	0.8	31.74	
			112.670	2	5.5	2.5	0.8	22.00	
			112.946	2	6.2	3.2	0.8	31.74	
			113.473	2	5.5	2.5	0.8	22.00	
			113.759	2	5.2	2.2	0.8	18.30	
			114.312	2	5.5	2.5	0.8	22.00	
			114.808	2	5.6	2.6	0.8	23.30	
			115.525	2	5.2	2.2	0.8	18.30	
			115.946	2	6.1	3.1	0.8	30.26	
			116.074	2	6.1	3.1	0.8	30.26	
			116.521	2	7.0	2.8	0.8	31.36	
			117.615	2	6.1	3.1	0.8	30.26	
			118.725	2	4.9	1.9	0.8	14.90	
			120.051	2	5.8	2.8	0.8	25.98	
			120.499	2	5.2	2.2	0.8	18.30	
			120.588	2	5.8	2.8	0.8	25.98	
			120.890	2	5.5	2.5	0.8	22.00	
			121.124	2	5.8	2.8	0.8	25.98	
			121.700	2	5.5	2.5	0.8	22.00	
			121.791	2	5.5	2.5	0.8	22.00	
			122.157	2	6.4	2.5	0.8	25.60	
			122.258	2	5.5	2.5	0.8	22.00	
			122.457	2	5.5	2.5	0.8	22.00	
			122.640	2	5.5	2.5	0.8	22.00	
			122.846	2	5.8	2.8	0.8	25.98	
			122.997	2	5.8	2.8	0.8	25.98	
			123.174	2	5.8	2.8	0.8	25.98	
			123.218	2	5.8	2.8	0.8	25.98	
			123.261	2	5.8	2.8	0.8	25.98	
			123.317	2	5.5	2.5	0.8	22.00	
			123.520	2	4.9	1.9	0.8	14.90	
			123.582	2	5.5	2.5	0.8	22.00	
			123.712	2	5.8	2.8	0.8	25.98	
			123.854	2	5.8	2.8	0.8	25.98	
			123.937	2	5.5	2.5	0.8	22.00	
			124.100	2	5.5	2.5	0.8	22.00	
			124.179	2	5.5	2.5	0.8	22.00	
			124.297	2	5.2	2.2	0.8	18.30	
			124.486	2	5.5	2.5	0.8	22.00	
			125.023	2	5.5	2.5	0.8	22.00	
			125.178	2	5.2	2.2	0.8	18.30	
			125.642	2	5.2	2.2	0.8	18.30	
			125.906	2	6.4	2.5	0.8	25.60	
			126.495	2	5.6	2.6	0.8	23.30	
			127.549	2	5.5	2.5	0.8	22.00	
			127.796	2	5.5	2.5	0.8	22.00	



Site Clearance and 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	127.969	2	5.5	2.5	0.8	22.00	
			128.459	2	5.8	2.8	0.8	25.98	
			128.619	2	5.5	2.5	0.8	22.00	
			128.759	2	5.5	2.5	0.8	22.00	
			129.172	2	5.5	2.5	0.8	22.00	
			129.242	2	5.2	2.2	0.8	18.30	
			129.445	2	5.8	2.8	0.8	25.98	
			129.520	2	5.2	2.2	0.8	18.30	
			129.593	2	4.9	1.9	0.8	14.90	
			130.080	2	5.8	2.8	0.8	25.98	
			130.323	2	5.5	2.5	0.8	22.00	
			130.403	2	7.4	4.4	0.8	52.10	
			130.496	2	5.5	2.5	0.8	22.00	
			130.850	2	5.5	2.5	0.8	22.00	
			130.974	2	5.5	2.5	0.8	22.00	
			131.248	2	5.5	2.5	0.8	22.00	
			131.606	2	5.5	2.5	0.8	22.00	
			131.852	2	5.5	2.5	0.8	22.00	
			132.160	2	6.1	3.1	0.8	30.26	
			132.250	2	5.5	2.5	0.8	22.00	
			132.530	2	5.6	2.6	0.8	23.30	
			132.959	2	5.5	2.5	0.8	22.00	
			133.217	2	5.5	2.5	0.8	22.00	
			133.410	2	5.5	2.5	0.8	22.00	
			133.535	2	5.6	2.6	0.8	23.30	
			133.686	2	5.8	2.8	0.8	25.98	
			133.936	2	5.6	2.6	0.8	23.30	
			134.664	2	6.1	3.1	0.8	30.26	



Site Clearance and Dismantling

Site Clearance and Disbarring									
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	103.719	2	10.0	3.00	1.50	90.00	
			103.942	2	12.5	3.00	1.50	112.50	
			104.191	2	12.4	3.00	1.50	111.60	
			104.475	2	11.3	3.00	1.50	101.70	
			104.592	2	8.8	3.00	1.50	79.47	
			105.477	2	11.6	3.00	1.50	103.95	
			105.896	2	12.4	3.00	1.50	111.60	
			106.200	2	18.6	3.00	1.50	167.40	
			106.540	2	10.1	3.00	1.50	90.90	
			106.778	2	11.6	3.00	1.50	103.95	
			107.624	2	11.6	3.00	1.50	103.95	
			107.955	2	12.5	3.00	1.50	112.50	
			108.690	2	16.6	3.00	1.50	149.40	
			109.005	2	11.6	3.00	1.50	103.95	
			109.589	2	11.6	3.00	1.50	103.95	
			109.834	2	15.2	3.00	1.50	136.80	
			110.064	2	10.0	3.00	1.50	90.00	
			110.377	2	13.0	3.00	1.50	117.00	
			110.874	2	12.0	3.00	1.50	108.00	
			111.716	2	14.5	3.00	1.50	130.50	
			111.916	2	10.0	3.00	1.50	90.00	
			112.108	2	11.3	3.00	1.50	101.70	
			112.582	2	15.0	3.00	1.50	135.00	
			113.062	2	14.0	3.00	1.50	126.00	
			113.274	2	11.3	3.00	1.50	101.70	
			113.967	2	12.0	3.00	1.50	108.00	
			114.129	2	15.8	3.00	1.50	142.20	
			115.160	2	13.7	3.00	1.50	123.30	
			115.448	2	8.0	3.00	1.50	72.00	
			115.818	2	12.5	3.00	1.50	112.50	
			116.676	2	12.0	3.00	1.50	108.00	
			116.816	2	15.8	3.00	1.50	142.20	
A) Stone Masonry	Abutments for existing slab culvert H=h, Length=L, and thickness=t.	cum	117.238	2	13.7	3.00	1.50	123.30	
			117.345	2	8.0	3.00	1.50	72.00	
			117.447	2	12.5	3.00	1.50	112.50	
			117.783	2	9.0	3.00	1.50	81.00	
			117.968	2	11.3	3.00	1.50	101.70	
			118.243	2	15.2	3.00	1.50	136.80	
			118.473	2	15.0	3.00	1.50	135.00	
			118.591	2	10.0	3.00	1.50	90.00	
			118.868	2	13.0	3.00	1.50	117.00	
			119.074	2	14.0	3.00	1.50	126.00	
			119.341	2	14.0	3.00	1.50	126.00	
			119.674	2	11.3	3.00	1.50	101.70	
			119.758	2	11.3	3.00	1.50	101.70	
			119.907	2	10.8	3.00	1.50	97.20	
			124.123	2	13.7	3.00	1.50	123.30	
			124.570	2	14.0	3.00	1.50	126.00	
			124.821	2	11.3	3.00	1.50	101.70	
			124.917	2	11.3	3.00	1.50	101.70	
			125.374	2	15.8	3.00	1.50	142.20	
			125.529	2	12.8	3.00	1.50	115.20	
			125.820	2	8.0	3.00	1.50	72.00	
			126.601	2	10.9	3.00	1.50	98.10	
			127.745	2	10.0	3.00	1.50	90.00	
			128.124	2	15.0	3.00	1.50	135.00	
			130.289	2	12.5	3.00	1.50	112.50	
			130.637	2	12.0	3.00	1.50	108.00	
			131.009	2	13.7	3.00	1.50	123.30	
			131.916	2	10.0	3.00	1.50	90.00	
			132.773	2	12.0	3.00	1.50	108.00	
			132.900	2	13.0	3.00	1.50	117.00	
			132.998	2	14.0	3.00	1.50	126.00	
			134.134	2	12.8	3.00	1.50	115.20	
134.309	2	13.7	3.00	1.50	123.30				
Total =								9842.25	



Site Clearance and Dismantling

Sl. No.	Brief Description	Unit	Survey ch.	No.	L	B / H	T	Quantity	Total Quantity
B) RCC	For Slab culvert	Cum	103.719	1	7.0	5.40	0.3	11.34	
			103.942	1	6.8	5.40	0.3	11.02	
			104.191	1	6.5	1.50	0.3	2.93	
			104.475	1	6.5	3.60	0.3	7.02	
			104.592	1	6.0	3.40	0.3	6.15	
			105.477	1	6.8	3.20	0.3	6.51	
			105.896	1	6.5	4.50	0.3	8.78	
			106.200	1	6.5	5.20	0.3	10.14	
			106.540	1	6.8	3.60	0.3	7.34	
			106.778	1	6.8	3.70	0.3	7.53	
			107.624	1	6.8	3.50	0.3	7.12	
			107.955	1	6.8	4.40	0.3	8.98	
			108.690	1	7.5	5.40	0.3	12.15	
			109.005	1	6.8	3.70	0.3	7.53	
			109.589	1	6.8	1.90	0.3	3.86	
			109.834	1	7.0	5.20	0.3	10.92	
			110.064	1	7.0	1.20	0.3	2.52	
			110.377	1	7.0	1.80	0.3	3.78	
			110.874	1	7.0	4.80	0.3	10.08	
			111.716	1	7.0	1.70	0.3	3.57	
			111.916	1	6.7	4.90	0.3	9.85	
			112.108	1	7.5	4.20	0.3	9.45	
			112.582	1	8.0	4.40	0.3	10.56	
			113.062	1	7.5	1.40	0.3	3.15	
			113.274	1	7.0	5.20	0.3	10.92	
			113.967	1	7.0	1.50	0.3	3.15	
			114.129	1	7.0	1.60	0.3	3.36	
			115.160	1	7.1	2.90	0.3	6.18	
			115.448	1	7.0	1.50	0.3	3.15	
			115.818	1	7.0	1.50	0.3	3.15	
			116.676	1	7.0	4.50	0.3	9.45	
			116.816	1	7.0	1.50	0.3	3.15	
			117.238	1	7.1	1.50	0.3	3.20	
			117.345	1	7.0	1.50	0.3	3.15	
			117.447	1	7.0	1.30	0.3	2.73	
			117.783	1	6.1	1.50	0.3	2.75	
			117.968	1	7.5	1.60	0.3	3.60	
			118.243	1	7.0	1.50	0.3	3.15	
			118.473	1	8.0	1.50	0.3	3.60	
			118.591	1	7.0	1.40	0.3	2.94	
			118.868	1	7.0	1.20	0.3	2.52	
			119.074	1	7.5	1.40	0.3	3.15	
			119.341	1	7.5	2.80	0.3	6.30	
			119.674	1	7.0	1.50	0.3	3.15	
			119.758	1	7.0	1.50	0.3	3.15	
			119.907	1	7.0	1.60	0.3	3.36	
			124.123	1	7.1	2.00	0.3	4.26	
			124.570	1	7.5	3.20	0.3	7.20	
			124.821	1	7.0	1.40	0.3	2.94	
			124.917	1	7.0	1.50	0.3	3.15	
			125.374	1	7.0	1.00	0.3	2.10	
			125.529	1	7.5	1.00	0.3	2.25	
			125.820	1	7.0	2.00	0.3	4.20	
			126.601	1	6.8	5.46	0.3	11.14	
			127.745	1	6.7	1.58	0.3	3.18	
			128.124	1	8.0	2.23	0.3	5.35	
			130.289	1	7.0	1.67	0.3	3.51	
			130.637	1	7.0	1.60	0.3	3.36	
			131.009	1	7.1	3.10	0.3	6.60	
			131.916	1	6.7	2.91	0.3	5.85	
B) RCC	For Slab culvert	Cum	132.773	1	7.0	2.95	0.3	6.20	
			132.900	1	7.0	5.83	0.3	12.24	
			132.998	1	7.5	2.95	0.3	6.64	
			134.134	1	7.5	2.70	0.3	6.08	
			134.309	1	7.1	1.60	0.3	3.41	
								Total=	371.15
C) Hume Pipe	Hume Pipe								
	Dia upto 600 mm =	m		16	12.00				192.00
	Dia from 600-900 mm =	m		51	13.50				688.50
	Dia above 900mm=	m		46	12.00				552.00

Quantity Summary of Dismantling of Existing Culvert::

Total Dismantling of Rubble stone masonry in cement mortar= **9842 cum**
 Total Dismantling of Reinforced cement concrete= **371 cum**
 Total Dismantling of brick masonry in cement mortar=
 Total Dismantling of up to 600 mm dia Hume Pipe= **192 cum**
 Total Dismantling of above 600 mm to 900 mm dia Hume Pipe= **689 cum**
 Total Dismantling of above 900 mm dia Hume Pipe= **552 cum**



Site Clearance and Dismantling
Quantity calculation for dismentling of Flexible Pavement

TCS	Length	Unit
TCS-3	15.549	Km
TCS-4	1.725	Km
TCS-5	1.675	Km
TCS-6	1.055	Km
TCS-7	0.895	Km
TCS-11	0.075	Km
TCS-12	1.175	Km
TCS-13	0.43	Km
Total	22.579	KM

Avg Road Width= 6.7 m
 Avg thickness of bituminoues layer 0.08 m

Total quantity for dismantling (Bituminous layer)=	12102	cum
Quantity of Dismantelled Bituminous Material(sqm) (Assume avg thickness 75mm)	161365	sqm



Details of Granular dismantling quantity

Chainage	FRL	EGL	Avg. Ext. Bituminous layer thck (m)	EGL- Bituminous layer	Difference after Scarification (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantling thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
101300	525.17	524.808	0.08	524.728	0.442	22.5	6.7	0.18	0.118	17.79	TCS-3
101325	525.38	524.85	0.08	524.77	0.61	25	6.7	0.18	0	0.00	TCS-3
101350	524.472	524.85	0.08	524.77	-0.298	25		0.18	0.176552		TCS-3A
101375	536.515	524.923	0.08	524.843	11.672	25		0.18	0		TCS-3A
101400	539.467	525.187	0.08	525.107	14.36	25		0.18	0		TCS-3A
101425	537.924	525.57	0.08	525.49	12.434	25		0.18	0		TCS-3A
101450	535.699	525.956	0.08	525.876	9.823	25		0.18	0		TCS-3A
101475	536.825	526.341	0.08	526.261	10.564	25		0.18	0		TCS-3A
101500	526.981	526.726	0.08	526.646	0.335	25	6.7	0.18	0.176552	29.57	TCS-4
101525	527.057	527.112	0.08	527.032	0.025	25	6.7	0.18	0.176552	29.57	TCS-4
101550	527.031	527.497	0.08	527.417	-0.386	25	6.7	0.18	0.176552	29.57	TCS-3
101575	527.458	527.882	0.08	527.802	-0.344	25	6.7	0.18	0.176552	29.57	TCS-3
101600	528.02	528.268	0.08	528.188	-0.168	25	6.7	0.18	0.176552	29.57	TCS-3
101625	528.411	528.653	0.08	528.573	-0.162	25	6.7	0.18	0.176552	29.57	TCS-3
101650	529.828	529.038	0.08	528.958	0.87	25	6.7	0.18	0	0.00	TCS-3
101675	529.277	529.424	0.08	529.344	-0.067	25		0.18	0.176552		TCS-3A
101700	537.665	529.809	0.08	529.729	7.936	25		0.18	0		TCS-3A
101725	551.764	530.194	0.08	530.114	21.65	25		0.18	0.176552		TCS-3A
101750	532.897	530.58	0.08	530.5	2.397	25	6.7	0.18	0	0.00	TCS-3
101775	530.435	530.965	0.08	530.885	-0.45	25	6.7	0.18	0.176552	29.57	TCS-3
101800	532.956	531.35	0.08	531.27	1.686	25		0.18	0.176552		TCS-3A
101825	532.804	531.736	0.08	531.656	1.148	25		0.18	0		TCS-3A
101850	534.13	532.121	0.08	532.041	2.089	25		0.18	0		TCS-3A
101875	532.975	532.506	0.08	532.426	0.549	25	6.7	0.18	0.011	1.84	TCS-4
101900	532.304	532.892	0.08	532.812	-0.508	25	6.7	0.18	0.176552	29.57	TCS-4
101925	533.12	533.277	0.08	533.197	-0.077	25	6.7	0.18	0.176552	29.57	TCS-4
101950	533.596	533.662	0.08	533.582	0.014	25	6.7	0.18	0.176552	29.57	TCS-5
101975	534.212	534.048	0.08	533.968	0.244	25	6.7	0.18	0.176552	29.57	TCS-5
102000	536.645	534.434	0.08	534.354	2.291	25		0.18	0		TCS-5A
102025	539.808	534.852	0.08	534.772	5.036	25		0.18	0		TCS-5A
102050	539.188	535.311	0.08	535.231	3.957	25		0.18	0		TCS-5A
102075	541.326	535.811	0.08	535.731	5.595	25		0.18	0		TCS-5A
102100	546.426	536.329	0.08	536.249	10.177	25		0.18	0		TCS-5A
102125	545.654	536.848	0.08	536.768	8.886	25	6.7	0.18	0	0.00	TCS-3
102150	537.558	537.366	0.08	537.286	0.272	25	6.7	0.18	0.176552	29.57	TCS-3
102175	537.632	537.885	0.08	537.805	-0.173	25	6.7	0.18	0.176552	29.57	TCS-3
102200	538.363	538.403	0.08	538.323	0.04	25	6.7	0.18	0.176552	29.57	TCS-3
102225	544.906	538.922	0.08	538.842	6.064	25		0.18	0		TCS-3A
102250	543.318	539.44	0.08	539.36	3.958	25	6.7	0.18	0	0.00	TCS-3
102275	540.408	539.959	0.08	539.879	0.529	25	6.7	0.18	0.031	5.19	TCS-3
102300	541.092	540.477	0.08	540.397	0.695	25	6.7	0.18	0	0.00	TCS-3
102325	541.33	540.995	0.08	540.915	0.415	25	6.7	0.18	0.145	24.29	TCS-3
102350	541.744	541.489	0.08	541.409	0.335	25	6.7	0.18	0.176552	29.57	TCS-4
102375	541.572	541.949	0.08	541.869	-0.297	25	6.7	0.18	0.176552	29.57	TCS-4
102400	541.951	542.373	0.08	542.293	-0.342	25		0.18	0.176552		TCS-3A
102425	545.063	542.762	0.08	542.682	2.381	25		0.18	0		TCS-3A
102450	547.062	543.116	0.08	543.036	4.026	25	6.7	0.18	0	0.00	TCS-3
102475	543.369	543.436	0.08	543.356	0.013	25	6.7	0.18	0.176552	29.57	TCS-3
102500	546.992	543.72	0.08	543.64	3.352	25	6.7	0.18	0	0.00	TCS-3
102525	546.152	543.969	0.08	543.889	2.263	25	6.7	0.18	0	0.00	TCS-3
102550	545.069	544.207	0.08	544.127	0.942	25	6.7	0.18	0	0.00	TCS-3
102575	544.482	544.445	0.08	544.365	0.117	25	6.7	0.18	0.176552	29.57	TCS-3
102600	544.312	544.682	0.08	544.602	-0.29	25	6.7	0.18	0.176552	29.57	TCS-3
102625	545.265	544.92	0.08	544.84	0.425	25	6.7	0.18	0.135	22.61	TCS-11
102650	544.897	545.158	0.08	545.078	-0.181	25	6.7	0.18	0.176552	29.57	TCS-11
102675	544.986	545.396	0.08	545.316	-0.33	25	6.7	0.18	0.176552	29.57	TCS-11
102700	545.158	545.633	0.08	545.553	-0.395	25	6.7	0.18	0.176552	29.57	TCS-3
102725	545.898	545.871	0.08	545.791	0.107	25	6.7	0.18	0.176552	29.57	TCS-3
102750	546.3	546.109	0.08	546.029	0.271	25		0.18	0.176552		TCS-3A
102775	548.997	546.347	0.08	546.267	2.73	25		0.18	0		TCS-3A
102800	547.136	546.585	0.08	546.505	0.631	25	6.7	0.18	0	0.00	TCS-3
102825	546.359	546.822	0.08	546.742	-0.383	25	6.7	0.18	0.176552	29.57	TCS-3
102850	546.435	547.06	0.08	546.98	-0.545	25	6.7	0.18	0.176552	29.57	TCS-3
102875	548.135	547.298	0.08	547.218	0.917	25	6.7	0.18	0	0.00	TCS-3
102900	547.479	547.536	0.08	547.456	0.023	25	6.7	0.18	0.176552	29.57	TCS-3
102925	547.594	547.773	0.08	547.693	-0.099	25	6.7	0.18	0.176552	29.57	TCS-3
102950	554.722	548.011	0.08	547.931	6.791	25		0.18	0		TCS-3A



Chainage	FRL	EGL	Avg.Ext. Bituminou s layer thck (m)	EGL- Bituminous layer	Difference after Scarificati on (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantlin g thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
102975	552.761	548.249	0.08	548.169	4.592	25		0.18	0		TCS-3A
103000	551.829	548.486	0.08	548.406	3.423	25		0.18	0		TCS-3A
103025	549.029	548.698	0.08	548.618	0.411	25	6.7	0.18	0.149	24.96	TCS-3
103050	551.669	548.87	0.08	548.79	2.879	25	6.7	0.18	0	0.00	TCS-3
103075	548.911	549.002	0.08	548.922	-0.011	25		0.18	0.176552		TCS-3A
103100	553.889	549.096	0.08	549.016	4.873	25		0.18	0		TCS-3A
103125	550.211	549.15	0.08	549.07	1.141	25		0.18	0		TCS-3A
103150	548.596	549.164	0.08	549.084	-0.488	25		0.18	0.176552		TCS-3A
103175	560.382	549.14	0.08	549.06	11.322	25		0.18	0		TCS-3A
103200	561.136	549.076	0.08	548.996	12.14	25		0.18	0		TCS-3A
103225	554.804	548.999	0.08	548.919	5.885	25		0.18	0		TCS-3A
103250	550.756	548.922	0.08	548.842	1.914	25		0.18	0		TCS-3A
103275	553.021	548.845	0.08	548.765	4.256	25	6.7	0.18	0	0.00	TCS-3
103300	548.502	548.768	0.08	548.688	-0.186	25	6.7	0.18	0.176552	29.57	TCS-3
103325	548.495	548.691	0.08	548.611	-0.116	25	6.7	0.18	0.176552	29.57	TCS-3
103350	548.451	548.614	0.08	548.534	-0.083	25		0.18	0.176552		TCS-3A
103375	551.652	548.537	0.08	548.457	3.195	25		0.18	0		TCS-3A
103400	554.287	548.46	0.08	548.38	5.907	25		0.18	0		TCS-3A
103425	558.68	548.383	0.08	548.303	10.377	25		0.18	0		TCS-3A
103450	555.343	548.305	0.08	548.225	7.118	25	6.7	0.18	0	0.00	TCS-3
103475	548.477	548.228	0.08	548.148	0.329	25	6.7	0.18	0.176552	29.57	TCS-3
103500	547.691	548.151	0.08	548.071	-0.38	25	6.7	0.18	0.176552	29.57	TCS-3
103525	547.31	548.074	0.08	547.994	-0.684	25	6.7	0.18	0.176552	29.57	TCS-3
103550	550.153	547.997	0.08	547.917	2.236	25	6.7	0.18	0	0.00	TCS-3
103575	547.624	547.92	0.08	547.84	-0.216	25	6.7	0.18	0.176552	29.57	TCS-3
103600	557.654	547.843	0.08	547.763	9.891	25		0.18	0		TCS-3A
103625	548.441	547.766	0.08	547.686	0.755	25		0.18	0		TCS-3A
103650	547.653	547.689	0.08	547.609	0.044	25	6.7	0.18	0.176552	29.57	TCS-4
103675	545.268	547.612	0.08	547.532	-2.264	25	6.7	0.18	0.176552	29.57	TCS-4
103700	543.335	547.535	0.08	547.455	-4.12	25		0.18	0.176552		TCS-3A
103725	555.441	547.458	0.08	547.378	8.063	25		0.18	0		TCS-3A
103750	549.631	547.381	0.08	547.301	2.33	25		0.18	0		TCS-3A
103775	551.099	547.304	0.08	547.224	3.875	25	6.7	0.18	0	0.00	TCS-3
103800	548.272	547.227	0.08	547.147	1.125	25	6.7	0.18	0	0.00	TCS-3
103825	546.449	547.149	0.08	547.069	-0.62	25	6.7	0.18	0.176552	29.57	TCS-3
103850	546.976	547.072	0.08	546.992	-0.016	25	6.7	0.18	0.176552	29.57	TCS-3
103875	547.85	546.995	0.08	546.915	0.935	25		0.18	0		TCS-3A
103900	551.824	546.918	0.08	546.838	4.986	25		0.18	0		TCS-3A
103925	548.201	546.841	0.08	546.761	1.44	25	6.7	0.18	0	0.00	TCS-3
103950	548.044	546.764	0.08	546.684	1.36	25	6.7	0.18	0	0.00	TCS-3
103975	546.912	546.687	0.08	546.607	0.305	25	6.7	0.18	0.176552	29.57	TCS-3
104000	546.475	546.61	0.08	546.53	-0.055	25	6.7	0.18	0.176552	29.57	TCS-4
104025	546.096	546.533	0.08	546.453	-0.357	25	6.7	0.18	0.176552	29.57	TCS-4
104050	546.257	546.456	0.08	546.376	-0.119	25	6.7	0.18	0.176552	29.57	TCS-3
104075	546.699	546.379	0.08	546.299	0.4	25	6.7	0.18	0.16	26.80	TCS-3
104100	545.429	546.302	0.08	546.222	-0.793	25	6.7	0.18	0.176552	29.57	TCS-3
104125	545.386	546.186	0.08	546.106	-0.72	25	6.7	0.18	0.176552	29.57	TCS-3
104150	546.325	545.89	0.08	545.81	0.515	25	6.7	0.18	0.045	7.54	TCS-3
104175	545.25	545.402	0.08	545.322	-0.072	25	6.7	0.18	0.176552	29.57	TCS-3
104200	544.859	544.74	0.08	544.66	0.199	25	6.7	0.18	0.176552	29.57	TCS-3
104225	547.579	544.048	0.08	543.968	3.611	25	6.7	0.18	0	0.00	TCS-3
104250	542.783	543.356	0.08	543.276	-0.493	25	6.7	0.18	0.176552	29.57	TCS-3
104275	542.111	542.675	0.08	542.595	-0.484	25	6.7	0.18	0.176552	29.57	TCS-4
104300	541.627	542.111	0.08	542.031	-0.404	25	6.7	0.18	0.176552	29.57	TCS-4
104325	541.44	541.689	0.08	541.609	-0.169	25	6.7	0.18	0.176552	29.57	TCS-3
104350	541.464	541.41	0.08	541.33	0.134	25	6.7	0.18	0.176552	29.57	TCS-3
104375	541.407	541.262	0.08	541.182	0.225	25	6.7	0.18	0.176552	29.57	TCS-3
104400	537.629	541.139	0.08	541.059	-3.43	25	6.7	0.18	0.176552	29.57	TCS-3
104425	540.998	541.016	0.08	540.936	0.062	25	6.7	0.18	0.176552	29.57	TCS-3
104450	540.908	540.894	0.08	540.814	0.094	25	6.7	0.18	0.176552	29.57	TCS-3
104475	541.691	540.771	0.08	540.691	1	25		0.18	0		TCS-3A
104500	549.412	540.648	0.08	540.568	8.844	25		0.18	0		TCS-3A
104525	542.788	540.525	0.08	540.445	2.343	25		0.18	0		TCS-3A
104550	540.035	540.403	0.08	540.323	-0.288	25		0.18	0.176552		TCS-3A
104575	541.487	540.274	0.08	540.194	1.293	25		0.18	0		TCS-3A
104600	546.519	540.11	0.08	540.03	6.489	25		0.18	0		TCS-3A
104625	541.483	539.909	0.08	539.829	1.654	25	6.7	0.18	0	0.00	TCS-3
104650	539.994	539.671	0.08	539.591	0.403	25	6.7	0.18	0.157	26.30	TCS-3
104675	543.594	539.426	0.08	539.346	4.248	25	6.7	0.18	0	0.00	TCS-3
104700	541.028	539.181	0.08	539.101	1.927	25	6.7	0.18	0	0.00	TCS-3
104725	539.536	538.935	0.08	538.855	0.681	25	6.7	0.18	0	0.00	TCS-3
104750	540.428	538.69	0.08	538.61	1.818	25	6.7	0.18	0	0.00	TCS-3



Chainage	FRL	EGL	Avg.Ext. Bituminou s layer thck (m)	EGL- Bituminous layer	Difference after Scarificati on (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantlin g thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
104775	538.237	538.445	0.08	538.365	-0.128	25	6.7	0.18	0.176552	29.57	TCS-3
104800	537.935	538.2	0.08	538.12	-0.185	25	6.7	0.18	0.176552	29.57	TCS-3
104825	541.946	537.955	0.08	537.875	4.071	25	6.7	0.18	0	0.00	TCS-3
104850	537.726	537.736	0.08	537.656	0.07	25	6.7	0.18	0.176552	29.57	TCS-3
104875	537.291	537.556	0.08	537.476	-0.185	25	6.7	0.18	0.176552	29.57	TCS-3
104900	537.189	537.416	0.08	537.336	-0.147	25	6.7	0.18	0.176552	29.57	TCS-3
104925	536.988	537.316	0.08	537.236	-0.248	25	6.7	0.18	0.176552	29.57	TCS-3
104950	537.146	537.23	0.08	537.15	-0.004	25	6.7	0.18	0.176552	29.57	TCS-3
104975	537	537.144	0.08	537.064	-0.064	25	6.7	0.18	0.176552	29.57	TCS-3
105000	537.106	537.058	0.08	536.978	0.128	25	6.7	0.18	0.176552	29.57	TCS-3
105025	536.855	536.972	0.08	536.892	-0.037	25	6.7	0.18	0.176552	29.57	TCS-5
105050	536.742	536.886	0.08	536.806	-0.064	25	6.7	0.18	0.176552	29.57	TCS-5
105075	536.654	536.779	0.08	536.699	-0.045	25	6.7	0.18	0.176552	29.57	TCS-5
105100	540.367	536.619	0.08	536.539	3.828	25	6.7	0.18	0	0.00	TCS-5
105125	550.422	536.405	0.08	536.325	14.097	25	6.7	0.18	0	0.00	TCS-7A
105150	538.979	536.139	0.08	536.059	2.92	25	6.7	0.18	0	0.00	TCS-7A
105175	536.079	535.82	0.08	535.74	0.339	25		0.18	0.176552		TCS-3A
105200	542.176	535.478	0.08	535.398	6.778	25		0.18	0		TCS-3A
105225	538.287	535.137	0.08	535.057	3.23	25	6.7	0.18	0	0.00	TCS-7A
105250	550.695	534.796	0.08	534.716	15.979	25	6.7	0.18	0	0.00	TCS-7A
105275	535.116	534.454	0.08	534.374	0.742	25	6.7	0.18	0	0.00	TCS-3
105300	533.829	534.097	0.08	534.017	-0.188	25	6.7	0.18	0.176552	29.57	TCS-3
105325	534.748	533.72	0.08	533.64	1.108	25	6.7	0.18	0	0.00	TCS-3
105350	534.74	533.322	0.08	533.242	1.498	25	6.7	0.18	0	0.00	TCS-3
105375	534.406	532.915	0.08	532.835	1.571	25	6.7	0.18	0	0.00	TCS-12
105400	534.703	532.508	0.08	532.428	2.275	25	6.7	0.18	0	0.00	TCS-12
105425	534.268	532.101	0.08	532.021	2.247	25	6.7	0.18	0	0.00	TCS-12
105450	533.071	531.694	0.08	531.614	1.457	25	6.7	0.18	0	0.00	TCS-12
105475	531.704	531.287	0.08	531.207	0.497	25	6.7	0.18	0.063	10.55	TCS-12
105500	530.555	530.88	0.08	530.8	-0.245	25	6.7	0.18	0.176552	29.57	TCS-3
105525	530.522	530.473	0.08	530.393	0.129	25	6.7	0.18	0.176552	29.57	TCS-3
105550	531.017	530.066	0.08	529.986	1.031	25	6.7	0.18	0	0.00	TCS-13
105575	529.712	529.659	0.08	529.579	0.133	25	6.7	0.18	0.176552	29.57	TCS-13
105600	528.433	529.333	0.08	529.253	-0.82	25	6.7	0.18	0.176552	29.57	TCS-13
105625	533.462	529.158	0.08	529.078	4.384	25	6.7	0.18	0	0.00	TCS-13
105650	528.488	529.134	0.08	529.054	-0.566	25	6.7	0.18	0.176552	29.57	TCS-13
105675	528.774	529.21	0.08	529.13	-0.356	25	6.7	0.18	0.176552	29.57	TCS-13
105700	528.849	529.287	0.08	529.207	-0.358	25	6.7	0.18	0.176552	29.57	TCS-13
105725	528.765	529.365	0.08	529.285	-0.52	25		0.18	0.176552		TCS-7B
105750	537.777	529.435	0.08	529.355	8.422	25		0.18	0		TCS-7B
105775	530.536	529.49	0.08	529.41	1.126	25		0.18	0		TCS-7B
105800	535.37	529.53	0.08	529.45	5.92	25		0.18	0		TCS-7B
105825	528.889	529.556	0.08	529.476	-0.587	25		0.18	0.176552		TCS-7B
105850	534.73	529.566	0.08	529.486	5.244	25		0.18	0		TCS-7B
105875	543.514	529.562	0.08	529.482	14.032	25		0.18	0		TCS-7B
105900	538.629	529.543	0.08	529.463	9.166	25	6.7	0.18	0	0.00	TCS-13
105925	529.392	529.509	0.08	529.429	-0.037	25	6.7	0.18	0.176552	29.57	TCS-13
105950	534.689	529.46	0.08	529.38	5.309	25	6.7	0.18	0	0.00	TCS-13
105975	530.21	529.397	0.08	529.317	0.893	25	6.7	0.18	0	0.00	TCS-13
106000	542.481	529.326	0.08	529.246	13.235	25	6.7	0.18	0	0.00	TCS-13
106025	533.484	529.255	0.08	529.175	4.309	25	6.7	0.18	0	0.00	TCS-13
106050	538.187	529.184	0.08	529.104	9.083	25		0.18	0		TCS-7B
106075	538.244	529.114	0.08	529.034	9.21	25		0.18	0		TCS-7B
106100	536.002	529.043	0.08	528.963	7.039	25	6.7	0.18	0	0.00	TCS-13
106125	528.605	528.972	0.08	528.892	-0.287	25	6.7	0.18	0.176552	29.57	TCS-13
106150	528.019	528.902	0.08	528.822	-0.803	25	6.7	0.18	0.176552	29.57	TCS-13
106175	530.405	528.831	0.08	528.751	1.654	25	6.7	0.18	0	0.00	TCS-13
106200	534.955	528.76	0.08	528.68	6.275	25	6.7	0.18	0	0.00	TCS-13
106225	528.01	528.689	0.08	528.609	-0.599	25	6.7	0.18	0.176552	29.57	TCS-3
106250	527.781	528.619	0.08	528.539	-0.758	25	6.7	0.18	0.176552	29.57	TCS-3
106275	529.224	528.548	0.08	528.468	0.756	25	6.7	0.18	0	0.00	TCS-3
106300	527.555	528.477	0.08	528.397	-0.842	25	6.7	0.18	0.176552	29.57	TCS-12
106325	536.077	528.407	0.08	528.327	7.75	25	6.7	0.18	0	0.00	TCS-12
106350	528.818	528.336	0.08	528.256	0.562	25	6.7	0.18	0	0.00	TCS-3
106375	527.379	528.265	0.08	528.185	-0.806	25	6.7	0.18	0.176552	29.57	TCS-3
106400	528.925	528.194	0.08	528.114	0.811	25	6.7	0.18	0	0.00	TCS-3
106425	529.127	528.124	0.08	528.044	1.083	25	6.7	0.18	0	0.00	TCS-3
106450	527.716	528.053	0.08	527.973	-0.257	25		0.18	0.176552		TCS-3A
106475	536.441	527.982	0.08	527.902	8.539	25		0.18	0		TCS-3A
106500	533.785	527.937	0.08	527.857	5.928	25		0.18	0		TCS-3A
106525	533.055	527.941	0.08	527.861	5.194	25	6.7	0.18	0	0.00	TCS-3
106550	527.615	527.994	0.08	527.914	-0.299	25	6.7	0.18	0.176552	29.57	TCS-3



Chainage	FRL	EGL	Avg.Ext. Bituminou s layer thck (m)	EGL- Bituminous layer	Difference after Scarificati on (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantlin g thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
106575	527.666	528.08	0.08	528	-0.334	25	6.7	0.18	0.176552	29.57	TCS-3
106600	528.234	528.166	0.08	528.086	0.148	25		0.18	0.176552		TCS-3A
106625	527.589	528.253	0.08	528.173	-0.584	25		0.18	0.176552		TCS-3A
106650	527.799	528.34	0.08	528.26	-0.461	25		0.18	0.176552		TCS-3A
106675	528.432	528.426	0.08	528.346	0.086	25	6.7	0.18	0.176552	29.57	TCS-5
106700	528.149	528.513	0.08	528.433	-0.284	25	6.7	0.18	0.176552	29.57	TCS-5
106725	530.187	528.6	0.08	528.52	1.667	25	6.7	0.18	0	0.00	TCS-5
106750	528.318	528.686	0.08	528.606	-0.288	25	6.7	0.18	0.176552	29.57	TCS-5
106775	531.525	528.768	0.08	528.688	2.837	25		0.18	0		TCS-5A
106800	534.766	528.829	0.08	528.749	6.017	25		0.18	0		TCS-5A
106825	536.847	528.87	0.08	528.79	8.057	25		0.18	0		TCS-5A
106850	531.954	528.891	0.08	528.811	3.143	25	6.7	0.18	0	0.00	TCS-3
106875	533.512	528.891	0.08	528.811	4.701	25	6.7	0.18	0	0.00	TCS-3
106900	528.372	528.871	0.08	528.791	-0.419	25	6.7	0.18	0.176552	29.57	TCS-3
106925	528.799	528.831	0.08	528.751	0.048	25	6.7	0.18	0.176552	29.57	TCS-3
106950	539.718	528.769	0.08	528.689	11.029	25	6.7	0.18	0	0.00	TCS-3
106975	527.604	528.693	0.08	528.613	-1.009	25	6.7	0.18	0.176552	29.57	TCS-3
107000	528.409	528.616	0.08	528.536	-0.127	25	6.7	0.18	0.176552	29.57	TCS-3
107025	531.295	528.539	0.08	528.459	2.836	25	6.7	0.18	0	0.00	TCS-3
107050	527.935	528.462	0.08	528.382	-0.447	25	6.7	0.18	0.176552	29.57	TCS-3
107075	527.79	528.385	0.08	528.305	-0.515	25	6.7	0.18	0.176552	29.57	TCS-3
107100	528.13	528.308	0.08	528.228	-0.098	25	6.7	0.18	0.176552	29.57	TCS-3
107125	527.626	528.231	0.08	528.151	-0.525	25	6.7	0.18	0.176552	29.57	TCS-3
107150	528.473	528.154	0.08	528.074	0.399	25	6.7	0.18	0.161	26.97	TCS-3
107175	527.771	528.076	0.08	527.996	-0.225	25	6.7	0.18	0.176552	29.57	TCS-3
107200	528.132	527.999	0.08	527.919	0.213	25	6.7	0.18	0.176552	29.57	TCS-3
107225	529.048	527.922	0.08	527.842	1.206	25	6.7	0.18	0	0.00	TCS-3
107250	526.892	527.847	0.08	527.767	-0.875	25	6.7	0.18	0.176552	29.57	TCS-3
107275	527.331	527.802	0.08	527.722	-0.391	25	6.7	0.18	0.176552	29.57	TCS-3
107300	528.996	527.798	0.08	527.718	1.278	25	6.7	0.18	0	0.00	TCS-3
107325	527.56	527.833	0.08	527.753	-0.193	25	6.7	0.18	0.176552	29.57	TCS-3
107350	531.435	527.906	0.08	527.826	3.609	25	6.7	0.18	0	0.00	TCS-3
107375	530.502	527.989	0.08	527.909	2.593	25	6.7	0.18	0	0.00	TCS-3
107400	527.679	528.071	0.08	527.991	-0.312	25	6.7	0.18	0.176552	29.57	TCS-3
107425	529.922	528.154	0.08	528.074	1.848	25	6.7	0.18	0	0.00	TCS-3
107450	536.256	528.237	0.08	528.157	8.099	25	6.7	0.18	0	0.00	TCS-3
107475	527.973	528.319	0.08	528.239	-0.266	25	6.7	0.18	0.176552	29.57	TCS-3
107500	529.111	528.402	0.08	528.322	0.789	25	6.7	0.18	0	0.00	TCS-3
107525	530.035	528.485	0.08	528.405	1.63	25	6.7	0.18	0	0.00	TCS-3
107550	528.798	528.567	0.08	528.487	0.311	25	6.7	0.18	0.176552	29.57	TCS-3
107575	531.191	528.65	0.08	528.57	2.621	25	6.7	0.18	0	0.00	TCS-3
107600	527.776	528.733	0.08	528.653	-0.877	25	6.7	0.18	0.176552	29.57	TCS-4
107625	527.613	528.815	0.08	528.735	-1.122	25	6.7	0.18	0.176552	29.57	TCS-4
107650	528.139	528.898	0.08	528.818	-0.679	25	6.7	0.18	0.176552	29.57	TCS-4
107675	528.112	528.968	0.08	528.888	-0.776	25	6.7	0.18	0.176552	29.57	TCS-4
107700	530.613	529.018	0.08	528.938	1.675	25		0.18	0		TCS-3A
107725	538.135	529.048	0.08	528.968	9.167	25		0.18	0		TCS-3A
107750	528.297	529.058	0.08	528.978	-0.681	25	6.7	0.18	0.176552	29.57	TCS-4
107775	528.139	529.047	0.08	528.967	-0.828	25	6.7	0.18	0.176552	29.57	TCS-4
107800	534.371	529.017	0.08	528.937	5.434	25	6.7	0.18	0	0.00	TCS-3
107825	528.021	528.965	0.08	528.885	-0.864	25	6.7	0.18	0.176552	29.57	TCS-3
107850	528.216	528.894	0.08	528.814	-0.598	25	6.7	0.18	0.176552	29.57	TCS-3
107875	530.8	528.815	0.08	528.735	2.065	25	6.7	0.18	0	0.00	TCS-3
107900	528.561	528.736	0.08	528.656	-0.095	25	6.7	0.18	0.176552	29.57	TCS-3
107925	528.115	528.656	0.08	528.576	-0.461	25	6.7	0.18	0.176552	29.57	TCS-3
107950	533.557	528.577	0.08	528.497	5.06	25	6.7	0.18	0	0.00	TCS-3
107975	527.875	528.507	0.08	528.427	-0.552	25	6.7	0.18	0.176552	29.57	TCS-3
108000	528.952	528.479	0.08	528.399	0.553	25	6.7	0.18	0.007	1.17	TCS-3
108025	528.599	528.497	0.08	528.417	0.182	25		0.18	0.176552		TCS-3A
108050	538.898	528.559	0.08	528.479	10.419	25		0.18	0		TCS-3A
108075	531.68	528.656	0.08	528.576	3.104	25		0.18	0		TCS-3A
108100	528.814	528.756	0.08	528.676	0.138	25		0.18	0.176552		TCS-3A
108125	533.656	528.856	0.08	528.776	4.88	25		0.18	0		TCS-3A
108150	533.027	528.956	0.08	528.876	4.151	25		0.18	0		TCS-3A
108175	532.085	529.056	0.08	528.976	3.109	25	6.7	0.18	0	0.00	TCS-3
108200	528.762	529.156	0.08	529.076	-0.314	25	6.7	0.18	0.176552	29.57	TCS-3
108225	529.132	529.257	0.08	529.177	-0.045	25	6.7	0.18	0.176552	29.57	TCS-3
108250	529.191	529.357	0.08	529.277	-0.086	25	6.7	0.18	0.176552	29.57	TCS-3
108275	529.158	529.457	0.08	529.377	-0.219	25	6.7	0.18	0.176552	29.57	TCS-3
108300	529.477	529.554	0.08	529.474	0.003	25	6.7	0.18	0.176552	29.57	TCS-3
108325	529.57	529.644	0.08	529.564	0.006	25	6.7	0.18	0.176552	29.57	TCS-3
108350	535.459	529.726	0.08	529.646	5.813	25	6.7	0.18	0	0.00	TCS-3



Chainage	FRL	EGL	Avg.Ext. Bituminous layer thick (m)	EGL- Bituminous layer	Difference after Scarification (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantling thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
108375	531.504	529.801	0.08	529.721	1.783	25	6.7	0.18	0	0.00	TCS-3
108400	531.224	529.876	0.08	529.796	1.428	25	6.7	0.18	0	0.00	TCS-3
108425	530.294	529.95	0.08	529.87	0.424	25	6.7	0.18	0.136	22.78	TCS-3
108450	530.027	530.025	0.08	529.945	0.082	25	6.7	0.18	0.176552	29.57	TCS-3
108475	529.781	530.099	0.08	530.019	-0.238	25	6.7	0.18	0.176552	29.57	TCS-3
108500	531.286	530.174	0.08	530.094	1.192	25	6.7	0.18	0	0.00	TCS-3
108525	529.638	530.248	0.08	530.168	-0.53	25	6.7	0.18	0.176552	29.57	TCS-3
108550	529.348	530.323	0.08	530.243	-0.895	25	6.7	0.18	0.176552	29.57	TCS-3
108575	529.893	530.397	0.08	530.317	-0.424	25	6.7	0.18	0.176552	29.57	TCS-3
108600	530.081	530.472	0.08	530.392	-0.311	25	6.7	0.18	0.176552	29.57	TCS-3
108625	529.82	530.546	0.08	530.466	-0.646	25	6.7	0.18	0.176552	29.57	TCS-3
108650	530.035	530.621	0.08	530.541	-0.506	25	6.7	0.18	0.176552	29.57	TCS-3
108675	529.81	530.695	0.08	530.615	-0.805	25	6.7	0.18	0.176552	29.57	TCS-3
108700	529.778	530.77	0.08	530.69	-0.912	25	6.7	0.18	0.176552	29.57	TCS-3
108725	531.109	530.844	0.08	530.764	0.345	25	6.7	0.18	0.176552	29.57	TCS-3
108750	529.769	530.918	0.08	530.838	-1.069	25	6.7	0.18	0.176552	29.57	TCS-3
108775	535.726	530.993	0.08	530.913	4.813	25	6.7	0.18	0	0.00	TCS-3
108800	532.301	531.066	0.08	530.986	1.315	25	6.7	0.18	0	0.00	TCS-3
108825	530.62	531.124	0.08	531.044	-0.424	25		0.18	0.176552		TCS-3A
108850	538.346	531.163	0.08	531.083	7.263	25		0.18	0		TCS-3A
108875	533.238	531.183	0.08	531.103	2.135	25		0.18	0		TCS-3A
108900	538.656	531.184	0.08	531.104	7.552	25		0.18	0		TCS-3A
108925	531.155	531.165	0.08	531.085	0.07	25	6.7	0.18	0.176552	29.57	TCS-3
108950	530.52	531.128	0.08	531.048	-0.528	25	6.7	0.18	0.176552	29.57	TCS-3
108975	529.562	531.071	0.08	530.991	-1.429	25	6.7	0.18	0.176552	29.57	TCS-3
109000	533.628	530.996	0.08	530.916	2.712	25	6.7	0.18	0	0.00	TCS-3
109025	529.903	530.918	0.08	530.838	-0.935	25	6.7	0.18	0.176552	29.57	TCS-3
109050	531.006	530.839	0.08	530.759	0.247	25	6.7	0.18	0.176552	29.57	TCS-3
109075	532.716	530.76	0.08	530.68	2.036	25	6.7	0.18	0	0.00	TCS-3
109100	530.656	530.682	0.08	530.602	0.054	25	6.7	0.18	0.176552	29.57	TCS-3
109125	529.385	530.603	0.08	530.523	-1.138	25	6.7	0.18	0.176552	29.57	TCS-3
109150	529.6	530.524	0.08	530.444	-0.844	25	6.7	0.18	0.176552	29.57	TCS-3
109175	529.805	530.446	0.08	530.366	-0.561	25	6.7	0.18	0.176552	29.57	TCS-3
109200	530.034	530.367	0.08	530.287	-0.253	25	6.7	0.18	0.176552	29.57	TCS-3
109225	530.314	530.288	0.08	530.208	0.106	25	6.7	0.18	0.176552	29.57	TCS-3
109250	534.768	530.21	0.08	530.13	4.638	25		0.18	0		TCS-3A
109275	535.424	530.131	0.08	530.051	5.373	25	6.7	0.18	0	0.00	TCS-3
109300	530.135	530.088	0.08	530.008	0.127	25	6.7	0.18	0.176552	29.57	TCS-3
109325	530.059	530.154	0.08	530.074	-0.015	25	6.7	0.18	0.176552	29.57	TCS-3
109350	530.133	530.33	0.08	530.25	-0.117	25	6.7	0.18	0.176552	29.57	TCS-3
109375	530.564	530.596	0.08	530.516	0.048	25	6.7	0.18	0.176552	29.57	TCS-3
109400	530.987	530.87	0.08	530.79	0.197	25	6.7	0.18	0.176552	29.57	TCS-3
109425	531.364	531.145	0.08	531.065	0.299	25	6.7	0.18	0.176552	29.57	TCS-3
109450	531.858	531.419	0.08	531.339	0.519	25	6.7	0.18	0.041	6.87	TCS-3
109475	532.176	531.681	0.08	531.601	0.575	25	6.7	0.18	0	0.00	TCS-3
109500	532.077	531.849	0.08	531.769	0.308	25	6.7	0.18	0.176552	29.57	TCS-3
109525	532.227	531.904	0.08	531.824	0.403	25	6.7	0.18	0.157	26.30	TCS-3
109550	538.491	531.852	0.08	531.772	6.719	25	6.7	0.18	0	0.00	TCS-3
109575	532.548	531.769	0.08	531.689	0.859	25	6.7	0.18	0	0.00	TCS-3
109600	531.869	531.686	0.08	531.606	0.263	25	6.7	0.18	0.176552	29.57	TCS-3
109625	535.36	531.603	0.08	531.523	3.837	25	6.7	0.18	0	0.00	TCS-12
109650	544.192	531.52	0.08	531.44	12.752	25	6.7	0.18	0	0.00	TCS-12
109675	533.091	531.437	0.08	531.357	1.734	25	6.7	0.18	0	0.00	TCS-3
109700	533.148	531.354	0.08	531.274	1.874	25	6.7	0.18	0	0.00	TCS-3
109725	535.367	531.271	0.08	531.191	4.176	25	6.7	0.18	0	0.00	TCS-3
109750	539.656	531.188	0.08	531.108	8.548	25	6.7	0.18	0	0.00	TCS-3
109775	531.553	531.105	0.08	531.025	0.528	25	6.7	0.18	0.032	5.36	TCS-3
109800	532.17	531.022	0.08	530.942	1.228	25	6.7	0.18	0	0.00	TCS-3
109825	530.553	530.94	0.08	530.86	-0.307	25		0.18	0.176552		TCS-3A
109850	532.267	530.857	0.08	530.777	1.49	25		0.18	0		TCS-3A
109875	537.747	530.774	0.08	530.694	7.053	25	6.7	0.18	0	0.00	TCS-3
109900	530.049	530.695	0.08	530.615	-0.566	25	6.7	0.18	0.176552	29.57	TCS-3
109925	530.702	530.66	0.08	530.58	0.122	25	6.7	0.18	0.176552	29.57	TCS-3
109950	530.332	530.675	0.08	530.595	-0.263	25	6.7	0.18	0.176552	29.57	TCS-4
109975	530.498	530.74	0.08	530.66	-0.162	25	6.7	0.18	0.176552	29.57	TCS-4
110000	530.686	530.82	0.08	530.74	-0.054	25	6.7	0.18	0.176552	29.57	TCS-12
110025	532.899	530.9	0.08	530.82	2.079	25	6.7	0.18	0	0.00	TCS-12
110050	534.727	530.98	0.08	530.9	3.827	25	6.7	0.18	0	0.00	TCS-12
110075	537.048	531.06	0.08	530.98	6.068	25	6.7	0.18	0	0.00	TCS-12
110100	534.371	531.14	0.08	531.06	3.311	25		0.18	0		TCS-3A
110125	533.082	531.22	0.08	531.14	1.942	25		0.18	0		TCS-3A
110150	532.575	531.3	0.08	531.22	1.355	25		0.18	0		TCS-3A



Chainage	FRL	EGL	Avg.Ext. Bituminou s layer thck (m)	EGL- Bituminous layer	Difference after Scarificati on (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantlin g thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
110175	532.81	531.38	0.08	531.3	1.51	25		0.18	0		TCS-3A
110200	530.656	531.46	0.08	531.38	-0.724	25		0.18	0.176552		TCS-3A
110225	530.729	531.54	0.08	531.46	-0.731	25		0.18	0.176552		TCS-3A
110250	531.144	531.62	0.08	531.54	-0.396	25		0.18	0.176552		TCS-3A
110275	538.724	531.7	0.08	531.62	7.104	25		0.18	0		TCS-3A
110300	532.92	531.775	0.08	531.695	1.225	25		0.18	0		TCS-3A
110325	533.752	531.807	0.08	531.727	2.025	25	6.7	0.18	0	0.00	TCS-4
110350	531.386	531.788	0.08	531.708	-0.322	25	6.7	0.18	0.176552	29.57	TCS-4
110375	531.123	531.719	0.08	531.639	-0.516	25	6.7	0.18	0.176552	29.57	TCS-4
110400	531.12	531.636	0.08	531.556	-0.436	25	6.7	0.18	0.176552	29.57	TCS-7A
110425	535.488	531.552	0.08	531.472	4.016	25	6.7	0.18	0	0.00	TCS-7A
110450	549.055	531.469	0.08	531.389	17.666	25	6.7	0.18	0	0.00	TCS-7A
110475	540.172	531.386	0.08	531.306	8.866	25	6.7	0.18	0	0.00	TCS-3
110500	531.851	531.302	0.08	531.222	0.629	25	6.7	0.18	0	0.00	TCS-3
110525	531.46	531.219	0.08	531.139	0.321	25	6.7	0.18	0.176552	29.57	TCS-3
110550	531.835	531.135	0.08	531.055	0.78	25	6.7	0.18	0	0.00	TCS-3
110575	530.997	531.052	0.08	530.972	0.025	25	6.7	0.18	0.176552	29.57	TCS-3
110600	530.757	530.969	0.08	530.889	-0.132	25	6.7	0.18	0.176552	29.57	TCS-3
110625	534.45	530.885	0.08	530.805	3.645	25	6.7	0.18	0	0.00	TCS-3
110650	532.769	530.802	0.08	530.722	2.047	25	6.7	0.18	0	0.00	TCS-3
110675	530.571	530.718	0.08	530.638	-0.067	25	6.7	0.18	0.176552	29.57	TCS-3
110700	530.286	530.635	0.08	530.555	-0.269	25		0.18	0.176552		TCS-3A
110725	534.909	530.564	0.08	530.484	4.425	25		0.18	0		TCS-3A
110750	533.235	530.519	0.08	530.439	2.796	25	6.7	0.18	0	0.00	TCS-3
110775	530.358	530.501	0.08	530.421	-0.063	25	6.7	0.18	0.176552	29.57	TCS-3
110800	530.371	530.5	0.08	530.42	-0.049	25		0.18	0.176552		TCS-3A
110825	533.779	530.5	0.08	530.42	3.359	25		0.18	0		TCS-3A
110850	536.88	530.5	0.08	530.42	6.46	25		0.18	0		TCS-3A
110875	533.532	530.491	0.08	530.411	3.121	25		0.18	0		TCS-3A
110900	543.391	530.457	0.08	530.377	13.014	25		0.18	0		TCS-3A
110925	532.59	530.397	0.08	530.317	2.273	25		0.18	0		TCS-3A
110950	530.326	530.316	0.08	530.236	0.09	25	6.7	0.18	0.176552	29.57	TCS-3
110975	529.974	530.234	0.08	530.154	-0.18	25	6.7	0.18	0.176552	29.57	TCS-3
111000	532.927	530.152	0.08	530.072	2.855	25	6.7	0.18	0	0.00	TCS-3
111025	529.848	530.07	0.08	529.99	-0.142	25	6.7	0.18	0.176552	29.57	TCS-3
111050	530.989	529.988	0.08	529.908	1.081	25		0.18	0		TCS-3A
111075	543.075	529.906	0.08	529.826	13.249	25		0.18	0		TCS-3A
111100	538.367	529.824	0.08	529.744	8.623	25		0.18	0		TCS-3A
111125	531.144	529.742	0.08	529.662	1.482	25	6.7	0.18	0	0.00	TCS-7A
111150	529.331	529.66	0.08	529.58	-0.249	25	6.7	0.18	0.176552	29.57	TCS-7A
111175	536.885	529.65	0.08	529.57	7.315	25	6.7	0.18	0	0.00	TCS-7A
111200	544.918	529.806	0.08	529.726	15.192	25	6.7	0.18	0	0.00	TCS-7A
111225	539.524	530.127	0.08	530.047	9.477	25	6.7	0.18	0	0.00	TCS-5
111250	533.137	530.614	0.08	530.534	2.603	25	6.7	0.18	0	0.00	TCS-5
111275	535.965	531.266	0.08	531.186	4.779	25	6.7	0.18	0	0.00	TCS-5
111300	532.831	532.083	0.08	532.003	0.828	25	6.7	0.18	0	0.00	TCS-3
111325	534.224	532.993	0.08	532.913	1.311	25	6.7	0.18	0	0.00	TCS-3
111350	534.358	533.903	0.08	533.823	0.535	25	6.7	0.18	0.025	4.19	TCS-3
111375	534.687	534.813	0.08	534.733	-0.046	25	6.7	0.18	0.176552	29.57	TCS-3
111400	536.41	535.723	0.08	535.643	0.767	25		0.18	0		TCS-3A
111425	546.673	536.633	0.08	536.553	10.12	25		0.18	0		TCS-3A
111450	541.969	537.541	0.08	537.461	4.508	25		0.18	0		TCS-3A
111475	538.02	538.365	0.08	538.285	-0.265	25	6.7	0.18	0.176552	29.57	TCS-7
111500	539.516	539.067	0.08	538.987	0.529	25	6.7	0.18	0.031	5.19	TCS-7
111525	541.396	539.646	0.08	539.566	1.83	25	6.7	0.18	0	0.00	TCS-7
111550	541.544	540.165	0.08	540.085	1.459	25	6.7	0.18	0	0.00	TCS-7
111575	541.586	540.683	0.08	540.603	0.983	25	6.7	0.18	0	0.00	TCS-7
111600	540.702	541.201	0.08	541.121	-0.419	25	6.7	0.18	0.176552	29.57	TCS-7
111625	541.185	541.719	0.08	541.639	-0.454	25	6.7	0.18	0.176552	29.57	TCS-7
111650	543.384	542.237	0.08	542.157	1.227	25	6.7	0.18	0	0.00	TCS-7
111675	542.746	542.755	0.08	542.675	0.071	25	6.7	0.18	0.176552	29.57	TCS-7
111700	543.14	543.273	0.08	543.193	-0.053	25	6.7	0.18	0.176552	29.57	TCS-7
111725	543.574	543.791	0.08	543.711	-0.137	25	6.7	0.18	0.176552	29.57	TCS-7
111750	544.142	544.33	0.08	544.25	-0.108	25	6.7	0.18	0.176552	29.57	TCS-7
111775	544.679	544.933	0.08	544.853	-0.174	25	6.7	0.18	0.176552	29.57	TCS-7
111800	545.748	545.604	0.08	545.524	0.224	25	6.7	0.18	0.176552	29.57	TCS-3
111825	546.718	546.329	0.08	546.249	0.469	25	6.7	0.18	0.091	15.24	TCS-3
111850	547.433	547.06	0.08	546.98	0.453	25	6.7	0.18	0.107	17.92	TCS-3
111875	548.364	547.791	0.08	547.711	0.653	25	6.7	0.18	0	0.00	TCS-3
111900	549.215	548.522	0.08	548.442	0.773	25	6.7	0.18	0	0.00	TCS-3
111925	550.069	549.254	0.08	549.174	0.895	25	6.7	0.18	0	0.00	TCS-3
111950	550.459	549.985	0.08	549.905	0.554	25	6.7	0.18	0.006	1.01	TCS-3



Chainage	FRL	EGL	Avg.Ext. Bituminou s layer thck (m)	EGL- Bituminous layer	Difference after Scarificati on (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantlin g thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
111975	550.773	550.716	0.08	550.636	0.137	25	6.7	0.18	0.176552	29.57	TCS-3
112000	552.982	551.447	0.08	551.367	1.615	25	6.7	0.18	0	0.00	TCS-3
112025	552.148	552.178	0.08	552.098	0.05	25	6.7	0.18	0.176552	29.57	TCS-3
112050	552.528	552.909	0.08	552.829	-0.301	25	6.7	0.18	0.176552	29.57	TCS-3
112075	553.049	553.64	0.08	553.56	-0.511	25	6.7	0.18	0.176552	29.57	TCS-3
112100	555.4	554.371	0.08	554.291	1.109	25	6.7	0.18	0	0.00	TCS-3
112125	556.983	555.103	0.08	555.023	1.96	25	6.7	0.18	0	0.00	TCS-3
112150	555.974	555.834	0.08	555.754	0.22	25	6.7	0.18	0.176552	29.57	TCS-5
112175	556.04	556.58	0.08	556.5	-0.46	25	6.7	0.18	0.176552	29.57	TCS-5
112200	557.616	557.367	0.08	557.287	0.329	25	6.7	0.18	0.176552	29.57	TCS-5
112225	558.307	558.197	0.08	558.117	0.19	25	6.7	0.18	0.176552	29.57	TCS-5
112250	559.638	559.061	0.08	558.981	0.657	25	6.7	0.18	0	0.00	TCS-5
112275	561.388	559.927	0.08	559.847	1.541	25	6.7	0.18	0	0.00	TCS-5
112300	561.38	560.793	0.08	560.713	0.667	25	6.7	0.18	0	0.00	TCS-5
112325	562.156	561.659	0.08	561.579	0.577	25	6.7	0.18	0	0.00	TCS-5
112350	568.363	562.525	0.08	562.445	5.918	25	6.7	0.18	0	0.00	TCS-5
112375	564.755	563.391	0.08	563.311	1.444	25	6.7	0.18	0	0.00	TCS-5
112400	563.974	564.258	0.08	564.178	-0.204	25	6.7	0.18	0.176552	29.57	TCS-5
112425	565.78	565.124	0.08	565.044	0.736	25	6.7	0.18	0	0.00	TCS-5
112450	569.873	565.99	0.08	565.91	3.963	25	6.7	0.18	0	0.00	TCS-5
112475	566.111	566.856	0.08	566.776	-0.665	25	6.7	0.18	0.176552	29.57	TCS-5
112500	566.822	567.722	0.08	567.642	-0.82	25	6.7	0.18	0.176552	29.57	TCS-5
112525	567.708	568.588	0.08	568.508	-0.8	25	6.7	0.18	0.176552	29.57	TCS-5
112550	569.098	569.455	0.08	569.375	-0.277	25	6.7	0.18	0.176552	29.57	TCS-3
112575	571.066	570.321	0.08	570.241	0.825	25	6.7	0.18	0	0.00	TCS-3
112600	573.786	571.187	0.08	571.107	2.679	25	6.7	0.18	0	0.00	TCS-3
112625	584.062	572.053	0.08	571.973	12.089	25	6.7	0.18	0	0.00	TCS-3
112650	573.844	572.919	0.08	572.839	1.005	25	6.7	0.18	0	0.00	TCS-3
112675	573.974	573.785	0.08	573.705	0.269	25	6.7	0.18	0.176552	29.57	TCS-3
112700	574.701	574.652	0.08	574.572	0.129	25	6.7	0.18	0.176552	29.57	TCS-3
112725	575.022	575.518	0.08	575.438	-0.416	25	6.7	0.18	0.176552	29.57	TCS-3
112750	581.201	576.38	0.08	576.3	4.901	25	6.7	0.18	0	0.00	TCS-3
112775	581.087	577.197	0.08	577.117	3.97	25	6.7	0.18	0	0.00	TCS-3
112800	577.484	577.958	0.08	577.878	-0.394	25	6.7	0.18	0.176552	29.57	TCS-3
112825	578.067	578.662	0.08	578.582	-0.515	25	6.7	0.18	0.176552	29.57	TCS-3
112850	579.643	579.311	0.08	579.231	0.412	25	6.7	0.18	0.148	24.79	TCS-3
112875	579.723	579.904	0.08	579.824	-0.101	25	6.7	0.18	0.176552	29.57	TCS-3
112900	580.504	580.44	0.08	580.36	0.144	25	6.7	0.18	0.176552	29.57	TCS-3
112925	580.706	580.921	0.08	580.841	-0.135	25		0.18	0.176552		TCS-3A
112950	587.484	581.349	0.08	581.269	6.215	25		0.18	0		TCS-3A
112975	589.117	581.767	0.08	581.687	7.43	25		0.18	0		TCS-3A
113000	587.167	582.184	0.08	582.104	5.063	25	6.7	0.18	0	0.00	TCS-3
113025	582.563	582.602	0.08	582.522	0.041	25	6.7	0.18	0.176552	29.57	TCS-3
113050	583.231	583.02	0.08	582.94	0.291	25		0.18	0.176552		TCS-3A
113075	586.14	583.437	0.08	583.357	2.783	25		0.18	0		TCS-3A
113100	591.239	583.855	0.08	583.775	7.464	25	6.7	0.18	0	0.00	TCS-5
113125	587.073	584.273	0.08	584.193	2.88	25	6.7	0.18	0	0.00	TCS-5
113150	585.47	584.69	0.08	584.61	0.86	25	6.7	0.18	0	0.00	TCS-5
113175	587.027	585.108	0.08	585.028	1.999	25	6.7	0.18	0	0.00	TCS-5
113200	588.59	585.526	0.08	585.446	3.144	25	6.7	0.18	0	0.00	TCS-5
113225	586.331	585.943	0.08	585.863	0.468	25	6.7	0.18	0.092	15.41	TCS-5
113250	586.482	586.361	0.08	586.281	0.201	25	6.7	0.18	0.176552	29.57	TCS-5
113275	586.702	586.778	0.08	586.698	0.004	25	6.7	0.18	0.176552	29.57	TCS-5
113300	586.965	587.196	0.08	587.116	-0.151	25	6.7	0.18	0.176552	29.57	TCS-5
113325	587.178	587.614	0.08	587.534	-0.356	25	6.7	0.18	0.176552	29.57	TCS-5
113350	587.798	588.031	0.08	587.951	-0.153	25	6.7	0.18	0.176552	29.57	TCS-5
113375	588.871	588.449	0.08	588.369	0.502	25	6.7	0.18	0.058	9.71	TCS-5
113400	592.649	588.867	0.08	588.787	3.862	25	6.7	0.18	0	0.00	TCS-5
113425	593.799	589.284	0.08	589.204	4.595	25	6.7	0.18	0	0.00	TCS-5
113450	589.467	589.702	0.08	589.622	-0.155	25	6.7	0.18	0.176552	29.57	TCS-5
113475	590.569	590.12	0.08	590.04	0.529	25	6.7	0.18	0.031	5.19	TCS-5
113500	593.777	590.537	0.08	590.457	3.32	25	6.7	0.18	0	0.00	TCS-3
113525	595.301	590.955	0.08	590.875	4.426	25	6.7	0.18	0	0.00	TCS-3
113550	590.974	591.373	0.08	591.293	-0.319	25	6.7	0.18	0.176552	29.57	TCS-4
113575	591.157	591.79	0.08	591.71	-0.553	25	6.7	0.18	0.176552	29.57	TCS-4
113600	591.68	592.208	0.08	592.128	-0.448	25	6.7	0.18	0.176552	29.57	TCS-4
113625	593.832	592.626	0.08	592.546	1.286	25		0.18	0		TCS-3A
113650	598.566	593.043	0.08	592.963	5.603	25		0.18	0		TCS-3A
113675	598.371	593.461	0.08	593.381	4.99	25		0.18	0		TCS-3A
113700	595.139	593.879	0.08	593.799	1.34	25		0.18	0		TCS-3A
113725	604.984	594.296	0.08	594.216	10.768	25		0.18	0		TCS-3A
113750	602.251	594.714	0.08	594.634	7.617	25		0.18	0		TCS-3A



Chainage	FRL	EGL	Avg.Ext. Bituminou s layer thck (m)	EGL- Bituminous layer	Difference after Scarificati on (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantlin g thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
113775	597.697	595.132	0.08	595.052	2.645	25		0.18	0		TCS-3A
113800	597.695	595.549	0.08	595.469	2.226	25	6.7	0.18	0	0.00	TCS-4
113825	595.094	595.967	0.08	595.887	-0.793	25	6.7	0.18	0.176552	29.57	TCS-4
113850	595.135	596.385	0.08	596.305	-1.17	25	6.7	0.18	0.176552	29.57	TCS-4
113875	596.107	596.802	0.08	596.722	-0.615	25	6.7	0.18	0.176552	29.57	TCS-4
113900	596.455	597.22	0.08	597.14	-0.685	25	6.7	0.18	0.176552	29.57	TCS-3
113925	597.333	597.637	0.08	597.557	-0.224	25	6.7	0.18	0.176552	29.57	TCS-3
113950	597.984	598.055	0.08	597.975	0.009	25	6.7	0.18	0.176552	29.57	TCS-3
113975	598.584	598.491	0.08	598.411	0.173	25	6.7	0.18	0.176552	29.57	TCS-5
114000	600.284	598.968	0.08	598.888	1.396	25	6.7	0.18	0	0.00	TCS-5
114025	600.689	599.488	0.08	599.408	1.281	25	6.7	0.18	0	0.00	TCS-5
114050	602.215	600.05	0.08	599.97	2.245	25	6.7	0.18	0	0.00	TCS-5
114075	602.584	600.654	0.08	600.574	2.01	25	6.7	0.18	0	0.00	TCS-5
114100	602.723	601.3	0.08	601.22	1.503	25	6.7	0.18	0	0.00	TCS-5
114125	603.07	601.989	0.08	601.909	1.161	25	6.7	0.18	0	0.00	TCS-5
114150	603.262	602.719	0.08	602.639	0.623	25		0.18	0		TCS-5A
114175	606.299	603.492	0.08	603.412	2.887	25		0.18	0		TCS-5A
114200	612.799	604.307	0.08	604.227	8.572	25		0.18	0		TCS-5A
114225	621.76	605.146	0.08	605.066	16.694	25	6.7	0.18	0	0.00	TCS-3
114250	605.134	605.986	0.08	605.906	-0.772	25	6.7	0.18	0.176552	29.57	TCS-3
114275	605.664	606.825	0.08	606.745	-1.081	25	6.7	0.18	0.176552	29.57	TCS-3
114300	606.649	607.664	0.08	607.584	-0.935	25	6.7	0.18	0.176552	29.57	TCS-3
114325	611.596	608.504	0.08	608.424	3.172	25	6.7	0.18	0	0.00	TCS-3
114350	609.522	609.343	0.08	609.263	0.259	25	6.7	0.18	0.176552	29.57	TCS-3
114375	609.814	610.182	0.08	610.102	-0.288	25	6.7	0.18	0.176552	29.57	TCS-3
114400	610.483	611.021	0.08	610.941	-0.458	25	6.7	0.18	0.176552	29.57	TCS-3
114425	615.984	611.861	0.08	611.781	4.203	25	6.7	0.18	0	0.00	TCS-3
114450	613.061	612.7	0.08	612.62	0.441	25	6.7	0.18	0.119	19.93	TCS-3
114475	614.199	613.539	0.08	613.459	0.74	25	6.7	0.18	0	0.00	TCS-3
114500	616.216	614.379	0.08	614.299	1.917	25	6.7	0.18	0	0.00	TCS-3
114525	617.144	615.218	0.08	615.138	2.006	25	6.7	0.18	0	0.00	TCS-3
114550	619.098	616.057	0.08	615.977	3.121	25	6.7	0.18	0	0.00	TCS-3
114575	617.509	616.897	0.08	616.817	0.692	25	6.7	0.18	0	0.00	TCS-3
114600	619.005	617.736	0.08	617.656	1.349	25	6.7	0.18	0	0.00	TCS-3
114625	618.936	618.575	0.08	618.495	0.441	25	6.7	0.18	0.119	19.93	TCS-3
114650	622.428	619.415	0.08	619.335	3.093	25	6.7	0.18	0	0.00	TCS-3
114675	622.038	620.254	0.08	620.174	1.864	25	6.7	0.18	0	0.00	TCS-3
114700	623.129	621.093	0.08	621.013	2.116	25	6.7	0.18	0	0.00	TCS-3
114725	630.781	621.933	0.08	621.853	8.928	25	6.7	0.18	0	0.00	TCS-3
114750	628.762	622.772	0.08	622.692	6.07	25	6.7	0.18	0	0.00	TCS-3
114775	623.866	623.611	0.08	623.531	0.335	25	6.7	0.18	0.176552	29.57	TCS-3
114800	626.339	624.451	0.08	624.371	1.968	25	6.7	0.18	0	0.00	TCS-3
114825	632.17	625.29	0.08	625.21	6.96	25	6.7	0.18	0	0.00	TCS-3
114850	625.854	626.129	0.08	626.049	-0.195	25	6.7	0.18	0.176552	29.57	TCS-3
114875	626.421	626.969	0.08	626.889	-0.468	25	6.7	0.18	0.176552	29.57	TCS-3
114900	632.849	627.808	0.08	627.728	5.121	25		0.18	0		TCS-5A
114925	643.798	628.647	0.08	628.567	15.231	25		0.18	0		TCS-5A
114950	637.361	629.487	0.08	629.407	7.954	25		0.18	0		TCS-5A
114975	649.829	630.326	0.08	630.246	19.583	25	6.7	0.18	0	0.00	TCS-7A
115000	649.656	631.165	0.08	631.085	18.571	25	6.7	0.18	0	0.00	TCS-7A
115025	636.256	632.005	0.08	631.925	4.331	25	6.7	0.18	0	0.00	TCS-3
115050	632.675	632.844	0.08	632.764	-0.089	25	6.7	0.18	0.176552	29.57	TCS-3
115075	633.642	633.683	0.08	633.603	0.039	25	6.7	0.18	0.176552	29.57	TCS-3
115100	634.316	634.523	0.08	634.443	-0.127	25	6.7	0.18	0.176552	29.57	TCS-3
115125	635.153	635.362	0.08	635.282	-0.129	25	6.7	0.18	0.176552	29.57	TCS-3
115150	636.146	636.201	0.08	636.121	0.025	25	6.7	0.18	0.176552	29.57	TCS-3
115175	640.51	637.041	0.08	636.961	3.549	25	6.7	0.18	0	0.00	TCS-3
115200	642.934	637.871	0.08	637.791	5.143	25	6.7	0.18	0	0.00	TCS-3
115225	638.274	638.674	0.08	638.594	-0.32	25	6.7	0.18	0.176552	29.57	TCS-3
115250	639.347	639.449	0.08	639.369	-0.022	25	6.7	0.18	0.176552	29.57	TCS-3
115275	639.687	640.196	0.08	640.116	-0.429	25	6.7	0.18	0.176552	29.57	TCS-3
115300	640.285	640.915	0.08	640.835	-0.55	25	6.7	0.18	0.176552	29.57	TCS-3
115325	641.02	641.621	0.08	641.541	-0.521	25	6.7	0.18	0.176552	29.57	TCS-3
115350	642.006	642.326	0.08	642.246	-0.24	25	6.7	0.18	0.176552	29.57	TCS-3
115375	642.946	643.031	0.08	642.951	-0.005	25	6.7	0.18	0.176552	29.57	TCS-3
115400	644.055	643.736	0.08	643.656	0.399	25	6.7	0.18	0.161	26.97	TCS-3
115425	646.332	644.442	0.08	644.362	1.97	25	6.7	0.18	0	0.00	TCS-3
115450	645.798	645.147	0.08	645.067	0.731	25	6.7	0.18	0	0.00	TCS-3
115475	648.555	645.852	0.08	645.772	2.783	25	6.7	0.18	0	0.00	TCS-3
115500	650.136	646.557	0.08	646.477	3.659	25	6.7	0.18	0	0.00	TCS-3
115525	648.568	647.263	0.08	647.183	1.385	25	6.7	0.18	0	0.00	TCS-3
115550	652.964	647.968	0.08	647.888	5.076	25	6.7	0.18	0	0.00	TCS-3



Chainage	FRL	EGL	Avg.Ext. Bituminou s layer thck (m)	EGL- Bituminous layer	Difference after Scarificati on (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantlin g thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
115575	648.506	648.673	0.08	648.593	-0.087	25	6.7	0.18	0.176552	29.57	TCS-3
115600	649.316	649.407	0.08	649.327	-0.011	25	6.7	0.18	0.176552	29.57	TCS-3
115625	650.072	650.253	0.08	650.173	-0.101	25	6.7	0.18	0.176552	29.57	TCS-3
115650	651.573	651.216	0.08	651.136	0.437	25	6.7	0.18	0.123	20.60	TCS-3
115675	653.039	652.297	0.08	652.217	0.822	25	6.7	0.18	0	0.00	TCS-3
115700	653.315	653.466	0.08	653.386	-0.071	25	6.7	0.18	0.176552	29.57	TCS-3
115725	654.925	654.641	0.08	654.561	0.364	25		0.18	0.176552		TCS-3A
115750	667.521	655.816	0.08	655.736	11.785	25		0.18	0		TCS-3A
115775	666.534	656.99	0.08	656.91	9.624	25		0.18	0		TCS-3A
115800	660.402	658.165	0.08	658.085	2.317	25	6.7	0.18	0	0.00	TCS-4
115825	658.661	659.34	0.08	659.26	-0.599	25	6.7	0.18	0.176552	29.57	TCS-4
115850	660.04	660.514	0.08	660.434	-0.394	25		0.18	0.176552		TCS-3A
115875	662.118	661.689	0.08	661.609	0.509	25		0.18	0.051		TCS-3A
115900	669.616	662.864	0.08	662.784	6.832	25	6.7	0.18	0	0.00	TCS-7A
115925	680.934	664.026	0.08	663.946	16.988	25	6.7	0.18	0	0.00	TCS-7A
115950	680.65	665.107	0.08	665.027	15.623	25	6.7	0.18	0	0.00	TCS-3
115975	665.749	666.097	0.08	666.017	-0.268	25	6.7	0.18	0.176552	29.57	TCS-3
116000	668.674	666.995	0.08	666.915	1.759	25	6.7	0.18	0	0.00	TCS-3
116025	667.875	667.801	0.08	667.721	0.154	25	6.7	0.18	0.176552	29.57	TCS-3
116050	668.423	668.516	0.08	668.436	-0.013	25	6.7	0.18	0.176552	29.57	TCS-4
116075	670.251	669.152	0.08	669.072	1.179	25	6.7	0.18	0	0.00	TCS-4
116100	671.221	669.777	0.08	669.697	1.524	25	6.7	0.18	0	0.00	TCS-7A
116125	673.169	670.402	0.08	670.322	2.847	25	6.7	0.18	0	0.00	TCS-7A
116150	674.837	671.027	0.08	670.947	3.89	25	6.7	0.18	0	0.00	TCS-7A
116175	676.772	671.674	0.08	671.594	5.178	25	6.7	0.18	0	0.00	TCS-7A
116200	681.12	672.478	0.08	672.398	8.722	25	6.7	0.18	0	0.00	TCS-7A
116225	678.993	673.462	0.08	673.382	5.611	25	6.7	0.18	0	0.00	TCS-7A
116250	682.614	674.626	0.08	674.546	8.068	25	6.7	0.18	0	0.00	TCS-7A
116275	678.834	675.969	0.08	675.889	2.945	25	6.7	0.18	0	0.00	TCS-7A
116300	679.261	677.448	0.08	677.368	1.893	25		0.18	0		TCS-3A
116325	685.221	678.935	0.08	678.855	6.366	25		0.18	0		TCS-5A
116350	690.9	680.421	0.08	680.341	10.559	25		0.18	0		TCS-5A
116375	684.529	681.908	0.08	681.828	2.701	25	6.7	0.18	0	0.00	TCS-5
116400	684.153	683.39	0.08	683.31	0.843	25	6.7	0.18	0	0.00	TCS-5
116425	684.913	684.81	0.08	684.73	0.183	25	6.7	0.18	0.176552	29.57	TCS-5
116450	685.939	686.151	0.08	686.071	-0.132	25	6.7	0.18	0.176552	29.57	TCS-5
116475	693.455	687.414	0.08	687.334	6.121	25		0.18	0		TCS-5A
116500	701.619	688.598	0.08	688.518	13.101	25		0.18	0		TCS-5A
116525	691.017	689.703	0.08	689.623	1.394	25	6.7	0.18	0	0.00	TCS-3
116550	693.54	690.736	0.08	690.656	2.884	25	6.7	0.18	0	0.00	TCS-3
116575	702.746	691.751	0.08	691.671	11.075	25	6.7	0.18	0	0.00	TCS-3
116600	693.356	692.767	0.08	692.687	0.669	25	6.7	0.18	0	0.00	TCS-3
116625	693.52	693.783	0.08	693.703	-0.183	25	6.7	0.18	0.176552	29.57	TCS-3
116650	698.343	694.799	0.08	694.719	3.624	25		0.18	0		TCS-3A
116675	703.007	695.815	0.08	695.735	7.272	25		0.18	0		TCS-3A
116700	704.347	696.831	0.08	696.751	7.596	25	6.7	0.18	0	0.00	TCS-3
116725	697.332	697.846	0.08	697.766	-0.434	25	6.7	0.18	0.176552	29.57	TCS-3
116750	700.719	698.862	0.08	698.782	1.937	25	6.7	0.18	0	0.00	TCS-3
116775	702.986	699.878	0.08	699.798	3.188	25	6.7	0.18	0	0.00	TCS-4
116800	700.021	700.894	0.08	700.814	-0.793	25	6.7	0.18	0.176552	29.57	TCS-4
116825	701.072	701.91	0.08	701.83	-0.758	25	6.7	0.18	0.176552	29.57	TCS-3
116850	702.202	702.926	0.08	702.846	-0.644	25	6.7	0.18	0.176552	29.57	TCS-3
116875	703.706	703.942	0.08	703.862	-0.156	25	6.7	0.18	0.176552	29.57	TCS-3
116900	704.872	704.957	0.08	704.877	-0.005	25	6.7	0.18	0.176552	29.57	TCS-3
116925	706.711	706.009	0.08	705.929	0.782	25	6.7	0.18	0	0.00	TCS-3
116950	706.734	707.204	0.08	707.124	-0.39	25	6.7	0.18	0.176552	29.57	TCS-3
116975	709.917	708.549	0.08	708.469	1.448	25	6.7	0.18	0	0.00	TCS-3
117000	709.83	710.027	0.08	709.947	-0.117	25	6.7	0.18	0.176552	29.57	TCS-5
117025	724.134	711.524	0.08	711.444	12.69	25	6.7	0.18	0	0.00	TCS-5
117050	724.153	713.022	0.08	712.942	11.211	25	6.7	0.18	0	0.00	TCS-7A
117075	729.055	714.519	0.08	714.439	14.616	25	6.7	0.18	0	0.00	TCS-7A
117100	730.428	716.017	0.08	715.937	14.491	25	6.7	0.18	0	0.00	TCS-3
117125	719.388	717.514	0.08	717.434	1.954	25	6.7	0.18	0	0.00	TCS-3
117150	720.089	719.011	0.08	718.931	1.158	25	6.7	0.18	0	0.00	TCS-3
117175	720.94	720.509	0.08	720.429	0.511	25	6.7	0.18	0.049	8.21	TCS-3
117200	722.278	722.006	0.08	721.926	0.352	25	6.7	0.18	0.176552	29.57	TCS-3
117225	723.656	723.503	0.08	723.423	0.233	25	6.7	0.18	0.176552	29.57	TCS-3
117250	726.258	725.001	0.08	724.921	1.337	25	6.7	0.18	0	0.00	TCS-3
117275	736.171	726.498	0.08	726.418	9.753	25	6.7	0.18	0	0.00	TCS-3
117300	728.566	727.982	0.08	727.902	0.664	25	6.7	0.18	0	0.00	TCS-3
117325	732.922	729.358	0.08	729.278	3.644	25	6.7	0.18	0	0.00	TCS-3
117350	734.711	730.612	0.08	730.532	4.179	25	6.7	0.18	0	0.00	TCS-3



Chainage	FRL	EGL	Avg.Ext. Bituminou s layer thck (m)	EGL- Bituminous layer	Difference after Scarificati on (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantlin g thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
117375	731.728	731.748	0.08	731.668	0.06	25	6.7	0.18	0.176552	29.57	TCS-3
117400	732.58	732.851	0.08	732.771	-0.191	25	6.7	0.18	0.176552	29.57	TCS-3
117425	742.017	733.954	0.08	733.874	8.143	25	6.7	0.18	0	0.00	TCS-3
117450	735.403	735.058	0.08	734.978	0.425	25	6.7	0.18	0.135	22.61	TCS-3
117475	735.434	736.161	0.08	736.081	-0.647	25	6.7	0.18	0.176552	29.57	TCS-3
117500	740.973	737.264	0.08	737.184	3.789	25	6.7	0.18	0	0.00	TCS-3
117525	738.018	738.368	0.08	738.288	-0.27	25	6.7	0.18	0.176552	29.57	TCS-3
117550	739.556	739.471	0.08	739.391	0.165	25	6.7	0.18	0.176552	29.57	TCS-5
117575	741.108	740.575	0.08	740.495	0.613	25	6.7	0.18	0	0.00	TCS-5
117600	742.603	741.678	0.08	741.598	1.005	25	6.7	0.18	0	0.00	TCS-5
117625	743.449	742.781	0.08	742.701	0.748	25	6.7	0.18	0	0.00	TCS-5
117650	745.63	743.885	0.08	743.805	1.825	25	6.7	0.18	0	0.00	TCS-5
117675	744.965	744.988	0.08	744.908	0.057	25	6.7	0.18	0.176552	29.57	TCS-5
117700	745.97	746.091	0.08	746.011	-0.041	25	6.7	0.18	0.176552	29.57	TCS-5
117725	747.075	747.195	0.08	747.115	-0.04	25	6.7	0.18	0.176552	29.57	TCS-5
117750	748.304	748.298	0.08	748.218	0.086	25	6.7	0.18	0.176552	29.57	TCS-5
117775	753.103	749.402	0.08	749.322	3.781	25	6.7	0.18	0	0.00	TCS-5
117800	766.372	750.505	0.08	750.425	15.947	25		0.18	0		TCS-5A
117825	767.67	751.608	0.08	751.528	16.142	25	6.7	0.18	0	0.00	TCS-3
117850	753.95	752.652	0.08	752.572	1.378	25	6.7	0.18	0	0.00	TCS-3
117875	754.532	753.591	0.08	753.511	1.021	25	6.7	0.18	0	0.00	TCS-3
117900	754.973	754.426	0.08	754.346	0.627	25	6.7	0.18	0	0.00	TCS-3
117925	755.421	755.197	0.08	755.117	0.304	25	6.7	0.18	0.176552	29.57	TCS-3
117950	756.003	755.967	0.08	755.887	0.116	25	6.7	0.18	0.176552	29.57	TCS-3
117975	756.37	756.737	0.08	756.657	-0.287	25	6.7	0.18	0.176552	29.57	TCS-3
118000	761.05	757.506	0.08	757.426	3.624	25	6.7	0.18	0	0.00	TCS-3
118025	761.959	758.276	0.08	758.196	3.763	25	6.7	0.18	0	0.00	TCS-3
118050	761.589	759.046	0.08	758.966	2.623	25	6.7	0.18	0	0.00	TCS-3
118075	759.519	759.816	0.08	759.736	-0.217	25	6.7	0.18	0.176552	29.57	TCS-3
118100	764.229	760.585	0.08	760.505	3.724	25	6.7	0.18	0	0.00	TCS-3
118125	764.673	761.355	0.08	761.275	3.398	25	6.7	0.18	0	0.00	TCS-3
118150	766.6	762.125	0.08	762.045	4.555	25	6.7	0.18	0	0.00	TCS-3
118175	762.663	762.895	0.08	762.815	-0.152	25		0.18	0.176552		TCS-6
118200	763.042	763.665	0.08	763.585	-0.543	25		0.18	0.176552		TCS-6
118225	763.906	764.434	0.08	764.354	-0.448	25		0.18	0.176552		TCS-6
118250	765.148	765.204	0.08	765.124	0.024	25		0.18	0.176552		TCS-6
118275	766.081	765.974	0.08	765.894	0.187	25		0.18	0.176552		TCS-6
118300	767.086	766.743	0.08	766.663	0.423	25		0.18	0.137		TCS-6
118325	767.789	767.336	0.08	767.256	0.533	25		0.18	0.027		TCS-6
118350	767.636	767.607	0.08	767.527	0.109	25		0.18	0.176552		TCS-6
118375	767.374	767.556	0.08	767.476	-0.102	25		0.18	0.176552		TCS-6
118400	767.497	767.301	0.08	767.221	0.276	25		0.18	0.176552		TCS-6
118425	767.424	767.042	0.08	766.962	0.462	25		0.18	0.098		TCS-6
118450	766.811	766.783	0.08	766.703	0.108	25		0.18	0.176552		TCS-6
118475	770.732	766.524	0.08	766.444	4.288	25		0.18	0		TCS-7B
118500	774.427	766.265	0.08	766.185	8.242	25		0.18	0		TCS-7B
118525	771.311	766.006	0.08	765.926	5.385	25	6.7	0.18	0	0.00	TCS-7
118550	765.607	765.747	0.08	765.667	-0.06	25	6.7	0.18	0.176552	29.57	TCS-7
118575	765.975	765.488	0.08	765.408	0.567	25		0.18	0		TCS-7B
118600	769.543	765.229	0.08	765.149	4.394	25		0.18	0		TCS-7B
118625	775.086	764.87	0.08	764.79	10.296	25		0.18	0		TCS-7B
118650	764.674	764.325	0.08	764.245	0.429	25	6.7	0.18	0.131	21.94	TCS-7
118675	767.423	763.596	0.08	763.516	3.907	25	6.7	0.18	0	0.00	TCS-7
118700	768.572	762.681	0.08	762.601	5.971	25		0.18	0		TCS-7B
118725	771.736	761.587	0.08	761.507	10.229	25		0.18	0		TCS-7B
118750	770.361	760.439	0.08	760.359	10.002	25		0.18	0		TCS-7B
118775	759.206	759.292	0.08	759.212	-0.006	25	6.7	0.18	0.176552	29.57	TCS-7
118800	759.689	758.144	0.08	758.064	1.625	25	6.7	0.18	0	0.00	TCS-7
118825	768.279	756.997	0.08	756.917	11.362	25		0.18	0		TCS-7B
118850	762.855	755.849	0.08	755.769	7.086	25		0.18	0		TCS-7B
118875	755.051	754.701	0.08	754.621	0.43	25	6.7	0.18	0.13	21.77	TCS-7
118900	753.021	753.554	0.08	753.474	-0.453	25	6.7	0.18	0.176552	29.57	TCS-7
118925	756.248	752.406	0.08	752.326	3.922	25		0.18	0		TCS-6
118950	751.487	751.259	0.08	751.179	0.308	25		0.18	0.176552		TCS-6
118975	750.188	750.111	0.08	750.031	0.157	25		0.18	0.176552		TCS-6
119000	748.892	748.964	0.08	748.884	0.008	25		0.18	0.176552		TCS-7B
119025	752.275	747.816	0.08	747.736	4.539	25		0.18	0		TCS-7B
119050	751.269	746.672	0.08	746.592	4.677	25	6.7	0.18	0	0.00	TCS-7
119075	745.746	745.619	0.08	745.539	0.207	25	6.7	0.18	0.176552	29.57	TCS-7
119100	744.87	744.695	0.08	744.615	0.255	25		0.18	0.176552		TCS-7B
119125	751.311	743.899	0.08	743.819	7.492	25		0.18	0		TCS-7B
119150	759.418	743.165	0.08	743.085	16.333	25	6.7	0.18	0	0.00	TCS-7



Chainage	FRL	EGL	Avg.Ext. Bituminou s layer thck (m)	EGL- Bituminous layer	Difference after Scarificati on (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantlin g thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
119175	743.967	742.431	0.08	742.351	1.616	25	6.7	0.18	0	0.00	TCS-7
119200	748.062	741.696	0.08	741.616	6.446	25	6.7	0.18	0	0.00	TCS-3
119225	749.797	740.962	0.08	740.882	8.915	25	6.7	0.18	0	0.00	TCS-3
119250	741.893	740.228	0.08	740.148	1.745	25		0.18	0		TCS-5A
119275	739.103	739.493	0.08	739.413	-0.31	25		0.18	0.176552		TCS-5A
119300	738.526	738.759	0.08	738.679	-0.153	25		0.18	0.176552		TCS-5A
119325	749.791	738.025	0.08	737.945	11.846	25		0.18	0		TCS-5A
119350	747.646	737.29	0.08	737.21	10.436	25		0.18	0		TCS-5A
119375	743.056	736.556	0.08	736.476	6.58	25		0.18	0		TCS-3A
119400	736.725	735.822	0.08	735.742	0.983	25		0.18	0		TCS-3A
119425	736.536	735.087	0.08	735.007	1.529	25		0.18	0		TCS-3A
119450	741.467	734.353	0.08	734.273	7.194	25		0.18	0		TCS-3A
119475	735.175	733.609	0.08	733.529	1.646	25		0.18	0		TCS-3A
119500	735.831	732.832	0.08	732.752	3.079	25		0.18	0		TCS-3A
119525	734.292	732.022	0.08	731.942	2.35	25		0.18	0		TCS-3A
119550	731.053	731.182	0.08	731.102	-0.049	25	6.7	0.18	0.176552	29.57	TCS-3
119575	732.534	730.34	0.08	730.26	2.274	25	6.7	0.18	0	0.00	TCS-7A
119600	740.139	729.498	0.08	729.418	10.721	25	6.7	0.18	0	0.00	TCS-7A
119625	732.575	728.655	0.08	728.575	4	25	6.7	0.18	0	0.00	TCS-7A
119650	725.458	727.813	0.08	727.733	-2.275	25	6.7	0.18	0.176552	29.57	TCS-7A
119675	732.41	726.971	0.08	726.891	5.519	25	6.7	0.18	0	0.00	TCS-7A
119700	734.843	726.128	0.08	726.048	8.795	25	6.7	0.18	0	0.00	TCS-7A
119725	734.255	725.286	0.08	725.206	9.049	25	6.7	0.18	0	0.00	TCS-7A
119750	731.104	724.444	0.08	724.364	6.74	25	6.7	0.18	0	0.00	TCS-7A
119775	724.762	723.601	0.08	723.521	1.241	25	6.7	0.18	0	0.00	TCS-7A
119800	723.291	722.759	0.08	722.679	0.612	25	6.7	0.18	0	0.00	TCS-7
119825	722.414	721.917	0.08	721.837	0.577	25	6.7	0.18	0	0.00	TCS-7
119850	720.708	721.074	0.08	720.994	-0.286	25	6.7	0.18	0.176552	29.57	TCS-7
119875	720.322	720.232	0.08	720.152	0.17	25	6.7	0.18	0.176552	29.57	TCS-7
119900	719.661	719.39	0.08	719.31	0.351	25	6.7	0.18	0.176552	29.57	TCS-7
119925	717.183	718.547	0.08	718.467	-1.284	25	6.7	0.18	0.176552	29.57	TCS-7
119950	716.263	717.705	0.08	717.625	-1.362	25	6.7	0.18	0.176552	29.57	TCS-7
119975	715.76	716.875	0.08	716.795	-1.035	25	6.7	0.18	0.176552	29.57	TCS-7
120000	715.311	716.098	0.08	716.018	-0.707	25	6.7	0.18	0.176552	29.57	TCS-7
120025	717.149	715.379	0.08	715.299	1.85	25		0.18	0		TCS-3A
120050	720.04	714.71	0.08	714.63	5.41	25		0.18	0		TCS-3A
120075	725.692	714.05	0.08	713.97	11.722	25		0.18	0		TCS-3A
120100	727.196	713.39	0.08	713.31	13.886	25		0.18	0		TCS-3A
120125	713.252	712.73	0.08	712.65	0.602	25	6.7	0.18	0	0.00	TCS-3
120150	712.88	712.07	0.08	711.99	0.89	25	6.7	0.18	0	0.00	TCS-3
120175	712.457	711.41	0.08	711.33	1.127	25	6.7	0.18	0	0.00	TCS-3
120200	712.201	710.75	0.08	710.67	1.531	25	6.7	0.18	0	0.00	TCS-3
120225	710.663	710.091	0.08	710.011	0.652	25	6.7	0.18	0	0.00	TCS-3
120250	709.216	709.431	0.08	709.351	-0.135	25	6.7	0.18	0.176552	29.57	TCS-3
120275	708.023	708.771	0.08	708.691	-0.668	25	6.7	0.18	0.176552	29.57	TCS-3
120300	707.265	708.111	0.08	708.031	-0.766	25		0.18	0.176552		TCS-5A
120325	719.033	707.448	0.08	707.368	11.665	25		0.18	0		TCS-5A
120350	723.552	706.709	0.08	706.629	16.923	25		0.18	0		TCS-5A
120375	707.832	705.866	0.08	705.786	2.046	25		0.18	0		TCS-5A
120400	705.041	704.917	0.08	704.837	0.204	25		0.18	0.176552		TCS-3A
120425	708.078	703.92	0.08	703.84	4.238	25		0.18	0		TCS-3A
120450	705.082	702.924	0.08	702.844	2.238	25		0.18	0		TCS-3A
120475	707.734	701.927	0.08	701.847	5.887	25	6.7	0.18	0	0.00	TCS-3
120500	699.427	700.93	0.08	700.85	-1.423	25	6.7	0.18	0.176552	29.57	TCS-3
120525	699.554	699.933	0.08	699.853	-0.299	25	6.7	0.18	0.176552	29.57	TCS-3
120550	702.743	698.936	0.08	698.856	3.887	25	6.7	0.18	0	0.00	TCS-3
120575	701.951	697.939	0.08	697.859	4.092	25	6.7	0.18	0	0.00	TCS-3
120600	696.585	696.942	0.08	696.862	-0.277	25	6.7	0.18	0.176552	29.57	TCS-3
120625	695.715	695.945	0.08	695.865	-0.15	25	6.7	0.18	0.176552	29.57	TCS-3
120650	695.058	694.948	0.08	694.868	0.19	25		0.18	0.176552		TCS-3A
120675	702.8	693.951	0.08	693.871	8.929	25		0.18	0		TCS-3A
120700	701.756	692.954	0.08	692.874	8.882	25	6.7	0.18	0	0.00	TCS-3
120725	693.087	691.957	0.08	691.877	1.21	25	6.7	0.18	0	0.00	TCS-3
120750	692.331	690.96	0.08	690.88	1.451	25	6.7	0.18	0	0.00	TCS-12
120775	700.33	689.964	0.08	689.884	10.446	25	6.7	0.18	0	0.00	TCS-12
120800	700.539	688.967	0.08	688.887	11.652	25	6.7	0.18	0	0.00	TCS-12
120825	695.29	687.97	0.08	687.89	7.4	25	6.7	0.18	0	0.00	TCS-3
120850	686.908	686.973	0.08	686.893	0.015	25	6.7	0.18	0.176552	29.57	TCS-3
120875	686.126	685.976	0.08	685.896	0.23	25	6.7	0.18	0.176552	29.57	TCS-3
120900	687.12	684.979	0.08	684.899	2.221	25	6.7	0.18	0	0.00	TCS-3
120925	685.035	683.997	0.08	683.917	1.118	25	6.7	0.18	0	0.00	TCS-3
120950	683.398	683.057	0.08	682.977	0.421	25	6.7	0.18	0.139	23.28	TCS-3



Chainage	FRL	EGL	Avg.Ext. Bituminou s layer thck (m)	EGL- Bituminous layer	Difference after Scarificati on (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantlin g thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
120975	681.992	682.16	0.08	682.08	-0.088	25	6.7	0.18	0.176552	29.57	TCS-3
121000	680.952	681.296	0.08	681.216	-0.264	25	6.7	0.18	0.176552	29.57	TCS-3
121025	680.181	680.434	0.08	680.354	-0.173	25	6.7	0.18	0.176552	29.57	TCS-3
121050	679.613	679.572	0.08	679.492	0.121	25	6.7	0.18	0.176552	29.57	TCS-3
121075	680.227	678.711	0.08	678.631	1.596	25	6.7	0.18	0	0.00	TCS-3
121100	680.995	677.849	0.08	677.769	3.226	25	6.7	0.18	0	0.00	TCS-3
121125	677.419	676.988	0.08	676.908	0.511	25	6.7	0.18	0.049	8.21	TCS-3
121150	675.937	676.126	0.08	676.046	-0.109	25	6.7	0.18	0.176552	29.57	TCS-3
121175	674.905	675.265	0.08	675.185	-0.28	25	6.7	0.18	0.176552	29.57	TCS-3
121200	674.153	674.403	0.08	674.323	-0.17	25	6.7	0.18	0.176552	29.57	TCS-3
121225	674.087	673.542	0.08	673.462	0.625	25	6.7	0.18	0	0.00	TCS-3
121250	672.649	672.68	0.08	672.6	0.049	25	6.7	0.18	0.176552	29.57	TCS-3
121275	671.334	671.818	0.08	671.738	-0.404	25	6.7	0.18	0.176552	29.57	TCS-3
121300	670.26	670.957	0.08	670.877	-0.617	25	6.7	0.18	0.176552	29.57	TCS-3
121325	669.856	670.095	0.08	670.015	-0.159	25	6.7	0.18	0.176552	29.57	TCS-3
121350	669.014	669.234	0.08	669.154	-0.14	25	6.7	0.18	0.176552	29.57	TCS-3
121375	668.779	668.372	0.08	668.292	0.487	25	6.7	0.18	0.073	12.23	TCS-3
121400	667.824	667.47	0.08	667.39	0.434	25	6.7	0.18	0.126	21.11	TCS-3
121425	666.415	666.475	0.08	666.395	0.02	25	6.7	0.18	0.176552	29.57	TCS-3
121450	669.313	665.386	0.08	665.306	4.007	25	6.7	0.18	0	0.00	TCS-4
121475	672.182	664.23	0.08	664.15	8.032	25	6.7	0.18	0	0.00	TCS-4
121500	662.872	663.071	0.08	662.991	-0.119	25	6.7	0.18	0.176552	29.57	TCS-3
121525	662.586	661.912	0.08	661.832	0.754	25	6.7	0.18	0	0.00	TCS-3
121550	661.717	660.811	0.08	660.731	0.986	25	6.7	0.18	0	0.00	TCS-3
121575	659.4	659.852	0.08	659.772	-0.372	25	6.7	0.18	0.176552	29.57	TCS-3
121600	658.739	659.034	0.08	658.954	-0.215	25	6.7	0.18	0.176552	29.57	TCS-3
121625	658.145	658.323	0.08	658.243	-0.098	25	6.7	0.18	0.176552	29.57	TCS-3
121650	658.384	657.617	0.08	657.537	0.847	25	6.7	0.18	0	0.00	TCS-7A
121675	671.638	656.912	0.08	656.832	14.806	25	6.7	0.18	0	0.00	TCS-7A
121700	676.107	656.206	0.08	656.126	19.981	25	6.7	0.18	0	0.00	TCS-7A
121725	671.606	655.501	0.08	655.421	16.185	25	6.7	0.18	0	0.00	TCS-7A
121750	664.19	654.795	0.08	654.715	9.475	25	6.7	0.18	0	0.00	TCS-3
121775	655.924	654.09	0.08	654.01	1.914	25	6.7	0.18	0	0.00	TCS-3
121800	655.209	653.384	0.08	653.304	1.905	25	6.7	0.18	0	0.00	TCS-3
121825	658.192	652.679	0.08	652.599	5.593	25	6.7	0.18	0	0.00	TCS-3
121850	658.573	651.974	0.08	651.894	6.679	25	6.7	0.18	0	0.00	TCS-3
121875	651.4	651.268	0.08	651.188	0.212	25	6.7	0.18	0.176552	29.57	TCS-3
121900	650.694	650.563	0.08	650.483	0.211	25	6.7	0.18	0.176552	29.57	TCS-3
121925	649.852	649.857	0.08	649.777	0.075	25	6.7	0.18	0.176552	29.57	TCS-3
121950	648.825	649.152	0.08	649.072	-0.247	25	6.7	0.18	0.176552	29.57	TCS-3
121975	648.565	648.446	0.08	648.366	0.199	25	6.7	0.18	0.176552	29.57	TCS-3
122000	647.017	647.741	0.08	647.661	-0.644	25	6.7	0.18	0.176552	29.57	TCS-4
122025	646.173	647.036	0.08	646.956	-0.783	25	6.7	0.18	0.176552	29.57	TCS-4
122050	653.9	646.33	0.08	646.25	7.65	25		0.18	0		TCS-3A
122075	654.7	645.625	0.08	645.545	9.155	25		0.18	0		TCS-3A
122100	644.073	644.919	0.08	644.839	-0.766	25	6.7	0.18	0.176552	29.57	TCS-3
122125	646.948	644.214	0.08	644.134	2.814	25	6.7	0.18	0	0.00	TCS-3
122150	643.406	643.508	0.08	643.428	-0.022	25	6.7	0.18	0.176552	29.57	TCS-3
122175	642.661	642.803	0.08	642.723	-0.062	25	6.7	0.18	0.176552	29.57	TCS-3
122200	641.788	642.097	0.08	642.017	-0.229	25	6.7	0.18	0.176552	29.57	TCS-3
122225	641.613	641.392	0.08	641.312	0.301	25	6.7	0.18	0.176552	29.57	TCS-3
122250	640.815	640.687	0.08	640.607	0.208	25	6.7	0.18	0.176552	29.57	TCS-3
122275	640.226	640.021	0.08	639.941	0.285	25	6.7	0.18	0.176552	29.57	TCS-3
122300	639.301	639.527	0.08	639.447	-0.146	25	6.7	0.18	0.176552	29.57	TCS-3
122325	638.882	639.213	0.08	639.133	-0.251	25	6.7	0.18	0.176552	29.57	TCS-4
122350	638.749	639.06	0.08	638.98	-0.231	25	6.7	0.18	0.176552	29.57	TCS-4
122375	638.531	638.933	0.08	638.853	-0.322	25	6.7	0.18	0.176552	29.57	TCS-4
122400	638.383	638.806	0.08	638.726	-0.343	25	6.7	0.18	0.176552	29.57	TCS-4
122425	639.589	638.648	0.08	638.568	1.021	25	6.7	0.18	0	0.00	TCS-4
122450	650.743	638.337	0.08	638.257	12.486	25	6.7	0.18	0	0.00	TCS-3
122475	638.424	637.863	0.08	637.783	0.641	25	6.7	0.18	0	0.00	TCS-3
122500	636.424	637.238	0.08	637.158	-0.734	25	6.7	0.18	0.176552	29.57	TCS-3
122525	635.175	636.587	0.08	636.507	-1.332	25	6.7	0.18	0.176552	29.57	TCS-3
122550	635.316	635.935	0.08	635.855	-0.539	25		0.18	0.176552		TCS-3A
122575	637.528	635.284	0.08	635.204	2.324	25		0.18	0		TCS-3A
122600	633.932	634.632	0.08	634.552	-0.62	25	6.7	0.18	0.176552	29.57	TCS-3
122625	633.668	633.981	0.08	633.901	-0.233	25	6.7	0.18	0.176552	29.57	TCS-3
122650	643.412	633.329	0.08	633.249	10.163	25	6.7	0.18	0	0.00	TCS-12
122675	647.011	632.678	0.08	632.598	14.413	25	6.7	0.18	0	0.00	TCS-12
122700	637.895	632.004	0.08	631.924	5.971	25	6.7	0.18	0	0.00	TCS-12
122725	630.943	631.22	0.08	631.14	-0.197	25	6.7	0.18	0.176552	29.57	TCS-4
122750	629.589	630.317	0.08	630.237	-0.648	25	6.7	0.18	0.176552	29.57	TCS-4



Chainage	FRL	EGL	Avg.Ext. Bituminou s layer thck (m)	EGL- Bituminous layer	Difference after Scarificati on (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantlin g thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
122775	628.478	629.305	0.08	629.225	-0.747	25	6.7	0.18	0.176552	29.57	TCS-4
122800	630.293	628.274	0.08	628.194	2.099	25	6.7	0.18	0	0.00	TCS-4
122825	631.661	627.242	0.08	627.162	4.499	25	6.7	0.18	0	0.00	TCS-3
122850	625.91	626.21	0.08	626.13	-0.22	25	6.7	0.18	0.176552	29.57	TCS-3
122875	626.118	625.178	0.08	625.098	1.02	25	6.7	0.18	0	0.00	TCS-3
122900	623.929	624.14	0.08	624.06	-0.131	25	6.7	0.18	0.176552	29.57	TCS-3
122925	623.059	623.034	0.08	622.954	0.105	25	6.7	0.18	0.176552	29.57	TCS-3
122950	628.609	621.843	0.08	621.763	6.846	25		0.18	0		TCS-3A
122975	624.738	620.57	0.08	620.49	4.248	25		0.18	0		TCS-3A
123000	621.894	619.269	0.08	619.189	2.705	25	6.7	0.18	0	0.00	TCS-3
123025	617.428	617.968	0.08	617.888	-0.46	25	6.7	0.18	0.176552	29.57	TCS-3
123050	616.037	616.668	0.08	616.588	-0.551	25	6.7	0.18	0.176552	29.57	TCS-3
123075	618.667	615.367	0.08	615.287	3.38	25	6.7	0.18	0	0.00	TCS-3
123100	619.97	614.073	0.08	613.993	5.977	25	6.7	0.18	0	0.00	TCS-12
123125	621.064	612.916	0.08	612.836	8.228	25	6.7	0.18	0	0.00	TCS-12
123150	613.102	611.944	0.08	611.864	1.238	25	6.7	0.18	0	0.00	TCS-12
123175	611.448	611.156	0.08	611.076	0.372	25	6.7	0.18	0.176552	29.57	TCS-3
123200	616.966	610.447	0.08	610.367	6.599	25	6.7	0.18	0	0.00	TCS-12
123225	621.196	609.738	0.08	609.658	11.538	25	6.7	0.18	0	0.00	TCS-12
123250	614.542	609.029	0.08	608.949	5.593	25	6.7	0.18	0	0.00	TCS-12
123275	608.756	608.32	0.08	608.24	0.516	25	6.7	0.18	0.044	7.37	TCS-3
123300	608.652	607.611	0.08	607.531	1.121	25	6.7	0.18	0	0.00	TCS-3
123325	618.87	606.888	0.08	606.808	12.062	25	6.7	0.18	0	0.00	TCS-12
123350	620.924	605.972	0.08	605.892	15.032	25	6.7	0.18	0	0.00	TCS-12
123375	610.259	604.81	0.08	604.73	5.529	25	6.7	0.18	0	0.00	TCS-3
123400	604.807	603.404	0.08	603.324	1.483	25	6.7	0.18	0	0.00	TCS-3
123425	605.468	601.909	0.08	601.829	3.639	25	6.7	0.18	0	0.00	TCS-7A
123450	606.505	600.413	0.08	600.333	6.172	25	6.7	0.18	0	0.00	TCS-7A
123475	609.273	598.917	0.08	598.837	10.436	25	6.7	0.18	0	0.00	TCS-7A
123500	601.337	597.422	0.08	597.342	3.995	25	6.7	0.18	0	0.00	TCS-7A
123525	602.47	595.926	0.08	595.846	6.624	25	6.7	0.18	0	0.00	TCS-7A
123550	603.614	594.43	0.08	594.35	9.264	25	6.7	0.18	0	0.00	TCS-7A
123575	602.319	592.935	0.08	592.855	9.464	25	6.7	0.18	0	0.00	TCS-7A
123600	614.317	591.439	0.08	591.359	22.958	25	6.7	0.18	0	0.00	TCS-7A
123625	604.128	589.943	0.08	589.863	14.265	25	6.7	0.18	0	0.00	TCS-7A
123650	598.005	588.447	0.08	588.367	9.638	25	6.7	0.18	0	0.00	TCS-7A
123675	595.526	586.952	0.08	586.872	8.654	25	6.7	0.18	0	0.00	TCS-12
123700	596.394	585.494	0.08	585.414	10.98	25	6.7	0.18	0	0.00	TCS-12
123725	593.429	584.207	0.08	584.127	9.302	25	6.7	0.18	0	0.00	TCS-12
123750	609.259	583.101	0.08	583.021	26.238	25	6.7	0.18	0	0.00	TCS-12
123775	607.569	582.176	0.08	582.096	25.473	25	6.7	0.18	0	0.00	TCS-12
123800	591.434	581.433	0.08	581.353	10.081	25	6.7	0.18	0	0.00	TCS-12
123825	589.978	580.806	0.08	580.726	9.252	25	6.7	0.18	0	0.00	TCS-12
123850	585.736	580.181	0.08	580.101	5.635	25	6.7	0.18	0	0.00	TCS-12
123875	583.284	579.556	0.08	579.476	3.808	25	6.7	0.18	0	0.00	TCS-12
123900	582.581	578.931	0.08	578.851	3.73	25	6.7	0.18	0	0.00	TCS-12
123925	599.643	578.306	0.08	578.226	21.417	25	6.7	0.18	0	0.00	TCS-12
123950	580.917	577.681	0.08	577.601	3.316	25	6.7	0.18	0	0.00	TCS-12
123975	579.718	577.056	0.08	576.976	2.742	25	6.7	0.18	0	0.00	TCS-12
124000	578.144	576.431	0.08	576.351	1.793	25	6.7	0.18	0	0.00	TCS-12
124025	576.863	575.806	0.08	575.726	1.137	25	6.7	0.18	0	0.00	TCS-4
124050	575.809	575.181	0.08	575.101	0.708	25	6.7	0.18	0	0.00	TCS-4
124075	572.666	574.556	0.08	574.476	-1.81	25	6.7	0.18	0.176552	29.57	TCS-4
124100	572.069	573.93	0.08	573.85	-1.781	25	6.7	0.18	0.176552	29.57	TCS-4
124125	571.286	573.182	0.08	573.102	-1.816	25	6.7	0.18	0.176552	29.57	TCS-3
124150	570.986	572.24	0.08	572.16	-1.174	25	6.7	0.18	0.176552	29.57	TCS-3
124175	570.343	571.102	0.08	571.022	-0.679	25	6.7	0.18	0.176552	29.57	TCS-3
124200	576.181	569.852	0.08	569.772	6.409	25	6.7	0.18	0	0.00	TCS-7A
124225	582.113	568.602	0.08	568.522	13.591	25	6.7	0.18	0	0.00	TCS-7A
124250	579.949	567.352	0.08	567.272	12.677	25	6.7	0.18	0	0.00	TCS-3
124275	566.177	566.115	0.08	566.035	0.142	25	6.7	0.18	0.176552	29.57	TCS-3
124300	564.928	564.951	0.08	564.871	0.057	25	6.7	0.18	0.176552	29.57	TCS-3
124325	571.266	563.869	0.08	563.789	7.477	25		0.18	0		TCS-3A
124350	566.694	562.869	0.08	562.789	3.905	25		0.18	0		TCS-3A
124375	561.677	561.939	0.08	561.859	-0.182	25	6.7	0.18	0.176552	29.57	TCS-5
124400	570.729	561.016	0.08	560.936	9.793	25	6.7	0.18	0	0.00	TCS-5
124425	564.564	560.094	0.08	560.014	4.55	25	6.7	0.18	0	0.00	TCS-3
124450	559.574	559.172	0.08	559.092	0.482	25	6.7	0.18	0.078	13.07	TCS-3
124475	558.507	558.249	0.08	558.169	0.338	25	6.7	0.18	0.176552	29.57	TCS-3
124500	557.652	557.327	0.08	557.247	0.405	25	6.7	0.18	0.155	25.96	TCS-3
124525	556.694	556.405	0.08	556.325	0.369	25	6.7	0.18	0.176552	29.57	TCS-3
124550	555.214	555.482	0.08	555.402	-0.188	25	6.7	0.18	0.176552	29.57	TCS-3



Chainage	FRL	EGL	Avg.Ext. Bituminous layer thick (m)	EGL- Bituminous layer	Difference after Scarification (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantling thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
124575	558.46	554.56	0.08	554.48	3.98	25	6.7	0.18	0	0.00	TCS-3
124600	553.291	553.651	0.08	553.571	-0.28	25	6.7	0.18	0.176552	29.57	TCS-3
124625	555.423	553.003	0.08	552.923	2.5	25	6.7	0.18	0	0.00	TCS-3
124650	554.978	552.713	0.08	552.633	2.345	25	6.7	0.18	0	0.00	TCS-3
124675	552.273	552.781	0.08	552.701	-0.428	25	6.7	0.18	0.176552	29.57	TCS-3
124700	552.543	553.004	0.08	552.924	-0.381	25	6.7	0.18	0.176552	29.57	TCS-3
124725	552.914	553.227	0.08	553.147	-0.233	25	6.7	0.18	0.176552	29.57	TCS-3
124750	553.308	553.45	0.08	553.37	-0.062	25	6.7	0.18	0.176552	29.57	TCS-3
124775	553.628	553.673	0.08	553.593	0.035	25	6.7	0.18	0.176552	29.57	TCS-3
124800	553.81	553.896	0.08	553.816	-0.006	25	6.7	0.18	0.176552	29.57	TCS-3
124825	554.728	554.119	0.08	554.039	0.689	25	6.7	0.18	0	0.00	TCS-3
124850	554.276	554.342	0.08	554.262	0.014	25	6.7	0.18	0.176552	29.57	TCS-3
124875	554.538	554.565	0.08	554.485	0.053	25	6.7	0.18	0.176552	29.57	TCS-3
124900	554.673	554.788	0.08	554.708	-0.035	25	6.7	0.18	0.176552	29.57	TCS-3
124925	554.93	555.011	0.08	554.931	-0.001	25	6.7	0.18	0.176552	29.57	TCS-3
124950	555.102	555.234	0.08	555.154	-0.052	25	6.7	0.18	0.176552	29.57	TCS-3
124975	555.295	555.457	0.08	555.377	-0.082	25	6.7	0.18	0.176552	29.57	TCS-3
125000	556.143	555.675	0.08	555.595	0.548	25	6.7	0.18	0.012	2.01	TCS-3
125025	555.433	555.645	0.08	555.565	-0.132	25	6.7	0.18	0.176552	29.57	TCS-4
125050	556.283	555.228	0.08	555.148	1.135	25	6.7	0.18	0	0.00	TCS-4
125075	554.406	554.423	0.08	554.343	0.063	25		0.18	0.176552		TCS-3A
125100	561.135	553.407	0.08	553.327	7.808	25		0.18	0		TCS-3A
125125	564.258	552.39	0.08	552.31	11.948	25	6.7	0.18	0	0.00	TCS-3
125150	551.281	551.374	0.08	551.294	-0.013	25	6.7	0.18	0.176552	29.57	TCS-3
125175	551.195	550.357	0.08	550.277	0.918	25	6.7	0.18	0	0.00	TCS-3
125200	556.882	549.34	0.08	549.26	7.622	25	6.7	0.18	0	0.00	TCS-3
125225	547.864	548.324	0.08	548.244	-0.38	25	6.7	0.18	0.176552	29.57	TCS-3
125250	547.454	547.307	0.08	547.227	0.227	25	6.7	0.18	0.176552	29.57	TCS-3
125275	550.839	546.29	0.08	546.21	4.629	25	6.7	0.18	0	0.00	TCS-3
125300	545.365	545.273	0.08	545.193	0.172	25	6.7	0.18	0.176552	29.57	TCS-3
125325	544.358	544.257	0.08	544.177	0.181	25	6.7	0.18	0.176552	29.57	TCS-3
125350	543.278	543.24	0.08	543.16	0.118	25	6.7	0.18	0.176552	29.57	TCS-3
125375	541.769	542.223	0.08	542.143	-0.374	25	6.7	0.18	0.176552	29.57	TCS-3
125400	541.691	541.207	0.08	541.127	0.564	25	6.7	0.18	0	0.00	TCS-3
125425	539.914	540.21	0.08	540.13	-0.216	25	6.7	0.18	0.176552	29.57	TCS-3
125450	539.01	539.288	0.08	539.208	-0.198	25	6.7	0.18	0.176552	29.57	TCS-3
125475	538.698	538.446	0.08	538.366	0.332	25	6.7	0.18	0.176552	29.57	TCS-3
125500	537.995	537.671	0.08	537.591	0.404	25	6.7	0.18	0.156	26.13	TCS-3
125525	536.816	536.905	0.08	536.825	-0.009	25	6.7	0.18	0.176552	29.57	TCS-3
125550	536.03	536.14	0.08	536.06	-0.03	25	6.7	0.18	0.176552	29.57	TCS-3
125575	540.466	535.374	0.08	535.294	5.172	25	6.7	0.18	0	0.00	TCS-3
125600	536.914	534.609	0.08	534.529	2.385	25	6.7	0.18	0	0.00	TCS-3
125625	533.893	533.844	0.08	533.764	0.129	25	6.7	0.18	0.176552	29.57	TCS-3
125650	532.983	533.078	0.08	532.998	-0.015	25	6.7	0.18	0.176552	29.57	TCS-3
125675	533.397	532.313	0.08	532.233	1.164	25	6.7	0.18	0	0.00	TCS-3
125700	531.158	531.547	0.08	531.467	-0.309	25	6.7	0.18	0.176552	29.57	TCS-3
125725	530.593	530.782	0.08	530.702	-0.109	25		0.18	0.176552		TCS-3A
125750	534.849	530.015	0.08	529.935	4.914	25		0.18	0		TCS-3A
125775	528.79	529.176	0.08	529.096	-0.306	25	6.7	0.18	0.176552	29.57	TCS-3
125800	530.474	528.228	0.08	528.148	2.326	25	6.7	0.18	0	0.00	TCS-3
125825	531.807	527.172	0.08	527.092	4.715	25	6.7	0.18	0	0.00	TCS-3
125850	526.1	526.058	0.08	525.978	0.122	25	6.7	0.18	0.176552	29.57	TCS-3
125875	529.342	524.945	0.08	524.865	4.477	25	6.7	0.18	0	0.00	TCS-3
125900	525.387	523.831	0.08	523.751	1.636	25	6.7	0.18	0	0.00	TCS-3
125925	522.522	522.718	0.08	522.638	-0.116	25	6.7	0.18	0.176552	29.57	TCS-3
125950	521.112	521.606	0.08	521.526	-0.414	25	6.7	0.18	0.176552	29.57	TCS-3
125975	520.25	520.589	0.08	520.509	-0.259	25	6.7	0.18	0.176552	29.57	TCS-3
126000	519.457	519.723	0.08	519.643	-0.186	25	6.7	0.18	0.176552	29.57	TCS-3
126025	519.351	519.009	0.08	518.929	0.422	25	6.7	0.18	0.138	23.11	TCS-3
126050	518.023	518.379	0.08	518.299	-0.276	25	6.7	0.18	0.176552	29.57	TCS-3
126075	517.378	517.749	0.08	517.669	-0.291	25	6.7	0.18	0.176552	29.57	TCS-3
126100	516.84	517.12	0.08	517.04	-0.2	25	6.7	0.18	0.176552	29.57	TCS-3
126125	516.286	516.49	0.08	516.41	-0.124	25	6.7	0.18	0.176552	29.57	TCS-3
126150	515.763	515.811	0.08	515.731	0.032	25	6.7	0.18	0.176552	29.57	TCS-3
126175	515.229	514.975	0.08	514.895	0.334	25	6.7	0.18	0.176552	29.57	TCS-3
126200	514.657	513.977	0.08	513.897	0.76	25	6.7	0.18	0	0.00	TCS-3
126225	519.082	512.844	0.08	512.764	6.318	25	6.7	0.18	0	0.00	TCS-3
126250	519.112	511.698	0.08	511.618	7.494	25	6.7	0.18	0	0.00	TCS-3
126275	510.701	510.551	0.08	510.471	0.23	25	6.7	0.18	0.176552	29.57	TCS-3
126300	510.199	509.405	0.08	509.325	0.874	25	6.7	0.18	0	0.00	TCS-3
126325	508.904	508.258	0.08	508.178	0.726	25	6.7	0.18	0	0.00	TCS-3
126350	507.86	507.111	0.08	507.031	0.829	25	6.7	0.18	0	0.00	TCS-3



Chainage	FRL	EGL	Avg. Ext. Bituminous layer thck (m)	EGL- Bituminous layer	Difference after Scarification (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantling thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
126375	507.083	505.965	0.08	505.885	1.198	25	6.7	0.18	0	0.00	TCS-3
126400	506.639	504.876	0.08	504.796	1.843	25	6.7	0.18	0	0.00	TCS-3
126425	505.835	503.947	0.08	503.867	1.968	25	6.7	0.18	0	0.00	TCS-3
126450	504.926	503.182	0.08	503.102	1.824	25	6.7	0.18	0	0.00	TCS-3
126475	503.808	502.546	0.08	502.466	1.342	25	6.7	0.18	0	0.00	TCS-3
126500	502.636	501.921	0.08	501.841	0.795	25	6.7	0.18	0	0.00	TCS-3
126525	501.621	501.296	0.08	501.216	0.405	25	6.7	0.18	0.155	25.96	TCS-3
126550	502.857	500.671	0.08	500.591	2.266	25	6.7	0.18	0	0.00	TCS-3
126575	500.429	500.046	0.08	499.966	0.463	25	6.7	0.18	0.097	16.25	TCS-4
126600	499.731	499.396	0.08	499.316	0.415	25	6.7	0.18	0.145	24.29	TCS-4
126625	498.857	498.612	0.08	498.532	0.325	25	6.7	0.18	0.176552	29.57	TCS-3
126650	497.663	497.683	0.08	497.603	0.06	25	6.7	0.18	0.176552	29.57	TCS-3
126675	498.423	496.62	0.08	496.54	1.883	25	6.7	0.18	0	0.00	TCS-3
126700	495.449	495.529	0.08	495.449	0	25	6.7	0.18	0.176552	29.57	TCS-3
126725	494.792	494.438	0.08	494.358	0.434	25	6.7	0.18	0.126	21.11	TCS-3
126750	493.431	493.347	0.08	493.267	0.164	25	6.7	0.18	0.176552	29.57	TCS-3
126775	493.73	492.257	0.08	492.177	1.553	25		0.18	0		TCS-3A
126800	501.745	491.166	0.08	491.086	10.659	25		0.18	0		TCS-3A
126825	504.044	490.075	0.08	489.995	14.049	25		0.18	0		TCS-3A
126850	491.567	488.984	0.08	488.904	2.663	25	6.7	0.18	0	0.00	TCS-3
126875	487.917	487.893	0.08	487.813	0.104	25	6.7	0.18	0.176552	29.57	TCS-3
126900	489.652	486.802	0.08	486.722	2.93	25	6.7	0.18	0	0.00	TCS-3
126925	494.398	485.712	0.08	485.632	8.766	25	6.7	0.18	0	0.00	TCS-3
126950	484.722	484.621	0.08	484.541	0.181	25	6.7	0.18	0.176552	29.57	TCS-3
126975	488.095	483.54	0.08	483.46	4.635	25	6.7	0.18	0	0.00	TCS-12
127000	494.393	482.522	0.08	482.442	11.951	25	6.7	0.18	0	0.00	TCS-12
127025	494.616	481.577	0.08	481.497	13.119	25		0.18	0		TCS-3A
127050	482.277	480.7	0.08	480.62	1.657	25		0.18	0		TCS-3A
127075	491.958	479.84	0.08	479.76	12.198	25		0.18	0		TCS-3A
127100	484.492	478.98	0.08	478.9	5.592	25		0.18	0		TCS-3A
127125	483.925	478.12	0.08	478.04	5.885	25	6.7	0.18	0	0.00	TCS-3
127150	480.634	477.26	0.08	477.18	3.454	25	6.7	0.18	0	0.00	TCS-3
127175	476.804	476.4	0.08	476.32	0.484	25	6.7	0.18	0.076	12.73	TCS-3
127200	478.272	475.54	0.08	475.46	2.812	25	6.7	0.18	0	0.00	TCS-3
127225	488.884	474.679	0.08	474.599	14.285	25	6.7	0.18	0	0.00	TCS-7A
127250	491.455	473.819	0.08	473.739	17.716	25	6.7	0.18	0	0.00	TCS-7A
127275	492.13	472.959	0.08	472.879	19.251	25	6.7	0.18	0	0.00	TCS-7A
127300	489.313	472.099	0.08	472.019	17.294	25	6.7	0.18	0	0.00	TCS-7A
127325	480.685	471.239	0.08	471.159	9.526	25	6.7	0.18	0	0.00	TCS-7A
127350	479.989	470.379	0.08	470.299	9.69	25	6.7	0.18	0	0.00	TCS-7A
127375	474.179	469.519	0.08	469.439	4.74	25	6.7	0.18	0	0.00	TCS-7A
127400	478.697	468.659	0.08	468.579	10.118	25	6.7	0.18	0	0.00	TCS-7A
127425	474.379	467.799	0.08	467.719	6.66	25	6.7	0.18	0	0.00	TCS-7A
127450	479.34	466.938	0.08	466.858	12.482	25	6.7	0.18	0	0.00	TCS-7A
127475	474.597	466.078	0.08	465.998	8.599	25	6.7	0.18	0	0.00	TCS-7A
127500	465.084	465.237	0.08	465.157	-0.073	25	6.7	0.18	0.176552	29.57	TCS-7A
127525	464.6	464.465	0.08	464.385	0.215	25	6.7	0.18	0.176552	29.57	TCS-7A
127550	470.087	463.764	0.08	463.684	6.403	25	6.7	0.18	0	0.00	TCS-7A
127575	479.945	463.124	0.08	463.044	16.901	25	6.7	0.18	0	0.00	TCS-7A
127600	477.743	462.492	0.08	462.412	15.331	25	6.7	0.18	0	0.00	TCS-7A
127625	477.741	461.86	0.08	461.78	15.961	25	6.7	0.18	0	0.00	TCS-7A
127650	478.468	461.228	0.08	461.148	17.32	25	6.7	0.18	0	0.00	TCS-7A
127675	471.644	460.596	0.08	460.516	11.128	25	6.7	0.18	0	0.00	TCS-7A
127700	472.309	459.963	0.08	459.883	12.426	25	6.7	0.18	0	0.00	TCS-7A
127725	462.096	459.196	0.08	459.116	2.98	25	6.7	0.18	0	0.00	TCS-7A
127750	458.435	458.189	0.08	458.109	0.326	25	6.7	0.18	0.176552	29.57	TCS-7A
127775	457.38	456.94	0.08	456.86	0.52	25	6.7	0.18	0.04	6.70	TCS-7A
127800	457.555	455.54	0.08	455.46	2.095	25	6.7	0.18	0	0.00	TCS-7A
127825	457.531	454.137	0.08	454.057	3.474	25	6.7	0.18	0	0.00	TCS-7A
127850	456.503	452.763	0.08	452.683	3.82	25	6.7	0.18	0	0.00	TCS-7A
127875	456.019	451.538	0.08	451.458	4.561	25	6.7	0.18	0	0.00	TCS-7A
127900	455.351	450.475	0.08	450.395	4.956	25	6.7	0.18	0	0.00	TCS-7A
127925	454.527	449.574	0.08	449.494	5.033	25	6.7	0.18	0	0.00	TCS-7A
127950	453.754	448.835	0.08	448.755	4.999	25	6.7	0.18	0	0.00	TCS-7A
127975	452.958	448.206	0.08	448.126	4.832	25	6.7	0.18	0	0.00	TCS-7A
128000	454.662	447.581	0.08	447.501	7.161	25	6.7	0.18	0	0.00	TCS-7A
128025	447.474	446.956	0.08	446.876	0.598	25	6.7	0.18	0	0.00	TCS-7A
128050	445.265	446.331	0.08	446.251	-0.986	25	6.7	0.18	0.176552	29.57	TCS-7A
128075	444.462	445.699	0.08	445.619	-1.157	25	6.7	0.18	0.176552	29.57	TCS-7A
128100	444.144	444.967	0.08	444.887	-0.743	25	6.7	0.18	0.176552	29.57	TCS-7A
128125	442.804	444.109	0.08	444.029	-1.225	25	6.7	0.18	0.176552	29.57	TCS-7A
128150	446.313	443.125	0.08	443.045	3.268	25	6.7	0.18	0	0.00	TCS-7A



Chainage	FRL	EGL	Avg. Ext. Bituminous layer thck (m)	EGL- Bituminous layer	Difference after Scarification (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantling thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
128175	445.466	442.022	0.08	441.942	3.524	25	6.7	0.18	0	0.00	TCS-7A
128200	444.094	440.892	0.08	440.812	3.282	25	6.7	0.18	0	0.00	TCS-7A
128225	440.236	439.762	0.08	439.682	0.554	25	6.7	0.18	0.006	1.01	TCS-7A
128250	440.235	438.632	0.08	438.552	1.683	25	6.7	0.18	0	0.00	TCS-7A
128275	438.854	437.502	0.08	437.422	1.432	25	6.7	0.18	0	0.00	TCS-7A
128300	439.063	436.406	0.08	436.326	2.737	25	6.7	0.18	0	0.00	TCS-7A
128325	440.092	435.401	0.08	435.321	4.771	25	6.7	0.18	0	0.00	TCS-7A
128350	433.594	434.489	0.08	434.409	-0.815	25	6.7	0.18	0.176552	29.57	TCS-7A
128375	440.475	433.65	0.08	433.57	6.905	25	6.7	0.18	0	0.00	TCS-7A
128400	435.243	432.817	0.08	432.737	2.506	25	6.7	0.18	0	0.00	TCS-7A
128425	432.738	431.984	0.08	431.904	0.834	25	6.7	0.18	0	0.00	TCS-7A
128450	432.193	431.15	0.08	431.07	1.123	25	6.7	0.18	0	0.00	TCS-7A
128475	433.011	430.317	0.08	430.237	2.774	25	6.7	0.18	0	0.00	TCS-7A
128500	431.228	429.484	0.08	429.404	1.824	25	6.7	0.18	0	0.00	TCS-7A
128525	428.953	428.65	0.08	428.57	0.383	25	6.7	0.18	0.176552	29.57	TCS-7A
128550	427.531	427.817	0.08	427.737	-0.206	25	6.7	0.18	0.176552	29.57	TCS-7A
128575	426.604	426.984	0.08	426.904	-0.3	25	6.7	0.18	0.176552	29.57	TCS-7A
128600	425.093	426.151	0.08	426.071	-0.978	25	6.7	0.18	0.176552	29.57	TCS-7A
128625	430.677	425.317	0.08	425.237	5.44	25	6.7	0.18	0	0.00	TCS-7A
128650	424.759	424.484	0.08	424.404	0.355	25	6.7	0.18	0.176552	29.57	TCS-7A
128675	430.972	423.651	0.08	423.571	7.401	25	6.7	0.18	0	0.00	TCS-7A
128700	432.427	422.818	0.08	422.738	9.689	25	6.7	0.18	0	0.00	TCS-7A
128725	422.244	421.984	0.08	421.904	0.34	25	6.7	0.18	0.176552	29.57	TCS-7A
128750	421.124	421.151	0.08	421.071	0.053	25	6.7	0.18	0.176552	29.57	TCS-7A
128775	425.568	420.318	0.08	420.238	5.33	25	6.7	0.18	0	0.00	TCS-7A
128800	428.677	419.484	0.08	419.404	9.273	25	6.7	0.18	0	0.00	TCS-7A
128825	428.285	418.651	0.08	418.571	9.714	25	6.7	0.18	0	0.00	TCS-7A
128850	418.018	417.818	0.08	417.738	0.28	25	6.7	0.18	0.176552	29.57	TCS-7A
128875	417.401	416.985	0.08	416.905	0.496	25	6.7	0.18	0.064	10.72	TCS-7A
128900	416.162	416.151	0.08	416.071	0.091	25	6.7	0.18	0.176552	29.57	TCS-7A
128925	416.242	415.318	0.08	415.238	1.004	25	6.7	0.18	0	0.00	TCS-7A
128950	421.324	414.485	0.08	414.405	6.919	25	6.7	0.18	0	0.00	TCS-7A
128975	425.302	413.625	0.08	413.545	11.757	25	6.7	0.18	0	0.00	TCS-7A
129000	413.612	412.586	0.08	412.506	1.106	25	6.7	0.18	0	0.00	TCS-7A
129025	413.314	411.343	0.08	411.263	2.051	25	6.7	0.18	0	0.00	TCS-7A
129050	413.916	409.905	0.08	409.825	4.091	25	6.7	0.18	0	0.00	TCS-7A
129075	411.698	408.418	0.08	408.338	3.36	25	6.7	0.18	0	0.00	TCS-7A
129100	410.758	407.025	0.08	406.945	3.813	25	6.7	0.18	0	0.00	TCS-7A
129125	422.839	406.067	0.08	405.987	16.852	25	6.7	0.18	0	0.00	TCS-7A
129150	416.777	405.573	0.08	405.493	11.284	25	6.7	0.18	0	0.00	TCS-7A
129175	404.071	405.5	0.08	405.42	-1.349	25	6.7	0.18	0.176552	29.57	TCS-7A
129200	405.747	405.5	0.08	405.42	0.327	25	6.7	0.18	0.176552	29.57	TCS-7A
129225	405.436	405.39	0.08	405.31	0.126	25	6.7	0.18	0.176552	29.57	TCS-7A
129250	404.785	405.066	0.08	404.986	-0.201	25	6.7	0.18	0.176552	29.57	TCS-7A
129275	404.25	404.638	0.08	404.558	-0.308	25	6.7	0.18	0.176552	29.57	TCS-7A
129300	405.467	404.21	0.08	404.13	1.337	25	6.7	0.18	0	0.00	TCS-7A
129325	404.329	403.783	0.08	403.703	0.626	25	6.7	0.18	0	0.00	TCS-7A
129350	401.791	403.355	0.08	403.275	-1.484	25	6.7	0.18	0.176552	29.57	TCS-7A
129375	402.242	402.927	0.08	402.847	-0.605	25	6.7	0.18	0.176552	29.57	TCS-7A
129400	401.738	402.506	0.08	402.426	-0.688	25	6.7	0.18	0.176552	29.57	TCS-7A
129425	401.839	402.154	0.08	402.074	-0.235	25	6.7	0.18	0.176552	29.57	TCS-7A
129450	401.679	401.887	0.08	401.807	-0.128	25	6.7	0.18	0.176552	29.57	TCS-7A
129475	401.644	401.705	0.08	401.625	0.019	25	6.7	0.18	0.176552	29.57	TCS-7A
129500	405.135	401.551	0.08	401.471	3.664	25	6.7	0.18	0	0.00	TCS-7A
129525	411.97	401.397	0.08	401.317	10.653	25	6.7	0.18	0	0.00	TCS-7A
129550	414.28	401.243	0.08	401.163	13.117	25	6.7	0.18	0	0.00	TCS-7A
129575	403.357	401.088	0.08	401.008	2.349	25	6.7	0.18	0	0.00	TCS-7A
129600	402.323	400.934	0.08	400.854	1.469	25	6.7	0.18	0	0.00	TCS-7A
129625	402.779	400.78	0.08	400.7	2.079	25	6.7	0.18	0	0.00	TCS-7A
129650	404.984	400.626	0.08	400.546	4.438	25	6.7	0.18	0	0.00	TCS-7A

Chainage	FRL	EGL	Avg.Ext. Bituminou s layer thck (m)	EGL- Bituminous layer	Difference after Scarificati on (m)	Length (m)	Existing Road Width (m)	Ext. Granular thickness (mm)	Granular material dismantlin g thickness (mm)	Granular material dismantling Quantity (cum)	TCS Type
129675	400.468	400.472	0.08	400.392	0.076	25	6.7	0.18	0.176552	29.57	TCS-7A
129700	400.255	400.317	0.08	400.237	0.018	25	6.7	0.18	0.176552	29.57	TCS-7A
129725	399.92	400.163	0.08	400.083	-0.163	25	6.7	0.18	0.176552	29.57	TCS-7A
129750	399.757	400.009	0.08	399.929	-0.172	25	6.7	0.18	0.176552	29.57	TCS-7A
129775	399.416	399.855	0.08	399.775	-0.359	25	6.7	0.18	0.176552	29.57	TCS-7A
129800	410.872	399.701	0.08	399.621	11.251	25	6.7	0.18	0	0.00	TCS-7A
129825	405.525	399.547	0.08	399.467	6.058	25	6.7	0.18	0	0.00	TCS-7A
129850	398.354	399.392	0.08	399.312	-0.958	25	6.7	0.18	0.176552	29.57	TCS-7A
129875	397.814	399.238	0.08	399.158	-1.344	25	6.7	0.18	0.176552	29.57	TCS-7A
129900	397.85	399.084	0.08	399.004	-1.154	25	6.7	0.18	0.176552	29.57	TCS-7A
129925	397.986	398.93	0.08	398.85	-0.864	25	6.7	0.18	0.176552	29.57	TCS-7A
129950	398.069	398.776	0.08	398.696	-0.627	25	6.7	0.18	0.176552	29.57	TCS-7A
129975	398.128	398.622	0.08	398.542	-0.414	25	6.7	0.18	0.176552	29.57	TCS-7A
130000	397.962	398.467	0.08	398.387	-0.425	25	6.7	0.18	0.176552	29.57	TCS-7A
130025	398.269	398.313	0.08	398.233	0.036	25	6.7	0.18	0.176552	29.57	TCS-7A
130050	399.208	398.159	0.08	398.079	1.129	25	6.7	0.18	0	0.00	TCS-7A
130075	402.393	398.005	0.08	397.925	4.468	25	6.7	0.18	0	0.00	TCS-7A
130100	399.811	397.851	0.08	397.771	2.04	25	6.7	0.18	0	0.00	TCS-7A
130125	397.088	397.696	0.08	397.616	-0.528	25	6.7	0.18	0.176552	29.57	TCS-7A
130150	397.032	397.542	0.08	397.462	-0.43	25	6.7	0.18	0.176552	29.57	TCS-7A
130175	397.273	397.388	0.08	397.308	-0.035	25	6.7	0.18	0.176552	29.57	TCS-7A
130200	397.344	397.234	0.08	397.154	0.19	25	6.7	0.18	0.176552	29.57	TCS-7A
130225	397.531	397.078	0.08	396.998	0.533	25	6.7	0.18	0.027	4.52	TCS-7A
130250	397.487	396.832	0.08	396.752	0.735	25	6.7	0.18	0	0.00	TCS-7A
130275	397.016	396.448	0.08	396.368	0.648	25	6.7	0.18	0	0.00	TCS-7A
130300	395.729	395.926	0.08	395.846	-0.117	25	6.7	0.18	0.176552	29.57	TCS-7A
130325	395.873	395.268	0.08	395.188	0.685	25	6.7	0.18	0	0.00	TCS-7A
130350	403.255	394.561	0.08	394.481	8.774	25	6.7	0.18	0	0.00	TCS-7A
130375	393.116	393.855	0.08	393.775	-0.659	25	6.7	0.18	0.176552	29.57	TCS-7A
130400	393.225	393.149	0.08	393.069	0.156	25	6.7	0.18	0.176552	29.57	TCS-7A
130425	392.488	392.489	0.08	392.409	0.079	25	6.7	0.18	0.176552	29.57	TCS-7A
130450	392.156	392.142	0.08	392.062	0.094	25	6.7	0.18	0.176552	29.57	TCS-7A
130475	392.127	392.1	0.08	392.02	0.107	25	6.7	0.18	0.176552	29.57	TCS-7A
130500	392.36	392.084	0.08	392.004	0.356	25	6.7	0.18	0.176552	29.57	TCS-7A
130525	402.453	391.776	0.08	391.696	10.757	25	6.7	0.18	0	0.00	TCS-7A
130550	400.404	391.089	0.08	391.009	9.395	25	6.7	0.18	0	0.00	TCS-7A
130575	399.933	390.3	0.08	390.22	9.713	25	6.7	0.18	0	0.00	TCS-7A
130600	388.053	389.511	0.08	389.431	-1.378	25	6.7	0.18	0.176552	29.57	TCS-7A
130625	388.455	388.722	0.08	388.642	-0.187	25	6.7	0.18	0.176552	29.57	TCS-7A
130650	387.705	387.933	0.08	387.853	-0.148	25	6.7	0.18	0.176552	29.57	TCS-7A
130675	386.757	387.143	0.08	387.063	-0.306	25	6.7	0.18	0.176552	29.57	TCS-7A
130700	385.678	386.354	0.08	386.274	-0.596	25	6.7	0.18	0.176552	29.57	TCS-7A
130725	385.09	385.565	0.08	385.485	-0.395	25	6.7	0.18	0.176552	29.57	TCS-7A
130750	384.216	384.772	0.08	384.692	-0.476	25	6.7	0.18	0.176552	29.57	TCS-7A
130775	382.927	383.942	0.08	383.862	-0.935	25	6.7	0.18	0.176552	29.57	TCS-7A
130800	385.378	383.066	0.08	382.986	2.392	25	6.7	0.18	0	0.00	TCS-7A
130825	383.611	382.147	0.08	382.067	1.544	25	6.7	0.18	0	0.00	TCS-7A
130850	382.344	381.186	0.08	381.106	1.238	25	6.7	0.18	0	0.00	TCS-7A
130875	380.208	380.218	0.08	380.138	0.07	25	6.7	0.18	0.176552	29.57	TCS-7A
130900	379.107	379.25	0.08	379.17	-0.063	25	6.7	0.18	0.176552	29.57	TCS-7A
130925	378.245	378.283	0.08	378.203	0.042	25	6.7	0.18	0.176552	29.57	TCS-7A
130950	377.434	377.315	0.08	377.235	0.199	25	6.7	0.18	0.176552	29.57	TCS-7A
130975	376.256	376.347	0.08	376.267	-0.011	25	6.7	0.18	0.176552	29.57	TCS-7A
131000	374.907	375.379	0.08	375.299	-0.392	25	6.7	0.18	0.176552	29.57	TCS-7A
131025	374.031	374.411	0.08	374.331	-0.3	25	6.7	0.18	0.176552	29.57	TCS-7A
131050	373.029	373.443	0.08	373.363	-0.334	25	6.7	0.18	0.176552	29.57	TCS-7A
131075	372.155	372.475	0.08	372.395	-0.24	25	6.7	0.18	0.176552	29.57	TCS-7A
131100	371.122	371.507	0.08	371.427	-0.305	25	6.7	0.18	0.176552	29.57	TCS-7A
131125	369.998	370.54	0.08	370.46	-0.462	25	6.7	0.18	0.176552	29.57	TCS-7A
131150	369.375	369.57	0.08	369.49	-0.115	25	6.7	0.18	0.176552	29.57	TCS-7A
131175	368.472	368.566	0.08	368.486	-0.014	25	6.7	0.18	0.176552	29.57	TCS-7A
131200	367.591	367.513	0.08	367.433	0.158	25	6.7	0.18	0.176552	29.57	TCS-7A
131225	366.151	366.41	0.08	366.33	-0.179	25	6.7	0.18	0.176552	29.57	TCS-7A
131250	366.519	365.286	0.08	365.206	1.313	25	6.7	0.18	0	0.00	TCS-7A
						29972.5					

QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
101300	95.616	0	0.00	0.00
101325	40.776	0	2131.13	0.00
101350	3.464	1.98	691.25	24.75
101375	226.768	0	3597.38	24.75
101400	313.888	0	8447.75	0.00
101425	251.944	0	8841.13	0.00
101450	190.544	0	6913.88	0.00
101475	203.464	0	6156.38	0.00
101500	60.304	0	4121.38	0.00
101525	5.56	11.78	1029.13	147.25
101550	10.088	0	244.50	147.25
101575	24.808	0.86	545.25	10.75
101600	4.6	43.16	459.50	550.25
101625	18.64	0.06	363.13	540.25
101650	21.568	0	628.25	0.75
101675	6.704	0	441.75	0.00
101700	93.392	0	1564.00	0.00
101725	377	0	7349.88	0.00
101750	82.504	0	7179.75	0.00
101775	7.096	0.06	1400.00	0.75
101800	37.6	0	698.38	0.75
101825	32.016	1.83	1087.75	22.88
101850	32.408	4.84	1006.63	83.38
101875	18.248	1.2	791.50	75.50
101900	3.4	75.19	338.25	954.88
101925	5.88	0	145.00	939.88
101950	29.064	151.55	546.00	1894.38
101975	30.904	0	937.00	1894.38
102000	57.024	0	1373.88	0.00
102025	103.048	0.02	2501.13	0.25
102050	135.624	4.29	3729.25	53.88
102075	142.008	0	4338.00	53.63
102100	203.896	0	5404.75	0.00
102125	167.36	0	5800.88	0.00
102150	8.912	0	2754.25	0.00
102175	3.632	0	196.00	0.00
102200	12.72	0	255.50	0.00
102225	124.68	0	2146.88	0.00
102250	65.216	0	2967.13	0.00
102275	6.752	8.73	1124.50	109.13
102300	13.952	0	323.50	109.13
102325	17.52	0	491.75	0.00
102350	16.688	0	534.50	0.00
102375	10.92	96.91	431.38	1211.38
102400	6.496	17.91	272.13	1435.25
102425	44.72	1.09	800.25	237.50
102450	71.68	0	1818.75	13.63
102475	19.816	0	1429.63	0.00
102500	134.592	0	2412.63	0.00
102525	46.752	0	2833.50	0.00
102550	22.04	0	1074.88	0.00
102575	15.744	14.06	590.38	175.75
102600	4.56	0	317.25	175.75



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
102625	18.032	1.2	353.00	15.00
102650	9.8	133.94	434.88	1689.25
102675	16.72	0	414.38	1674.25
102700	3.944	100.42	322.88	1255.25
102725	18.72	38.89	354.13	1741.38
102750	19.36	0.38	595.00	490.88
102775	55.904	0.3	1176.00	8.50
102800	23.296	0	1237.50	3.75
102825	2.08	1.57	396.50	19.63
102850	5.152	1.89	113.00	43.25
102875	30.376	2.16	555.13	50.63
102900	14.808	0.11	706.00	28.38
102925	12.296	0.13	423.50	3.00
102950	77.168	0	1397.88	1.63
102975	76.272	0	2397.50	0.00
103000	83.024	0	2489.00	0.00
103025	9.512	0	1445.88	0.00
103050	56.312	0	1028.50	0.00
103075	12.408	0.14	1073.75	1.75
103100	65.864	0	1223.00	1.75
103125	28.592	0	1475.88	0.00
103150	2.624	0.87	487.75	10.88
103175	315.032	0	4963.38	10.88
103200	402.736	0	11215.13	0.00
103225	189.208	0	9249.13	0.00
103250	66.576	0.22	3996.63	2.75
103275	87.968	0	2414.75	2.75
103300	33.208	0	1893.38	0.00
103325	18.016	0	800.38	0.00
103350	48.84	0	1044.63	0.00
103375	104.96	0	2403.13	0.00
103400	161.664	0	4166.00	0.00
103425	260.024	0	6588.88	0.00
103450	194.072	0	7095.25	0.00
103475	28.696	0	3480.75	0.00
103500	3.872	0.18	508.88	2.25
103525	8.92	0.56	199.88	9.25
103550	50.256	1.6	924.63	27.00
103575	11.616	2.85	966.75	55.63
103600	143.688	0	2426.63	35.63
103625	23.376	2.31	2610.38	28.88
103650	5.456	47.9	450.50	627.63
103675	0	28.08	85.25	949.75
103700	1.352	36.47	21.13	806.88
103725	125.248	0	1978.13	455.88
103750	39.304	0	2571.13	0.00
103775	62.672	0	1593.38	0.00
103800	22.464	0	1330.25	0.00
103825	0.464	1.49	358.25	18.63
103850	18.84	0	301.63	18.63
103875	27.816	0	729.00	0.00
103900	113.888	0	2214.13	0.00
103925	38.52	0	2381.38	0.00



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
103950	82.976	0	1898.38	0.00
103975	39.352	0.02	1911.38	0.25
104000	27.296	0	1041.38	0.25
104025	1.224	37.53	445.63	469.13
104050	8.264	0.05	148.25	469.75
104075	21.088	0.05	458.63	1.25
104100	34.504	2.32	868.63	29.63
104125	22.376	0.9	888.75	40.25
104150	32.688	0	860.38	11.25
104175	9.832	58.93	664.38	736.63
104200	23.008	2.17	513.13	763.75
104225	62.96	0.54	1343.25	33.88
104250	9.28	2.92	1128.75	43.25
104275	9.832	53.22	298.63	701.75
104300	1.52	12.6	177.38	822.75
104325	9	2.07	164.38	183.38
104350	38.44	0	741.25	25.88
104375	14.464	0	826.63	0.00
104400	2.424	28.51	263.88	356.38
104425	10.984	0	209.50	356.38
104450	50.848	0	966.13	0.00
104475	58.608	0	1710.25	0.00
104500	160.832	0	3428.75	0.00
104525	62.792	0	3494.13	0.00
104550	3.744	0.58	1039.63	7.25
104575	26.416	0	471.25	7.25
104600	83.616	0	1719.25	0.00
104625	29.272	0	1763.88	0.00
104650	8.464	0	589.63	0.00
104675	73.12	0	1274.75	0.00
104700	35.296	0	1694.00	0.00
104725	21.904	0	893.75	0.00
104750	108.912	43.71	2044.00	546.38
104775	8.296	0	1831.38	546.38
104800	6.344	0.48	228.75	6.00
104825	51.472	0	903.38	6.00
104850	3.152	69.84	853.50	873.00
104875	1.856	75.62	78.25	1818.25
104900	71.76	0	1150.25	945.25
104925	1.576	6.27	1145.88	78.38
104950	5.4	9.04	109.00	191.38
104975	11.888	0	270.13	113.00
105000	66.16	0	1219.50	0.00
105025	38.36	0	1633.13	0.00
105050	113.504	0	2372.88	0.00
105075	18.928	0.6	2069.25	7.50
105100	124.744	0	2244.88	7.50
105125	245.792	0	5789.63	0.00
105150	61.888	0	4807.50	0.00
105175	5.896	1.99	1059.13	24.88
105200	133.224	0	2173.75	24.88
105225	75.456	0	3260.63	0.00
105250	250.68	0	5095.88	0.00



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
105275	57.408	0.62	4813.88	7.75
105300	12.008	0	1084.63	7.75
105325	34.96	0	733.88	0.00
105350	51.032	0	1343.63	0.00
105375	47.448	0	1538.75	0.00
105400	90.456	0	2154.75	0.00
105425	37.752	0	2003.25	0.00
105450	30.056	0	1059.50	0.00
105475	10.488	0	633.50	0.00
105500	1.616	9.09	189.13	113.63
105525	19.712	0	333.25	113.63
105550	20.344	0.77	625.88	9.63
105575	12.272	2.82	509.63	44.88
105600	0.024	3.46	192.13	78.50
105625	81.4	0	1272.25	43.25
105650	0.44	4.83	1278.75	60.38
105675	3.104	0	55.38	60.38
105700	2.312	0	84.63	0.00
105725	2.08	0.25	68.63	3.13
105750	154.72	0	2450.00	3.13
105775	27.704	3.1	2850.38	38.75
105800	86.936	0	1791.25	38.75
105825	7.776	11.07	1479.88	138.38
105850	92.776	3.41	1571.13	181.00
105875	192.296	0	4454.25	42.63
105900	104.824	0	4642.50	0.00
105925	9.56	5.42	1787.25	67.75
105950	62.872	0	1131.75	67.75
105975	15.64	2.87	1226.75	35.88
106000	176.056	0	2995.25	35.88
106025	71.344	0	3865.63	0.00
106050	152.776	0	3501.88	0.00
106075	165.448	0	4972.25	0.00
106100	177.696	0	5361.63	0.00
106125	33.872	1.61	3305.75	20.13
106150	0	22.58	529.25	302.38
106175	23.008	0	359.50	282.25
106200	105.576	0	2009.13	0.00
106225	0	7.59	1649.63	94.88
106250	2.744	1.51	42.88	113.75
106275	39.968	0.64	667.38	26.88
106300	0	11.99	624.50	157.88
106325	127.784	0	1996.63	149.88
106350	13.824	0.8	2212.63	10.00
106375	40.024	2.74	841.38	44.25
106400	38.024	2.41	1219.50	64.38
106425	34.024	0	1125.75	30.13
106450	2.688	8.27	573.63	103.38
106475	126.84	0	2023.88	103.38
106500	132.496			



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
106600	39.176	0.11	826.13	42.88
106625	5.328	101.81	695.38	1274.00
106650	6.384	158.46	183.00	3253.38
106675	57.344	0	995.75	1980.75
106700	3.232	0	946.50	0.00
106725	51.88	0	861.13	0.00
106750	48.576	79.28	1569.63	991.00
106775	90.264	0	2169.38	991.00
106800	174.104	0	4130.75	0.00
106825	216.568	0	6104.25	0.00
106850	200.704	0.11	6519.88	1.38
106875	82.816	0.25	4430.00	4.50
106900	10.304	34.82	1455.00	438.38
106925	9.472	0	309.00	435.25
106950	165.256	0	2730.13	0.00
106975	7.664	5.1	2701.88	63.75
107000	22.144	4.76	465.75	123.25
107025	73.576	1.17	1495.63	74.13
107050	36.344	0	1717.50	14.63
107075	1.04	2.3	584.13	28.75
107100	6.872	0.59	123.63	36.13
107125	2.928	3.37	153.13	49.50
107150	18.024	1.44	327.38	60.13
107175	5.232	0	363.38	18.00
107200	15.128	0	318.13	0.00
107225	20.52	0	557.00	0.00
107250	0	14.09	320.63	176.13
107275	20.24	1.2	316.25	191.13
107300	133.048	0	2395.13	15.00
107325	6.832	0	2185.63	0.00
107350	63.2	0	1094.25	0.00
107375	53.272	0	1819.88	0.00
107400	5.552	0.08	919.13	1.00
107425	38.576	0.63	689.50	8.88
107450	125.712	0.24	2567.00	10.88
107475	14.344	0	2188.38	3.00
107500	14.952	0	457.75	0.00
107525	34.728	0	776.25	0.00
107550	16.408	0.34	799.00	4.25
107575	58.176	3.36	1165.38	46.25
107600	2.016	4.86	940.50	102.75
107625	4.744	6.85	105.63	146.38
107650	2.168	8.25	108.00	188.75
107675	3.76	69.22	92.63	968.38
107700	42.944	5.13	729.75	929.38
107725	163.264	0	3222.00	64.13
107750	15.56	6.25	2794.13	78.13
107775	3.952	7.24	304.88	168.63
107800	84.936	0	1388.88	90.50
107825	15.56			



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
107925	19.568	53.25	639.63	665.63
107950	125.008	0	2259.00	665.63
107975	0.944	3.11	1968.00	38.88
108000	44.288	0	706.75	38.88
108025	9.088	0.54	834.00	6.75
108050	190.72	0	3122.00	6.75
108075	57.128	0	3872.63	0.00
108100	13.72	12.5	1107.00	156.25
108125	80.512	0	1472.38	156.25
108150	74.504	0	2422.13	0.00
108175	80.264	0	2418.25	0.00
108200	3.056	6.54	1301.88	81.75
108225	5.6	3.08	135.25	120.25
108250	23.336	0	452.13	38.50
108275	56.856	0	1253.00	0.00
108300	8.608	0	1022.88	0.00
108325	18.992	0	431.25	0.00
108350	98.08	0	1829.25	0.00
108375	68.736	0	2606.50	0.00
108400	73.448	0	2221.63	0.00
108425	37.936	82.81	1740.38	1035.13
108450	59.296	0	1519.25	1035.13
108475	60.728	0	1875.38	0.00
108500	52.088	0	1762.75	0.00
108525	0.632	0.22	823.75	2.75
108550	0	7.43	9.88	95.63
108575	12.08	0.03	188.75	93.25
108600	5.232	0.02	270.50	0.63
108625	24.552	0.4	465.38	5.25
108650	17.128	0.98	651.25	17.25
108675	73.408	2.55	1414.63	44.13
108700	4.608	9.46	1219.00	150.13
108725	42.784	11.03	740.50	256.13
108750	103.264	52.72	2282.00	796.88
108775	67.4	1.67	2666.63	679.88
108800	46.4	1	1778.13	33.38
108825	34.064	1.13	1257.25	26.63
108850	113.128	0	2299.88	14.13
108875	47.352	0.07	2507.50	0.88
108900	141.432	0	2949.75	0.88
108925	23.56	0.11	2578.00	1.38
108950	12.648	16.03	565.75	201.75
108975	19.848	4.52	507.75	256.88
109000	67.888	0	1370.88	56.50
109025	7.648	0.83	1180.25	10.38
109050	28.464	0.29	564.25	14.00
109075	54.72	0	1299.75	3.63
109100	44.912	1.82	1556.75	22.75
109125	60.656	64.97	1649.50	834.88
109150	24.16			



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
109250	73.192	0	1276.63	0.00
109275	89.528	0	2542.50	0.00
109300	46.464	0	2124.88	0.00
109325	4.528	1.23	796.75	15.38
109350	4.264	0.38	137.38	20.13
109375	12.496	0	261.88	4.75
109400	11.024	0	367.50	0.00
109425	11.4	0	350.38	0.00
109450	19.704	0	486.00	0.00
109475	23.992	0	682.75	0.00
109500	36.256	0	941.38	0.00
109525	12.456	0.04	761.13	0.50
109550	111.824	0.35	1941.88	4.88
109575	26.368	0	2159.25	4.38
109600	50.064	0	1194.25	0.00
109625	84.016	0	2095.00	0.00
109650	283.744	0	5746.25	0.00
109675	97.4	0	5955.38	0.00
109700	77.344	0	2730.38	0.00
109725	94.04	0	2677.88	0.00
109750	87.512	0	2836.75	0.00
109775	31.176	0	1854.50	0.00
109800	23.816	0	859.25	0.00
109825	4.696	6.55	445.50	81.88
109850	47.44	0	814.63	81.88
109875	140.144	0.01	2931.00	0.13
109900	44.752	0.87	2889.00	11.00
109925	39.648	3.22	1318.75	51.13
109950	2.008	165.79	650.88	2112.63
109975	15.216	0	269.13	2072.38
110000	13.008	0	441.00	0.00
110025	30.744	0	683.63	0.00
110050	105.264	0	2125.13	0.00
110075	205.664	0	4858.25	0.00
110100	123.408	0	5141.75	0.00
110125	50.936	0	2724.13	0.00
110150	29.152	0	1251.38	0.00
110175	40.512	0	1088.50	0.00
110200	1.032	13.4	649.13	167.50
110225	0.912	5.57	30.38	237.13
110250	3.728	1.37	72.50	86.75
110275	77.416	0.03	1267.88	17.50
110300	28.912	0	1661.38	0.38
110325	39.096	0	1062.63	0.00
110350	5.288	0.37	693.50	4.63
110375	1.88	24.33	112.00	308.75
110400	8.12	164	156.25	2354.13
110425	71.232	0	1239.88	2050.00
110450	355.864	0	6673.38	0.00
110475	188.208			



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
110575	82.536	6.44	2041.38	80.50
110600	48.936	0	2054.25	80.50
110625	52.456	0.44	1584.25	5.50
110650	133.744	0.13	2909.38	7.13
110675	5.888	0	2181.75	1.63
110700	4.192	0.59	157.50	7.38
110725	70.632	0	1169.13	7.38
110750	71.536	0	2221.38	0.00
110775	6.624	1	1221.25	12.50
110800	10.352	0	265.25	12.50
110825	76.256	0	1353.25	0.00
110850	196.96	0	4269.00	0.00
110875	81.496	0	4350.88	0.00
110900	249.928	0	5178.50	0.00
110925	105.096	1.52	5547.25	19.00
110950	56.904	0	2531.25	19.00
110975	20.992	0.04	1217.13	0.50
111000	110.648	0	2056.88	0.50
111025	8.072	0	1855.00	0.00
111050	33.192	0	644.75	0.00
111075	252.08	0	4457.38	0.00
111100	205.224	0	7145.38	0.00
111125	85.752	0	4546.50	0.00
111150	1.568	2.8	1364.38	35.00
111175	89.76	0	1427.00	35.00
111200	273.752	0	5679.88	0.00
111225	163.856	0	6837.63	0.00
111250	47.984	0.02	3310.00	0.25
111275	67.064	0	1797.63	0.25
111300	10.264	32.57	1208.25	407.13
111325	74.816	0	1329.38	407.13
111350	77.008	0	2372.25	0.00
111375	78.184	0	2424.88	0.00
111400	69.208	0.08	2303.00	1.00
111425	175.192	0	3818.75	1.00
111450	80.032	0	3987.88	0.00
111475	4.224	0	1316.50	0.00
111500	34.464	0	604.50	0.00
111525	51.336	0	1340.63	0.00
111550	39.344	0	1416.88	0.00
111575	39.584	0	1233.25	0.00
111600	2.656	0	660.00	0.00
111625	39.808	0.34	663.50	4.25
111650	60.296	0.37	1564.13	8.88
111675	40.896	0	1581.13	4.63
111700	5.504	0	725.00	0.00
111725	4.368	56.93	154.25	711.63
111750	15.928	0	317.13	711.63
111775	22.28	0	597.00	0.00
111800	7.016			



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
111900	17.872	0	617.13	0.00
111925	21.552	0	616.00	0.00
111950	21.088	0	666.25	0.00
111975	88.52	0	1712.63	0.00
112000	63.448	0	2374.50	0.00
112025	6.208	0.63	1088.38	7.88
112050	23.888	0.27	470.25	11.25
112075	18.888	0.11	668.38	4.75
112100	31.112	2	781.25	26.38
112125	40.928	0	1125.63	25.00
112150	9.032	0	780.63	0.00
112175	101.152	0	1721.63	0.00
112200	56.416	0	2462.00	0.00
112225	67.232	13.89	1932.00	173.63
112250	48.56	0	1809.25	173.63
112275	134.552	0	2861.13	0.00
112300	82.224	0	3387.13	0.00
112325	77.392	0	2494.00	0.00
112350	184.832	0.03	4097.25	0.38
112375	63.632	0.29	3882.25	4.00
112400	84.104	0	2308.38	3.63
112425	49.728	0.5	2091.13	6.25
112450	89.656	0.86	2177.88	17.00
112475	61.872	1.46	2367.63	29.00
112500	20.728	15.32	1290.63	209.75
112525	55.056	40.65	1184.13	699.63
112550	206.184	0	4081.88	508.13
112575	22.096	0	3566.88	0.00
112600	59.32	0	1272.13	0.00
112625	333.728	0	6141.38	0.00
112650	55.888	0	6087.75	0.00
112675	68.36	0	1941.38	0.00
112700	26.4	0	1480.63	0.00
112725	1.792	31.54	440.50	394.25
112750	91.376	3.09	1455.75	432.88
112775	68.072	0	2491.38	38.63
112800	1.6	0.61	1088.63	7.63
112825	2.104	3.23	57.88	48.00
112850	27.6	0.25	464.13	43.50
112875	12.408	0.6	625.13	10.63
112900	36.504	1.68	764.25	28.50
112925	28.912	0.08	1022.13	22.00
112950	183.72	0	3322.38	1.00
112975	179.112	0	5669.25	0.00
113000	108.64	0.05	4496.13	0.63
113025	10.096	0	1855.25	0.63
113050	24.4	0.13	539.00	1.63
113075	63.616	0	1375.25	1.63
113100	121.304	0	2889.38	0.00
113125	73.44			



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
113225	16.12	0	1074.50	0.00
113250	10.04	4.25	408.75	53.13
113275	11.84	0	341.88	53.13
113300	14.048	0	404.50	0.00
113325	4.832	1.25	295.00	15.63
113350	60.728	0.18	1024.38	17.88
113375	25.152	0	1341.88	2.25
113400	54.352	0	1242.25	0.00
113425	60.928	0	1801.25	0.00
113450	7.568	0	1070.25	0.00
113475	18.384	0	405.50	0.00
113500	111.168	0	2024.25	0.00
113525	308.92	0	6563.88	0.00
113550	18.008	1.95	5108.25	24.38
113575	11.136	3.73	455.38	71.00
113600	67.16	15.52	1223.38	240.63
113625	98.472	35.75	2588.00	640.88
113650	287.768	0	6035.00	446.88
113675	431.752	0	11242.50	0.00
113700	13.864	0.06	6962.75	0.75
113725	439.176	0	7078.75	0.75
113750	161.064	0	9378.75	0.00
113775	55.336	0	3381.25	0.00
113800	52.928	0.26	1691.63	3.25
113825	3.84	228.8	887.00	2863.25
113850	28.104	32.03	499.13	3260.38
113875	14.424	36.94	664.50	862.13
113900	33.712	56.86	752.13	1172.50
113925	34.6	25.62	1067.38	1031.00
113950	41.424	0.66	1187.88	328.50
113975	43.16	0	1321.63	8.25
114000	358.8	0	6280.63	0.00
114025	584.344	0	14736.63	0.00
114050	540.184	0	17570.75	0.00
114075	580.496	0	17510.63	0.00
114100	824.864	0	21958.75	0.00
114125	279.2	0	17251.00	0.00
114150	432.952	0	11127.38	0.00
114175	327.256	0	11878.25	0.00
114200	342.528	0	10465.38	0.00
114225	460.032	0	12540.00	0.00
114250	79.896	58.68	8436.38	733.50
114275	52.552	170.32	2069.50	2862.50
114300	80.808	153	2083.75	4041.50
114325	199.08	0.58	4373.25	1919.75
114350	52.312	0	3928.00	7.25
114375	52.048	0	1630.63	0.00
114400	39.832	0.35	1435.63	4.38
114425	55.856	0.71	1495.13	13.25
114450	47.24			



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
114550	134.752	0	3823.00	0.00
114575	235.872	0	5791.00	0.00
114600	132.928	0	5762.50	0.00
114625	11.48	0	2256.38	0.00
114650	121.664	0	2080.38	0.00
114675	69.28	0	2983.50	0.00
114700	81.92	0	2362.50	0.00
114725	160.592	0	3789.25	0.00
114750	167.28	0	5123.00	0.00
114775	46.456	49.47	3339.63	618.38
114800	53.992	0.13	1569.50	620.00
114825	138.696	16.36	3010.75	206.13
114850	65.688	0.02	3193.50	204.75
114875	15.432	0	1267.50	0.25
114900	227.368	0	3793.75	0.00
114925	460.096	0	10741.63	0.00
114950	327.256	0	12302.38	0.00
114975	495.08	0	12849.00	0.00
115000	521.488	0	15883.88	0.00
115025	236.048	0	11836.50	0.00
115050	207.84	0	6935.75	0.00
115075	26.48	0	3661.25	0.00
115100	48.312	0.01	1168.63	0.13
115125	93.696	0	2218.88	0.13
115150	178.064	0	4246.25	0.00
115175	201.8	0	5935.38	0.00
115200	203.544	0	6333.50	0.00
115225	96.152	0	4682.75	0.00
115250	54.528	0.02	2354.38	0.25
115275	63.712	0.69	1847.50	8.88
115300	99.312	1.79	2547.25	31.00
115325	88.256	2.51	2930.75	53.75
115350	123.832	0.44	3313.88	36.88
115375	196.888	19.67	5011.25	251.38
115400	105.264	32.14	4721.13	647.63
115425	137.04	0	3786.00	401.75
115450	128.504	0	4149.13	0.00
115475	191.208	0	4995.50	0.00
115500	118.16	0	4833.88	0.00
115525	76.912	0	3048.00	0.00
115550	124.128	0	3141.25	0.00
115575	7.336	0	2054.13	0.00
115600	20.792	2.04	439.50	25.50
115625	83.112	0	1623.50	25.50
115650	99.848	0	2858.75	0.00
115675	114.592	0	3350.63	0.00
115700	96.928	0	3305.00	0.00
115725	373.12	0	7344.50	0.00
115750	395.328	0	12007.00	0.00
115775	315.304			



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
115875	17.112	0	361.25	1155.00
115900	183.688	0	3137.50	0.00
115925	297.152	0	7513.13	0.00
115950	210.44	0	7931.13	0.00
115975	66.536	0	4327.75	0.00
116000	75.232	0	2215.13	0.00
116025	46.32	0	1899.25	0.00
116050	5.144	34.67	804.13	433.38
116075	15.28	100.5	319.13	1689.63
116100	48.184	0	991.63	1256.25
116125	46.744	0	1483.25	0.00
116150	85.632	0	2068.38	0.00
116175	158.976	0	3822.00	0.00
116200	299.704	0	7166.88	0.00
116225	194.224	0	7717.63	0.00
116250	194.832	0	6079.00	0.00
116275	78.376	0	4268.88	0.00
116300	58.488	0	2138.50	0.00
116325	199.52	0	4031.38	0.00
116350	333.024	0	8321.00	0.00
116375	253.088	0	9158.00	0.00
116400	173.848	0	6670.88	0.00
116425	190.56	0	5693.88	0.00
116450	211.784	0	6286.63	0.00
116475	333.568	0	8521.13	0.00
116500	572.528	0	14157.75	0.00
116525	544.088	0	17447.13	0.00
116550	482.272	0	16036.88	0.00
116575	702.544	0	18512.75	0.00
116600	278.112	0	15322.75	0.00
116625	73.248	0	5490.00	0.00
116650	602.4	0.92	10557.00	11.50
116675	709.08	0.45	20491.88	17.13
116700	1096.56	0.11	28213.13	7.00
116725	258.936	2.01	21179.63	26.50
116750	344.872	0.27	9434.50	28.50
116775	189.136	0.74	8343.88	12.63
116800	83.768	50.75	4264.13	643.63
116825	13.504	73.12	1519.88	1548.38
116850	28.024	0.56	648.88	921.00
116875	21.216	0	769.38	7.00
116900	30.056	0	801.13	0.00
116925	56.632	1.05	1354.50	13.13
116950	105.744	1.6	2537.13	33.13
116975	67.992	0	2714.63	20.00
117000	48.184	4.59	1815.25	57.38
117025	488.176	0	8380.63	57.38
117050	492.408	0	15321.63	0.00
117075	428.992	0	14396.88	0.00
117100	391.336			



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
117200	63.944	0	2074.25	0.00
117225	22.568	0	1351.75	0.00
117250	115.36	0	2155.13	0.00
117275	201.888	0	4957.00	0.00
117300	116.136	0	4969.13	0.00
117325	129.896	0	3844.25	0.00
117350	93.104	0	3484.38	0.00
117375	18.344	0	1741.38	0.00
117400	58.728	0	1204.25	0.00
117425	251.464	0	4846.75	0.00
117450	175.816	0	6676.25	0.00
117475	128.288	0.52	4751.63	6.50
117500	139.288	1.38	4180.88	23.75
117525	189.616	1.38	5139.13	34.50
117550	163.248	0	5513.50	17.25
117575	79.328	0	3790.25	0.00
117600	277.496	0	5575.38	0.00
117625	188.392	0	7279.50	0.00
117650	234.072	0	6601.00	0.00
117675	291.64	0	8214.25	0.00
117700	219.368	0	7984.50	0.00
117725	162.664	0	5969.25	0.00
117750	254.304	0	6515.13	0.00
117775	402.752	0	10266.50	0.00
117800	565.8	0	15133.63	0.00
117825	557.616	0	17553.38	0.00
117850	406.208	0	15059.75	0.00
117875	183.296	0	9211.00	0.00
117900	81.92	0	4144.00	0.00
117925	66.192	0	2314.25	0.00
117950	57.136	0	1927.00	0.00
117975	43.936	2.23	1579.25	27.88
118000	58.416	0	1599.25	27.88
118025	65.608	0	1937.88	0.00
118050	112.704	0	2786.13	0.00
118075	143.2	0	3998.50	0.00
118100	175.584	0	4981.00	0.00
118125	156.376	0.12	5186.88	1.50
118150	113.448	0.61	4216.00	9.13
118175	22	1.6	2116.38	27.63
118200	13.688	8.97	557.63	132.13
118225	30.728	1.96	694.00	136.63
118250	16.192	4.79	733.13	84.38
118275	12.064	0	441.50	59.88
118300	15.176	0	425.63	0.00
118325	14.352	0	461.38	0.00
118350	6.704	0	329.00	0.00
118375	11.616	0	286.25	0.00
118400	15.848	0	429.13	0.00
118425	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)
118525	88.52	0.000	3566.00	0.00
118550	12.344	18.070	1576.00	225.88
118575	49	0.000	958.50	225.88
118600	122.544	0.000	2680.38	0.00
118625	265.264	0.000	6059.50	0.00
118650	58.264	0.000	5055.13	0.00
118675	131.24	0.000	2961.00	0.00
118700	152.176	0.000	4428.38	0.00
118725	232.344	0.000	6008.13	0.00
118750	229.904	0.000	7222.63	0.00
118775	52.8	5.960	4417.25	74.50
118800	65.52	0.000	1848.75	74.50
118825	303.104	0.000	5759.75	0.00
118850	277.592	0.000	9073.38	0.00
118875	28.496	0.000	4782.63	0.00
118900	50.76	1.250	1238.38	15.63
118925	107.272	2.990	2469.25	53.00
118950	59.272	0.310	2602.25	41.25
118975	26.904	0.000	1346.50	3.88
119000	8.096	0.000	546.88	0.00
119025	114.512	0.000	1915.75	0.00
119050	110.232	0.030	3511.63	0.38
119075	86.704	0.000	3077.13	0.38
119100	35.44	0.350	1908.50	4.38
119125	287.424	0.000	5044.75	4.38
119150	386.504	0.000	10530.13	0.00
119175	90.648	0.000	7455.50	0.00
119200	174.96	1.030	4150.13	12.88
119225	168.336	0.000	5364.00	12.88
119250	36.432	0.000	3199.50	0.00
119275	1.72	0.000	596.13	0.00
119300	11.224	0.860	202.25	10.75
119325	504.744	0.000	8062.00	10.75
119350	453.888	0.000	14978.63	0.00
119375	279.368	0.000	11457.13	0.00
119400	82.088	0.000	5647.75	0.00
119425	55.216	0.000	2145.38	0.00
119450	112.416	0.000	2619.25	0.00
119475	37.232	0.000	2338.25	0.00
119500	65.208	0.000	1600.63	0.00
119525	65.088	0.000	2035.88	0.00
119550	11.168	0.000	1191.50	0.00
119575	54.984	0.000	1033.63	0.00
119600	195.424	0.000	3912.63	0.00
119625	101.584	0.000	4640.75	0.00
119650	2.848	7.900	1631.75	98.75
119675	214.6	0.000	3397.63	98.75
119700	348.712	0.000	8801.75	0.00
119725	334.368	0.000	10673.13	0.00
119750	214.488	0.000	8575.88	0.00
119775	63.32	0.000	4340.75	0.00
119800	34.552	0.000	1529.25	0.00
119825	108.92	0.000	2241.75	0.00



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
119850	213.744	0.000	5041.63	0.00
119875	339.264	0.000	8640.75	0.00
119900	59.728	0.810	6234.25	10.13
119925	24.448	0.000	1315.25	10.13
119950	35.808	0.000	941.50	0.00
119975	112.408	0.000	2315.88	0.00
120000	284.776	0.000	6206.00	0.00
120025	300.888	0.000	9151.00	0.00
120050	22.536	0.000	5053.50	0.00
120075	37.512	0.000	938.25	0.00
120100	27.248	0.000	1011.88	0.00
120125	63.032	0.000	1410.63	0.00
120150	71.672	0.000	2104.75	0.00
120175	28.504	0.000	1565.25	0.00
120200	23.92	199.390	819.13	2492.38
120225	15.76	40.250	620.00	2995.50
120250	114.968	0.000	2042.63	503.13
120275	507.328	0.000	9723.38	0.00
120300	323.792	0.000	12986.25	0.00
120325	121.032	0.100	6950.38	1.25
120350	200.616	0.000	5025.75	1.25
120375	75.992	0.680	4322.00	8.50
120400	102.528	0.400	2789.38	13.50
120425	4.944	1.960	1679.25	29.50
120450	0.184	1.950	80.13	48.88
120475	33.264	0.000	522.63	24.38
120500	56.752	0.000	1406.50	0.00
120525	15.184	1.020	1124.00	12.75
120550	11.568	0.000	418.00	12.75
120575	3.408	0.630	234.00	7.88
120600	191.704	0.000	3048.63	7.88
120625	212.936	0.000	6322.50	0.00
120650	75.728	0.000	4510.38	0.00
120675	27.96	0.000	1620.13	0.00
120700	197.832	0.000	3528.00	0.00
120725	262.408	0.000	7191.25	0.00
120750	265.888	0.000	8254.63	0.00
120775	113.28	0.000	5924.50	0.00
120800	98.336	0.000	3306.50	0.00
120825	186.512	0.000	4450.75	0.00
120850	121.952	0.000	4819.75	0.00
120875	108.184	0.000	3595.88	0.00
120900	85.192	0.000	3021.50	0.00
120925	65.192	0.000	2349.75	0.00
120950	79.92	0.000	2267.38	0.00
120975	80.896	1.760	2512.75	22.00
121000	46.48	0.000	1990.25	22.00
121025	97.128	0.000	2243.88	0.00
121050	60.28	0.000	2459.50	0.00
121075	30.016	40.170	1410.88	502.13
121100	16.64	0.000	729.00	502.13
121125	4.664	3.090	332.88	38.63
121150	25.352	0.000	469.00	38.63



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
121175	25.368	0.450	792.50	5.63
121200	34.744	0.290	939.25	9.25
121225	2.544	60.020	582.63	753.88
121250	19.672	0.000	347.13	750.25
121275	0.888	208.020	321.25	2600.25
121300	26.28	19.690	424.50	2846.38
121325	24.472	0.000	793.00	246.13
121350	12.648	32.130	580.00	401.63
121375	53.192	0.030	1028.75	402.00
121400	210.2	0.000	4115.50	0.38
121425	90.592	136.770	4699.88	1709.63
121450	109.768	0.820	3130.63	1719.88
121475	74.224	0.000	2874.88	10.25
121500	38.416	0.000	1760.00	0.00
121525	26.496	0.000	1014.25	0.00
121550	5.512	0.000	500.13	0.00
121575	7.792	0.410	207.88	5.13
121600	346.408	0.000	5534.38	5.13
121625	604.664	0.000	14860.50	0.00
121650	409.464	0.000	15845.75	0.00
121675	301.136	0.000	11103.13	0.00
121700	111.912	0.000	6453.88	0.00
121725	61.296	0.000	2706.38	0.00
121750	137.92	0.000	3112.75	0.00
121775	205.096	0.000	5359.63	0.00
121800	39.192	0.000	3817.00	0.00
121825	35.408	0.000	1165.63	0.00
121850	41.784	0.000	1206.13	0.00
121875	40.6	17.690	1287.25	221.13
121900	15.968	0.230	883.88	224.00
121925	30.568	0.930	727.13	14.50
121950	6.76	122.620	583.25	1544.38
121975	140.016	1.830	2293.38	1555.63
122000	224.84	0.000	5700.88	22.88
122025	0.672	2.860	3523.63	35.75
122050	57.296	0.000	905.75	35.75
122075	12.04	0.000	1083.38	0.00
122100	5.024	4.160	266.63	52.00
122125	5.816	0.000	169.38	52.00
122150	12.584	0.000	287.50	0.00
122175	111.064	0.000	1932.00	0.00
122200	12.888	0.000	1936.75	0.00
122225	7.64	0.000	320.75	0.00
122250	37.496	64.330	705.25	804.13
122275	5.784	114.960	676.25	2241.13
122300	32.088	237.890	591.75	4410.63
122325	57.008	416.580	1392.13	8180.88
122350	150.752	610.110	3246.25	12833.63
122375	387.024	0.000	8402.75	7626.38
122400	152.096	0.000	8423.75	0.00
122425	132.232	83.870	4442.63	1048.38
122450	2.088	123.580	2098.75	2593.13
122475	13.408	51.550	242.13	2189.13



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
122500	55.224	0.400	1072.38	649.38
122525	14.4	0.440	1087.88	10.50
122550	5.136	0.170	305.25	7.63
122575	220.648	0.000	3527.88	2.13
122600	261.32	0.000	7530.75	0.00
122625	127.92	0.000	6081.88	0.00
122650	21.792	131.340	2339.25	1641.75
122675	15.152	228.530	577.25	4498.38
122700	3.624	170.810	293.38	4991.75
122725	14.048	102.350	276.13	3414.50
122750	105.52	0.000	1868.25	1279.38
122775	35.344	0.000	2201.00	0.00
122800	106.48	0.000	2216.00	0.00
122825	50.968	38.120	2460.13	476.50
122850	57.656	0.000	1697.25	476.50
122875	107.184	0.000	2575.63	0.00
122900	108.552	0.000	3370.88	0.00
122925	55.552	0.000	2564.13	0.00
122950	9.104	0.690	1010.25	8.63
122975	1.72	0.000	169.13	8.63
123000	51.952	0.000	838.63	0.00
123025	21.168	0.000	1142.50	0.00
123050	146.176	0.000	2614.75	0.00
123075	120.232	0.000	4162.63	0.00
123100	11.208	4.170	2053.75	52.13
123125	61.416	0.000	1134.75	52.13
123150	286.504	0.000	5436.25	0.00
123175	129.112	0.000	6494.00	0.00
123200	16.952	0.000	2282.25	0.00
123225	16.96	0.000	529.88	0.00
123250	108.2	0.000	1955.63	0.00
123275	283.584	0.000	6121.63	0.00
123300	108.248	0.000	6122.38	0.00
123325	23.52	0.000	2058.88	0.00
123350	52.056	0.000	1180.88	0.00
123375	103.312	0.000	2427.63	0.00
123400	261.944	0.000	5707.13	0.00
123425	257.704	0.000	8119.50	0.00
123450	221.968	0.000	7494.88	0.00
123475	400.84	0.000	9731.38	0.00
123500	283.624	0.000	10694.75	0.00
123525	395.008	0.000	10603.63	0.00
123550	238.376	0.000	9896.63	0.00
123575	233.288	0.000	7369.75	0.00
123600	296.864	0.000	8283.63	0.00
123625	331.12	0.000	9812.25	0.00
123650	163.28	0.000	7725.00	0.00
123675	342.56	0.000	7903.75	0.00
123700	541.728	0.000	13817.00	0.00
123725	291.136	0.000	13013.50	0.00
123750	269.112	0.000	8753.88	0.00
123775	180.352	0.000	7022.88	0.00
123800	113.776	0.000	4595.75	0.00



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
123825	57.6	0.000	2677.75	0.00
123850	346.496	0.000	6314.00	0.00
123875	64.08	0.000	6415.25	0.00
123900	127.128	0.000	2987.63	0.00
123925	59.824	0.000	2921.13	0.00
123950	28.624	0.000	1382.00	0.00
123975	13.8	0.000	662.88	0.00
124000	0.056	48.190	216.50	602.38
124025	7.6	121.430	119.63	2120.25
124050	81.272	125.950	1388.63	3092.25
124075	56.256	11.750	2148.88	1721.25
124100	29.176	4.570	1334.88	204.00
124125	94.088	0.000	1926.00	57.13
124150	336.352	0.000	6725.63	0.00
124175	369.256	0.000	11025.13	0.00
124200	57.12	0.000	6662.13	0.00
124225	6.92	2.780	1000.63	34.75
124250	126.152	0.690	2079.25	43.38
124275	74.632	0.490	3137.25	14.75
124300	40.632	0.000	1801.00	6.13
124325	332.504	0.000	5830.25	0.00
124350	371.912	0.000	11006.50	0.00
124375	34.536	0.000	6350.75	0.00
124400	108.704	0.000	2238.13	0.00
124425	59.512	32.770	2628.38	409.63
124450	99.544	0.000	2485.25	409.63
124475	140.32	0.000	3747.88	0.00
124500	154.096	0.000	4600.25	0.00
124525	7.008	0.000	2517.25	0.00
124550	17.192	2.040	378.13	25.50
124575	101.584	0.150	1855.88	27.38
124600	96.12	34.380	3089.13	431.63
124625	36.992	48.010	2079.88	1029.88
124650	32.968	2.120	1093.13	626.63
124675	8.216	0.000	643.50	26.50
124700	14.128	0.000	349.13	0.00
124725	32.096	0.000	722.25	0.00
124750	22.376	0.000	851.13	0.00
124775	32.552	0.000	858.25	0.00
124800	22.544	0.000	860.88	0.00
124825	5.272	0.000	434.63	0.00
124850	16.912	0.000	346.63	0.00
124875	27	8.340	686.13	104.25
124900	115.904	1.020	2232.88	117.00
124925	109.752	1.770	3525.88	34.88
124950	77.624	89.420	2927.75	1139.88
124975	48.64	106.190	1972.88	2445.13
125000	97.336	0.000	2280.88	1327.38
125025	91.704	0.000	2953.75	0.00
125050	312.312	0.000	6312.75	0.00
125075	51.08	0.000	5678.00	0.00
125100	25.752	0.000	1200.50	0.00
125125	121.088	2.140	2294.38	26.75



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
125150	35.344	12.560	2444.25	183.75
125175	65.336	42.180	1573.13	684.25
125200	87.688	0.000	2391.00	527.25
125225	9.448	0.000	1517.75	0.00
125250	60.304	0.000	1089.88	0.00
125275	54.448	0.000	1793.00	0.00
125300	0.104	7.660	852.38	95.75
125325	48.208	7.570	754.88	190.38
125350	35.528	0.000	1308.38	94.63
125375	19.64	0.000	862.00	0.00
125400	67.64	0.000	1363.75	0.00
125425	104.08	0.000	2683.13	0.00
125450	49.848	0.000	2405.13	0.00
125475	43.536	32.350	1459.13	404.38
125500	166.056	0.000	3274.88	404.38
125525	114.736	0.000	4387.38	0.00
125550	12.56	14.000	1989.00	175.00
125575	63.104	0.000	1182.25	175.00
125600	148.672	3.020	3309.00	37.75
125625	73.696	1.820	3474.50	60.50
125650	9.12	20.700	1294.00	281.50
125675	138.016	0.000	2299.00	258.75
125700	14.416	0.000	2381.75	0.00
125725	24.256	0.000	604.25	0.00
125750	118.08	0.000	2224.00	0.00
125775	2.496	38.990	1884.00	487.38
125800	94.912	0.000	1522.00	487.38
125825	116.112	0.000	3297.25	0.00
125850	80.856	0.000	3077.63	0.00
125875	11.528	0.000	1443.50	0.00
125900	6.96	23.640	288.875	295.500
125925	50.136	1.500	892.125	314.250
125950	87.032	0.000	2143.250	18.750
125975	11.84	14.870	1544.875	185.875
126000	52.256	11.650	1001.500	331.500
126025	54.688	0.000	1671.000	145.625
126050	20.856	27.700	1180.375	346.250
126075	56.008	0.000	1201.000	346.250
126100	48.184	40.020	1628.000	500.250
126125	25.688	0.000	1154.250	500.250
126150	126.968	0.000	2385.250	0.000
126175	124.112	0.000	3923.125	0.000
126200	52.432	0.000	2758.500	0.000
126225	41.688	0.000	1470.625	0.000
126250	62.576	0.000	1629.125	0.000
126275	59.976	15.630	1914.875	195.375
126300	94.416	0.000	2412.375	195.375
126325	109.008	0.000	3178.500	0.000
126350	109.12	0.000	3408.250	0.000
126375	45.888	0.000	2422.000	0.000
126400	85.32	0.000	2050.125	0.000
126425	47.184	0.000	2070.375	0.000
126450	1.784	1.060	765.125	13.250



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
126475	33.984	6.760	558.875	97.750
126500	96.192	0.000	2034.000	84.500
126525	29.168	0.460	1958.750	5.750
126550	103.44	0.000	2072.000	5.750
126575	19.76	0.000	1925.000	0.000
126600	83.88	0.000	1619.375	0.000
126625	136.808	6.950	3448.250	86.875
126650	6.168	0.000	2234.000	86.875
126675	5.184	0.000	177.375	0.000
126700	33.36	0.000	602.250	0.000
126725	241.912	0.000	4301.125	0.000
126750	277.408	0.000	8114.375	0.000
126775	122.032	0.000	6241.250	0.000
126800	12.064	0.000	2095.250	0.000
126825	15.936	0.000	437.500	0.000
126850	194.64	0.000	3290.250	0.000
126875	70.912	0.000	4149.250	0.000
126900	56.072	0.110	1984.125	1.375
126925	209.72	0.000	4153.000	1.375
126950	222.368	0.000	6751.375	0.000
126975	57.36	0.000	4370.750	0.000
127000	180.472	0.000	3716.125	0.000
127025	206.28	0.000	6043.000	0.000
127050	119.4	0.000	5088.750	0.000
127075	131.504	0.000	3920.375	0.000
127100	30.456	0.000	2530.625	0.000
127125	16.744	0.000	737.500	0.000
127150	202.176	0.000	3420.625	0.000
127175	343.856	0.000	8531.750	0.000
127200	357.832	0.000	10963.875	0.000
127225	414.056	0.000	12060.750	0.000
127250	406.288	0.000	12817.875	0.000
127275	235.952	0.000	10035.000	0.000
127300	156.448	0.000	6131.250	0.000
127325	185	0.000	5335.125	0.000
127350	234.488	0.000	6554.500	0.000
127375	248.936	0.000	7553.500	0.000
127400	223.64	0.000	7384.000	0.000
127425	38.456	0.000	4095.250	0.000
127450	64.84	0.000	1614.000	0.000
127475	130.296	0.000	3049.000	0.000
127500	342.296	0.000	7384.250	0.000
127525	307.352	0.000	10150.750	0.000
127550	271.576	0.000	9045.750	0.000
127575	251.44	0.000	8172.125	0.000
127600	310.256	0.000	8776.500	0.000
127625	267.736	0.000	9031.125	0.000
127650	142.44	0.000	6409.000	0.000
127675	55.328	0.000	3090.125	0.000
127700	77.544	0.000	2076.125	0.000
127725	24.4	0.000	1592.875	0.000
127750	98.76	0.000	1924.375	0.000
127775	41.344	0.000	2189.125	0.000



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
127800	72.824	0.000	1783.875	0.000
127825	89.368	0.000	2534.250	0.000
127850	102.296	0.000	2994.750	0.000
127875	94.344	0.000	3072.500	0.000
127900	75.912	0.000	2660.250	0.000
127925	120.072	0.000	3062.250	0.000
127950	80.2	0.000	3129.250	0.000
127975	41.688	132.090	1904.500	1651.125
128000	0	66.410	651.375	2481.250
128025	5.976	5.570	93.375	899.750
128050	16.072	0.000	344.500	69.625
128075	46.272	0.000	974.125	0.000
128100	53.264	0.000	1555.250	0.000
128125	51.096	0.000	1630.625	0.000
128150	28.064	0.000	1236.875	0.000
128175	35.312	0.000	990.250	0.000
128200	54.232	0.000	1399.125	0.000
128225	68.12	0.200	1911.750	2.500
128250	96.192	0.570	2567.375	9.625
128275	33.368	0.000	2024.375	7.125
128300	25.256	0.000	916.000	0.000
128325	50.816	0.000	1188.625	0.000
128350	7.528	24.590	911.625	307.375
128375	20.256	0.000	434.125	307.375
128400	59.096	0.000	1239.875	0.000
128425	62.248	0.000	1896.000	0.000
128450	30.72	0.000	1452.625	0.000
128475	8.4	0.000	611.250	0.000
128500	32.008	1.330	631.375	16.625
128525	0	5.920	500.125	90.625
128550	143.224	0.000	2237.875	74.000
128575	12.8	20.360	2437.875	254.500
128600	28.664	0.000	647.875	254.500
128625	168.704	0.000	3083.875	0.000
128650	130.48	0.000	4674.750	0.000
128675	4.112	41.510	2103.000	518.875
128700	64.136	0.000	1066.375	518.875
128725	199.504	0.000	4119.375	0.000
128750	219.552	0.000	6547.750	0.000
128775	32.288	0.000	3935.000	0.000
128800	33.568	71.860	1029.000	898.250
128825	60.08	58.670	1463.250	1631.625
128850	72.216	0.000	2067.125	733.375
128875	189.616	0.000	4091.125	0.000
128900	238.128	0.000	6683.500	0.000
128925	64.68	0.000	4731.375	0.000
128950	67.72	0.000	2068.750	0.000
128975	139.056	0.000	3230.875	0.000
129000	156.696	0.000	4621.125	0.000
129025	60.912	0.000	3400.125	0.000
129050	288.448	0.000	5458.750	0.000
129075	286.984	0.000	8991.125	0.000
129100	13.52	0.000	4695.375	0.000



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
129125	3.472	16.820	265.500	210.250
129150	13.512	0.000	265.375	210.250
129175	7.24	0.000	324.250	0.000
129200	58.616	0.120	1029.000	1.500
129225	36.968	0.280	1493.500	5.000
129250	77.376	0.150	1786.625	5.375
129275	49.384	3.980	1980.625	51.625
129300	0.8	3.770	784.125	96.875
129325	13.624	1.460	225.375	65.375
129350	26.232	1.210	622.750	33.375
129375	16.152	0.000	662.250	15.125
129400	3.816	9.200	312.000	115.000
129425	59.536	0.000	989.875	115.000
129450	237.088	0.000	4634.750	0.000
129475	287.784	0.000	8201.125	0.000
129500	164.736	0.000	7070.625	0.000
129525	111.776	0.000	4320.500	0.000
129550	136.544	0.000	3880.000	0.000
129575	105.76	0.000	3786.000	0.000
129600	31.952	0.000	2151.750	0.000
129625	3.944	0.000	560.875	0.000
129650	67.584	0.000	1117.625	0.000
129675	22.088	13.480	1401.125	168.500
129700	7.944	14.200	469.250	346.000
129725	131.896	0.520	2185.000	184.000
129750	154.936	0.000	4481.750	6.500
129775	0	6.340	2420.875	79.250
129800	4.168	110.250	65.125	1457.375
129825	28.232	53.050	506.250	2041.250
129850	22.992	82.270	800.375	1691.500
129875	23.016	2.200	718.875	1055.875
129900	18.864	12.380	654.375	182.250
129925	0.584	2.620	303.875	187.500
129950	55.24	0.000	872.250	32.750
129975	54.944	0.000	1721.625	0.000
130000	91.088	0.000	2281.750	0.000
130025	77.816	0.000	2639.125	0.000
130050	1.616	0.020	1241.125	0.250
130075	0.32	0.120	30.250	1.750
130100	31.848	0.000	502.625	1.500
130125	50.144	0.000	1281.125	0.000
130150	17.16	0.000	1051.625	0.000
130175	18.264	0.000	553.500	0.000
130200	13.832	0.000	501.500	0.000
130225	8.512	0.000	349.125	0.000
130250	15.936	0.000	382.000	0.000
130275	137.104	0.000	2391.250	0.000
130300	83.144	0.030	3441.375	0.375
130325	29.728	0.000	1763.625	0.375
130350	44.384	0.800	1158.000	10.000
130375	51.048	0.000	1491.125	10.000
130400	10.36	0.000	959.500	0.000
130425	6.712	0.000	266.750	0.000



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
130450	181.008	0.000	2933.125	0.000
130475	189.256	0.000	5785.375	0.000
130500	167.16	0.000	5569.000	0.000
130525	6.264	0.900	2709.750	11.250
130550	20.152	0.000	412.750	11.250
130575	12.712	8.860	513.500	110.750
130600	2.376	0.850	235.750	121.375
130625	19.224	0.630	337.500	18.500
130650	1.52	54.710	324.125	691.750
130675	3.24	1.450	74.375	702.000
130700	23.104	1.230	411.625	33.500
130725	37.144	0.000	941.375	15.375
130750	30.504	0.000	1057.000	0.000
130775	29.976	0.000	945.000	0.000
130800	18.216	0.000	753.000	0.000
130825	15.792	0.000	531.375	0.000
130850	25.736	0.000	648.875	0.000
130875	11.904	0.000	588.125	0.000
130900	6.296	0.000	284.375	0.000
130925	0.48	65.660	105.875	820.750
130950	0.392	58.100	13.625	1547.000
130975	15.504	47.380	248.375	1318.500
131000	6.8	0.000	348.500	592.250
131025	3.784	0.000	165.375	0.000
131050	11.616	0.000	240.625	0.000
131075	20.208	0.000	497.250	0.000
131100	12.808	0.000	515.875	0.000
131125	16.424	0.000	456.750	0.000
131150	16.664	0.000	517.000	0.000
131175	13.656	0.280	473.750	3.500
131200	23.848	0.390	586.000	8.375



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
Total =			3,499,220	241,411

Scarified Bituminous and Granular Material(A)= 33626 cum
 Total Earthwork in cutting(C) = 3499220 cum
Actual earthwork in soil(C-A-B)= 3,465,594 cum

Assume 20% total cutting Volume for Ordinary Rock Cu 693,119 cum
 Earthwork In soil = 2,772,475 cum
Earthwork in filling = 241,411 cum
Total Earthwork in filling = 241,411 cum

Using 40% of cutting material for filling earthworks in embankment
 Earthwork used from Roadway Cutting Material= 1386238 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	2765750.000	cum
2	Total Earthwork In Filling (Consider Only Embankment)	tot_fill	241411.000	cum
3	Percentage of Rock	per_rock	20.000	percent

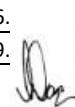


Calculation of Extra Widening

	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	101325.145	101381.324	48.323	1.5	30	72.48	45	117.48
Arc	101542.857	101607.577	52.88	1.5	15	79.32	22.5	101.82
Arc	101652.748	101665.329	12.488	1.5	30	18.73	45	63.73
Arc	101706.77	101734.222	27.426	0.6	0	16.46	0	16.46
Arc	101769.751	101778.406	8.626	1.5	30	12.94	45	57.94
Arc	101853.834	101862.59	8.725	1.5	30	13.09	45	58.09
Arc	101913.048	101929.777	16.717	0.6	15	10.03	9	19.03
Arc	101985.113	102031.548	44.784	1.2	40	53.74	48	101.74
Arc	102168.579	102184.811	16.035	1.5	30	24.05	45	69.05
Arc	102222.228	102253.694	31.426	0.6	0	18.86	0	18.86
Arc	102294.452	102324.073	28.433	1.5	30	42.65	45	87.65
Arc	102422.518	102430.432	7.891	1.5	30	11.84	45	56.84
Arc	102491.336	102510.542	19.022	1.5	25	28.53	37.5	66.03
Arc	102597.266	102651.497	47.142	1.5	30	70.71	45	115.71
Arc	102710.104	102714.199	4.094	1.2	20	4.91	24	28.91
Arc	102758.761	102775.54	16.7	1.2	20	20.04	24	44.04
Arc	102817.446	102824.952	7.499	1.2	20	9.00	24	33.00
Arc	102865.343	102892.375	26.704	1.2	20	32.04	24	56.04
Arc	102944.196	103026.41	75.931	1.2	15	91.12	18	109.12
Arc	103061.575	103077.68	16.036	1.2	20	19.24	24	43.24
Arc	103132.978	103179.789	42.205	1.5	30	63.31	45	108.31
Arc	103248.556	103265.605	16.992	1.2	35	20.39	42	62.39
Arc	103398.542	103479.432	78.703	0.9	20	70.83	18	88.83
Arc	103571.769	103656.107	67.23	1.5	30	100.85	45	145.85
Arc	103828.704	103865.736	34.725	1.5	30	52.09	45	97.09
Arc	103905.901	103943.474	37.549	0.6	0	22.53	0	22.53
Arc	103982.36	104015.819	33.027	1.2	35	39.63	42	81.63
Arc	104095.261	104107.163	11.824	1.5	30	17.74	45	62.74
Arc	104164.402	104168.19	3.787	1.2	20	4.54	24	28.54
Arc	104203.816	104256.008	45.855	1.5	15	68.78	22.5	91.28
Arc	104364.372	104424.384	52.926	1.5	30	79.39	45	124.39
Arc	104485.413	104488.289	2.875	1.5	30	4.31	45	49.31
Arc	104549.718	104563.918	14.068	1.5	30	21.10	45	66.10
Arc	104683.862	104685.899	2.037	1.5	25	3.06	37.5	40.56
Arc	104711.627	104742.388	30.723	0.6	0	18.43	0	18.43
Arc	104780.151	104808.796	27.568	1.5	30	41.35	45	86.35
Arc	104854.34	104862.512	8.171	0.6	0	4.90	0	4.90
Arc	104897.505	104920.614	22.789	1.5	25	34.18	37.5	71.68
Arc	104965.673	104977.861	12.158	1.2	20	14.59	24	38.59
Arc	105058.879	105064.5	5.613	1.5	30	8.42	45	53.42
Arc	105109.207	105137.324	28.088	0.6	0	16.85	0	16.85
Arc	105173.648	105181.645	7.974	1.5	30	11.96	45	56.96
Arc	105382.028	105413.519	30.973	1.2	40	37.17	48	85.17
Arc	105498.721	105506.852	8.106	1.5	30	12.16	45	57.16
Arc	105566.872	105577.425	10.543	0.9	30	9.49	27	36.49
Arc	105649.111	105694.296	43.663	1.2	40	52.40	48	100
Arc	105815.828	105957.936	111.145	1.2	35	133.37	42	175



	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	106139.349	106218.407	71.077	1.2	40	85.29	48	133.29
Arc	106352.813	106362.026	9.176	1.5	30	13.76	45	58.76
Arc	106446.082	106496.947	44.988	1.5	30	67.48	45	112.48
Arc	106570.787	106608.282	32.24	1.5	20	48.36	30	78.36
Arc	106751.935	106777.068	24.869	1.2	40	29.84	48	77.84
Arc	106953.39	107000.262	42.248	1.5	30	63.37	45	108.37
Arc	107064.759	107081.032	16.162	1.5	25	24.24	37.5	61.74
Arc	107132.488	107148.102	15.59	0.9	25	14.03	22.5	36.53
Arc	107229.43	107283.008	46.736	1.5	30	70.10	45	115.10
Arc	107335.001	107344.824	9.807	1.2	20	11.77	24	35.77
Arc	107393.216	107396.345	3.129	1.5	25	4.69	37.5	42.19
Arc	107449.399	107458.973	9.55	1.5	25	14.33	37.5	51.83
Arc	107496.156	107518.655	22.494	0.6	0	13.50	0	13.50
Arc	107561.914	107592.699	30.301	1.2	40	36.36	48	84.36
Arc	107659.048	107669.682	10.626	0.9	25	9.56	22.5	32.06
Arc	107733.07	107780.585	46.284	1.2	35	55.54	42	97.54
Arc	107835.944	107844.558	8.612	0.9	20	7.75	18	25.75
Arc	107921.281	107941.105	19.734	1.2	15	23.68	18	41.68
Arc	107992.181	108003.352	11.107	1.5	30	16.66	45	61.66
Arc	108051.482	108139.444	80.294	1.2	15	96.35	18	114.35
Arc	108194.911	108227.495	31.005	1.5	30	46.51	45	91.51
Arc	108257.784	108264.011	6.226	0.6	0	3.74	0	3.74
Arc	108304.984	108343.442	37.517	1.2	40	45.02	48	93.02
Arc	108531.687	108558.951	27.211	0.6	15	16.33	9	25.33
Arc	108595.455	108636.478	39.883	1.2	20	47.86	24	71.86
Arc	108681.663	108694.344	12.628	1.5	25	18.94	37.5	56.44
Arc	108745.402	108810.512	58.156	1.5	25	87.23	37.5	124.73
Arc	108932.248	108958.003	25.61	0.9	30	23.05	27	50.05
Arc	109069.48	109150.329	70.406	1.2	25	84.49	30	114.49
Arc	109211.834	109237.349	25.324	1.2	35	30.39	42	72.39
Arc	109396.964	109436.632	33.479	1.5	20	50.22	30	80.22
Arc	109517.731	109560.483	41.462	1.2	20	49.75	24	73.75
Arc	109581.644	109600.277	18.625	0.6	0	11.18	0	11.18
Arc	109630.73	109645.825	14.937	1.5	30	22.41	45	67.41
Arc	109764.786	109825.1	50.657	1.5	30	75.99	45	120.99
Arc	109891.261	109915.611	23.687	1.5	30	35.53	45	80.53
Arc	109962.375	109976.274	13.868	1.2	15	16.64	18	34.64
Arc	110012.247	110142.253	121.043	0.9	20	108.94	18	126.94
Arc	110205.325	110234.176	28.453	1.2	40	34.14	48	82.14
Arc	110391.862	110439.044	44.494	1.5	25	66.74	37.5	104.24
Arc	110497.202	110532.17	33.022	1.5	30	49.53	45	94.53
Arc	110612.323	110642.371	28.808	1.5	30	43.21	45	88.21
Arc	110772.963	110826.335	46.607	1.5	30	69.91	45	114.91
Arc	110887.119	110917.667	29.245	1.5	30	43.87	45	88.87
Arc	111016.244	111024.471	8.224	0.9	15	7.40	13.5	20.90
Arc	111071.265	111082.336	11.008	1.5	30	16.51	45	61.51
Arc	111129.55	111180.964	45.349	1.5	15	68.02	22.5	90.52
Arc	111226.193	111235.882	9.647	1.5	30	14.47	45	59.47
Arc	111286.687	111305.551	18.752	1.2	20	22.50	24	46.
Arc	111388.215	111421.487	31.593	1.5	15	47.39	22.5	69.

	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	111452.251	111481.968	28.518	1.5	15	42.78	22.5	65.28
Arc	111512.247	111528.453	16.157	1.2	15	19.39	18	37.39
Arc	111586.705	111608.963	21.751	1.5	30	32.63	45	77.63
Arc	111654.809	111675.485	20.573	1.2	15	24.69	18	42.69
Arc	111721.141	111727.928	6.772	1.5	30	10.16	45	55.16
Arc	111789.563	111796.894	7.329	0.9	20	6.60	18	24.60
Arc	111837.047	111869.094	31.91	0.9	20	28.72	18	46.72
Arc	111972.92	112029.168	54.747	0.9	30	49.27	27	76.27
Arc	112089.681	112092.628	2.946	1.5	30	4.42	45	49.42
Arc	112148.103	112160.12	11.972	1.5	25	17.96	37.5	55.46
Arc	112200.788	112213.121	12.333	0.6	0	7.40	0	7.40
Arc	112282.81	112307.62	24.109	1.5	30	36.16	45	81.16
Arc	112413.947	112456.567	41.341	1.2	40	49.61	48	97.61
Arc	112564.826	112567.449	2.622	1.5	30	3.93	45	48.93
Arc	112599.015	112627.79	28.744	0.6	0	17.25	0	17.25
Arc	112657.861	112679.702	21.361	1.5	30	32.04	45	77.04
Arc	112744.641	112788.205	39.836	1.5	30	59.75	45	104.75
Arc	112904.994	112910.711	5.712	1.5	25	8.57	37.5	46.07
Arc	112962.203	112965.994	3.789	1.5	25	5.68	37.5	43.18
Arc	113022.467	113042.847	19.991	1.5	30	29.99	45	74.99
Arc	113093.262	113101.472	8.2	1.2	20	9.84	24	33.84
Arc	113157.072	113158.951	1.879	1.5	25	2.82	37.5	40.32
Arc	113215.491	113235.172	19.33	1.5	30	29.00	45	74.00
Arc	113271.395	113307.623	36.167	0.6	0	21.70	0	21.70
Arc	113359.477	113429.353	64.326	1.2	20	77.19	24	101.19
Arc	113475.547	113531.621	51.594	1.5	25	77.39	37.5	114.89
Arc	113581.395	113623.922	42.208	0.9	20	37.99	18	55.99
Arc	113684.713	113712.003	26.359	1.5	30	39.54	45	84.54
Arc	113831.477	113879.142	44.894	1.5	25	67.34	37.5	104.84
Arc	113927.856	113931.531	3.675	1.2	20	4.41	24	28.41
Arc	113971.359	113992.447	20.98	1.2	15	25.18	18	43.18
Arc	114048.47	114077.822	28.195	1.5	30	42.29	45	87.29
Arc	114297.092	114319.848	22.655	0.9	30	20.39	27	47.39
Arc	114371.561	114378.375	6.813	0.9	20	6.13	18	24.13
Arc	114442.101	114446.222	4.12	1.2	40	4.94	48	52.94
Arc	114586.908	114612.207	25.162	0.9	30	22.65	27	49.65
Arc	114813.783	114823.39	9.593	1.2	40	11.51	48	59.51
Arc	114904.505	114991.631	85.373	0.6	35	51.22	21	72.22
Arc	115218.802	115329.064	107.796	0.6	30	64.68	18	82.68
Arc	115430.724	115494.068	63.079	0.6	20	37.85	12	49.85
Arc	115725.155	115742.9	17.652	1.2	40	21.18	48	69.18
Arc	115932.668	115941.646	8.945	1.5	30	13.42	45	58.42
Arc	115995.143	116050.695	53.589	1.2	15	64.31	18	82.31
Arc	116086.947	116113.284	24.475	1.5	20	36.71	30	66.71
Arc	116161.956	116165.006	3.049	1.2	20	3.66	24	27.66
Arc	116208.75	116223.684	14.879	1.2	20	17.85	24	41.85
Arc	116285.072	116329.426	43.616	0.9	30	39.25	27	66.25
Arc	116467.783	116491.996	24.175	0.6	15	14.51	9	23.51
Arc	116535.59	116577.139	41.083	0.9	25	36.97	22.5	59.
Arc	116708.193	116733.699	24.744	1.5	30	37.12	45	82.

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	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	116801.27	116822.501	21.12	1.2	35	25.34	42	67.34
Arc	116875.97	116898.515	22.412	1.2	15	26.89	18	44.89
Arc	116944.127	116951.235	7.091	1.5	30	10.64	45	55.64
Arc	117007.196	117033.256	25.601	1.5	25	38.40	37.5	75.90
Arc	117086.426	117121.238	34.538	0.9	25	31.08	22.5	53.58
Arc	117217.34	117221.045	3.706	0.9	25	3.34	22.5	25.84
Arc	117276.236	117303.976	26.762	1.5	30	40.14	45	85.14
Arc	117449.793	117459.435	9.626	1.2	40	11.55	48	59.55
Arc	117532.035	117562.788	30.506	0.9	30	27.46	27	54.46
Arc	117635.23	117662.18	26.898	0.6	15	16.14	9	25.14
Arc	117978.619	118105.235	110.048	0.9	30	99.04	27	126.04
Arc	118192.199	118229.752	36.676	1.2	40	44.01	48	92.01
Arc	118270.391	118275.601	5.21	0.6	0	3.13	0	3.13
Arc	118317.389	118341.862	24.229	1.2	40	29.07	48	77.07
Arc	118451.239	118493.946	42.5	0.6	15	25.50	9	34.50
Arc	118618.493	118672.655	51.552	1.2	40	61.86	48	109.86
Arc	118748.367	118764.427	16.012	1.2	35	19.21	42	61.21
Arc	118867.097	118877.586	10.48	0.9	30	9.43	27	36.43
Arc	118924.391	119050.192	103.991	1.2	15	124.79	18	142.79
Arc	119095.791	119114.04	17.969	1.5	30	26.95	45	71.95
Arc	119185.137	119197.815	12.655	1.2	35	15.19	42	57.19
Arc	119283.564	119342.604	49.963	1.5	30	74.94	45	119.94
Arc	119442.602	119457.696	15.004	1.5	25	22.51	37.5	60.01
Arc	119500.438	119522.386	21.826	1.2	15	26.19	18	44.19
Arc	119574.047	119609.05	33.051	1.5	30	49.58	45	94.58
Arc	119664.425	119676.925	12.449	1.5	25	18.67	37.5	56.17
Arc	119801.362	119893.825	79.84	1.2	40	95.81	48	143.81
Arc	119999.983	120070.017	61.425	1.5	25	92.14	37.5	129.64
Arc	120129.788	120175.692	38.656	1.5	20	57.98	30	87.98
Arc	120228.617	120313.856	75.285	1.2	20	90.34	24	114.34
Arc	120366.672	120378.781	12.063	1.5	25	18.09	37.5	55.59
Arc	120437.11	120448.172	11.027	1.5	25	16.54	37.5	54.04
Arc	120495.441	120506.847	11.381	1.2	20	13.66	24	37.66
Arc	120558.936	120602.22	39.626	1.5	30	59.44	45	104.44
Arc	120683.866	120722.555	38.448	0.9	20	34.60	18	52.60
Arc	120778.729	120788.282	9.543	1.2	35	11.45	42	53.45
Arc	120891.529	120900.531	9.001	0.6	30	5.40	18	23.40
Arc	120974.617	120986.629	12.009	0.6	30	7.21	18	25.21
Arc	121169.278	121194.535	25.227	0.6	30	15.14	18	33.14
Arc	121294.279	121303.039	8.756	0.9	25	7.88	22.5	30.38
Arc	121376.968	121438.917	51.514	1.5	30	77.27	45	122.27
Arc	121559.376	121609.631	44.582	1.5	30	66.87	45	111.87
Arc	121756.748	121777.054	19.92	1.5	30	29.88	45	74.88
Arc	121823.395	121861.546	37.511	1.2	15	45.01	18	63.01
Arc	121892.952	121965.93	71.946	0.6	15	43.17	9	52.17
Arc	122018.627	122054.839	36.085	0.6	15	21.65	9	30.65
Arc	122173.258	122203.865	30.53	0.6	15	18.32	9	27.32
Arc	122260.786	122274.81	14.013	0.9	20	12.61	18	30.61
Arc	122359.948	122418.558	53.506	1.5	25	80.26	37.5	117
Arc	122540.104	122561.011	20.755	1.2	40	24.91	48	72.

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	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	122628.238	122662.434	33.936	0.9	25	30.54	22.5	53.04
Arc	122742.849	122788.89	45.861	0.6	30	27.52	18	45.52
Arc	122901.69	122936.958	34.763	1.2	35	41.72	42	83.72
Arc	123153.294	123207.214	51.345	1.2	40	61.61	48	109.61
Arc	123309.184	123315.542	6.353	1.2	40	7.62	48	55.62
Arc	123429.66	123474.225	40.579	1.5	30	60.87	45	105.87
Arc	123641.348	123738.764	85.172	1.2	40	102.21	48	150.21
Arc	123838.41	123878.249	33.571	1.5	20	50.36	30	80.36
Arc	123956.039	123992.204	31.436	1.5	20	47.15	30	77.15
Arc	124102.864	124153.576	48.566	1.2	40	58.28	48	106.28
Arc	124253.28	124263.989	10.677	1.5	25	16.02	37.5	53.52
Arc	124322.118	124350.356	27.207	1.5	30	40.81	45	85.81
Arc	124467.609	124479.161	11.48	1.5	30	17.22	45	62.22
Arc	124530.058	124544.095	14.005	1.2	15	16.81	18	34.81
Arc	124599.699	124644.258	42.29	1.5	25	63.44	37.5	100.94
Arc	124690.991	124702.126	11.112	1.2	20	13.33	24	37.33
Arc	124801.984	124815.786	13.733	1.5	25	20.60	37.5	58.10
Arc	124886.502	124962.692	75.016	0.6	35	45.01	21	66.01
Arc	125071.306	125079.391	8.081	0.9	15	7.27	13.5	20.77
Arc	125115.931	125124.691	8.749	1.2	20	10.50	24	34.50
Arc	125171.201	125173.668	2.467	1.5	25	3.70	37.5	41.20
Arc	125223.878	125234.298	10.412	0.9	25	9.37	22.5	31.87
Arc	125289.303	125336.256	46.282	0.9	25	41.65	22.5	64.15
Arc	125418.41	125437.342	18.914	0.6	35	11.35	21	32.35
Arc	125552.473	125558.892	6.419	0.6	25	3.85	15	18.85
Arc	125603.386	125656.556	53.1	0.6	0	31.86	0	31.86
Arc	125806.124	125819.383	13.232	1.2	35	15.88	42	57.88
Arc	125900.921	125913.037	12.101	0.9	30	10.89	27	37.89
Arc	125967.334	126031.798	64.339	0.6	0	38.60	0	38.60
Arc	126111.993	126115.457	3.464	0.9	15	3.12	13.5	16.62
Arc	126158.283	126166.716	8.417	1.5	25	12.63	37.5	50.13
Arc	126217.543	126223.757	6.208	1.5	25	9.31	37.5	46.81
Arc	126265.254	126286.817	21.497	0.9	15	19.35	13.5	32.85
Arc	126349.331	126381.155	30.992	1.5	25	46.49	37.5	83.99
Arc	126432.975	126475.28	34.848	1.5	20	52.27	30	82.27
Arc	126514.915	126558.367	43.346	0.6	0	26.01	0	26.01
Arc	126578.458	126580.642	2.184	0.6	15	1.31	9	10.31
Arc	126621.677	126637.547	15.767	1.5	25	23.65	37.5	61.15
Arc	126681.953	126805.636	118.699	0.6	15	71.22	9	80.22
Arc	127566.182	127685.149	112.074	0.9	20	100.87	18	118.87
Arc	127723.803	127732.331	8.528	0.6	0	5.12	0	5.12
Arc	127772.839	127789.213	16.172	1.5	30	24.26	45	69.26
Arc	127919.97	127960.727	34.062	1.5	20	51.09	30	81.09
Arc	128013.455	128042.275	27.724	1.5	30	41.59	45	86.59
Arc	128202.071	128231.451	28.22	1.5	30	42.33	45	87.33
Arc	128336.933	128379.548	39.121	1.5	30	58.68	45	103.68
Arc	128458.919	128503.174	42.824	1.2	40	51.39	48	99.39
Arc	128637.623	128659.342	21.653	0.9	25	19.49	22.5	41.99
Arc	128724.113	128735.838	11.65	1.5	30	17.48	45	62.
Arc	128924.374	128964.473	39.033	1.2	40	46.84	48	94.

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	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	129127.689	129190.116	51.758	1.5	30	77.64	45	122.64
Arc	129280.736	129332.677	45.693	1.5	30	68.54	45	113.54
Arc	129394.093	129420.507	25.569	1.5	30	38.35	45	83.35
Arc	129542.083	129552.009	9.909	1.2	20	11.89	24	35.89
Arc	129617.286	129634.574	17.05	1.5	30	25.58	45	70.58
Arc	129719.566	129731.228	11.589	1.5	30	17.38	45	62.38
Arc	129790.08	129802.128	12.003	1.5	25	18.00	37.5	55.50
Arc	129848.748	129892.775	43.8	0.6	15	26.28	9	35.28
Arc	130052.67	130082.482	29.8	0.6	0	17.88	0	17.88
Arc	130117.892	130133.331	15.415	0.9	25	13.87	22.5	36.37
Arc	130204.427	130214.628	10.173	1.5	25	15.26	37.5	52.76
Arc	130362.92	130379.791	16.746	1.5	25	25.12	37.5	62.62
Arc	130443.992	130493.042	46.034	1.5	25	69.05	37.5	106.55
Arc	130628.467	130646.823	18.072	1.5	30	27.11	45	72.11
Arc	130838.732	130882.938	43.977	0.6	15	26.39	9	35.39
Arc	130930.621	130977.268	45.789	0.9	30	41.21	27	68.21
Arc	131028.95	131120.601	88.477	0.9	20	79.63	18	97.63
Arc	131171.008	131179.469	8.434	1.5	30	12.65	45	57.65
								17362.27

Total Area of Extra Widening= 17362 sqm



Variable Declaration

Extra Widening on Flexible Pavement

SI No	Variable Description	Variable	Dimension	Unit
1	Total Area of Extra Widening	ew_area	17362.000	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	11.690	percentage



RCC Covered Drain

Chainage (m)		Length of CD (m)	Net Length (m)	TCS No.	Side
From	To				
105550	105725	2.6	172.4	TCS-13	Valley
105725	105900	2.7	172.3	TCS-7B	Valley
105900	106030	2.6	127.4	TCS-13	Valley
106030	106100	0	70.0	TCS-7B	Valley
106100	106225	6.4	118.6	TCS-13	Valley
111460	111800	5.3	334.7	TCS-7	Valley
118175	118460	0	570.0	TCS-6	Both
118460	118525	0	65.0	TCS-7B	Valley
118525	118575	2.6	47.4	TCS-7	Valley
118575	118630	0	55.0	TCS-7B	Valley
118630	118700	2.6	67.4	TCS-7	Valley
118700	118760	0	60.0	TCS-7B	Valley
118760	118820	0	60.0	TCS-7	Valley
118820	118870	0	50.0	TCS-7B	Valley
118870	118925	0	55.0	TCS-7	Valley
118925	119000	0	150.0	TCS-6	Both
119000	119050	2.6	47.4	TCS-7B	Valley
119050	119100	2.6	47.4	TCS-7	Valley
119100	119150	0	50.0	TCS-7B	Valley
119150	119200	0	50.0	TCS-7	Valley
119790	120010	7.8	212.2	TCS-7	Valley
130100	130325	2.7	444.6	TCS-6	Both
130325	130375	2.7	94.6	TCS-6A	Both
130375	130465	0	180.0	TCS-6	Both
130595	130875	5.3	549.4	TCS-6	Both
131125	131225	3.96	192.1	TCS-6	Both
Total =			4043		



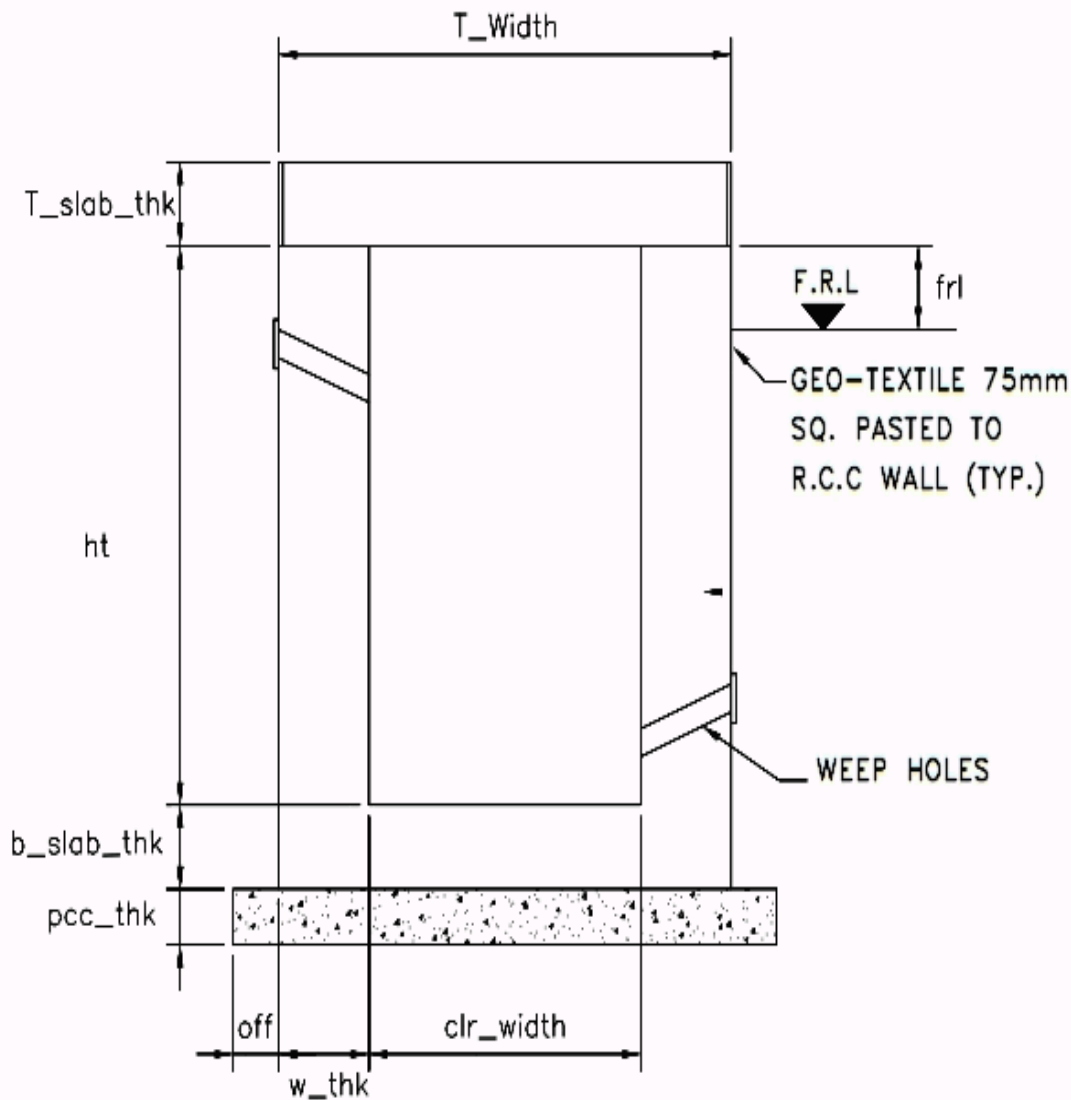
Variable Declaration

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	4043.000	m
9	Reinforcement Per Cum RCC	s	0.050	MT/Cum RCC
10	Finished Road Level	frl	0.300	m



Variable Declaration



[Signature]

CETEST
KOLKATA
700 092

Triangular Drain and Chut Drain

Chainage (m)		Length of CD	Net Length (m)	TCS No.	Side
From	To				
101280	101350	2.7	67.3	TCS-3	Hill
101350	101480	0	130.0	TCS-3A	Hill
101480	101530	0	50.0	TCS-4	Hill
101530	101675	0	145.0	TCS-3	Hill
101675	101750	6.06	68.9	TCS-3A	Hill
101750	101800	0	50.0	TCS-3	Hill
101800	101875	0	75.0	TCS-3A	Hill
101875	101950	5.3	69.7	TCS-4	Hill
102125	102210	5.26	79.7	TCS-3	Hill
102210	102250	0	40.0	TCS-3A	Hill
102250	102350	7.96	92.0	TCS-3	Hill
102350	102400	0	50.0	TCS-4	Hill
102400	102450	0	50.0	TCS-3A	Hill
102450	102625	0	175.0	TCS-3	Hill
102700	102750	2.6	47.4	TCS-3	Hill
102750	102800	0	50.0	TCS-3A	Hill
102800	102940	2.6	137.4	TCS-3	Hill
102940	103020	0	80.0	TCS-3A	Hill
103020	103075	0	55.0	TCS-3	Hill
103075	103275	3.96	196.0	TCS-3A	Hill
103275	103350	2.7	72.3	TCS-3	Hill
103350	103450	0	100.0	TCS-3A	Hill
103450	103580	7.7	122.3	TCS-3	Hill
103580	103640	0	60.0	TCS-3A	Hill
103640	103700	0	60.0	TCS-4	Hill
103700	103775	0	75.0	TCS-3A	Hill
103775	103875	9	91.0	TCS-3	Hill
103875	103925	0	50.0	TCS-3A	Hill
103925	104000	2.6	72.4	TCS-3	Hill
104000	104050	2.6	47.4	TCS-4	Hill
104050	104270	5	215.0	TCS-3	Hill
104270	104320	0	50.0	TCS-4	Hill
104320	104470	5	145.0	TCS-3	Hill
104470	104625	3.96	151.0	TCS-3A	Hill
104625	104875	2.6	247.4	TCS-3	Hill
104875	105025	2.6	147.4	TCS-3	Hill
105120	105170	0	50.0	TCS-7A	Valley
105170	105220	5	45.0	TCS-3A	Hill
105220	105270	0	50.0	TCS-7A	Valley
105270	105360	2.6	87.4	TCS-3	Hill
105360	105485	0	250.0	TCS-12	Both
105485	105550	6.06	58.9	TCS-3	Hill
105550	105725	2.6	172.4	TCS-13	Hill
105900	106030	2.6	127.4	TCS-13	Hill
106100	106225	6.4	118.6	TCS-13	Hill
106225	106300	5.4	69.6	TCS-3	Hill
106300	106350	0	100.0	TCS-12	Both



106350	106450	2.6	97.4	TCS-3	Hill
106450	106525	5.26	69.7	TCS-3A	Hill
106525	106600	2.6	72.4	TCS-3	Hill
106600	106675	0	75.0	TCS-3A	Hill
106850	107600	19.24	730.8	TCS-3	Hill
107600	107680	0	80.0	TCS-4	Hill
107680	107740	2.6	57.4	TCS-3A	Hill
107740	107790	2.7	47.3	TCS-4	Hill
107790	108025	13.06	221.9	TCS-3	Hill
108025	108175	0	150.0	TCS-3A	Hill
108175	108825	14.3	635.7	TCS-3	Hill
108825	108920	2.6	92.4	TCS-3A	Hill
108920	109235	14.04	301.0	TCS-3	Hill
109235	109275	0	40.0	TCS-3A	Hill
109275	109610	5.12	329.9	TCS-3	Hill
109610	109670	0	120.0	TCS-12	Both
109670	109825	8.66	146.3	TCS-3	Hill
109825	109875	0	50.0	TCS-3A	Hill
109875	109930	2.6	52.4	TCS-3	Hill
109930	109980	2.6	47.4	TCS-4	Hill
109980	110100	0	240.0	TCS-12	Both
110100	110325	3.96	221.0	TCS-3A	Hill
110325	110400	2.6	72.4	TCS-4	Hill
110400	110475	0	75.0	TCS-7A	Valley
110475	110700	9	216.0	TCS-3	Hill
110700	110750	0	50.0	TCS-3A	Hill
110750	110800	8	42.0	TCS-3	Hill
110800	110950	0	150.0	TCS-3A	Hill
110950	111050	2.6	97.4	TCS-3	Hill
111050	111125	0	75.0	TCS-3A	Hill
111125	111225	2.7	97.3	TCS-7A	Valley
111280	111400	2.6	117.4	TCS-3	Hill
111400	111460	0	60.0	TCS-3A	Hill
111800	112150	2.6	347.4	TCS-3	Hill
112550	112925	8	367.0	TCS-3	Hill
112925	113000	0	75.0	TCS-3A	Hill
113000	113050	2.6	47.4	TCS-3	Hill
113050	113100	0	50.0	TCS-3A	Hill
113480	113530	0	50.0	TCS-3	Hill
113530	113625	3.84	91.2	TCS-4	Hill
113625	113800	6.14	168.9	TCS-3A	Hill
113800	113900	2.7	97.3	TCS-4	Hill
113900	113975	0	75.0	TCS-3	Hill
114225	114880	14.56	640.4	TCS-3	Hill
114960	115010	2.6	47.4	TCS-7A	Valley
115010	115725	10.5	704.5	TCS-3	Hill
115725	115790	0	65.0	TCS-3A	Hill
115790	115850	0	60.0	TCS-4	Hill
115850	115900	2.7	47.3	TCS-3A	Hill
115900	115950	0	50.0	TCS-7A	Valley



115950	116030	0	80.0	TCS-3	Hill
116030	116085	2.6	52.4	TCS-4	Hill
116085	116280	0	195.0	TCS-7A	Valley
116280	116325	3.84	41.2	TCS-3A	Hill
116515	116650	2.6	132.4	TCS-3	Hill
116650	116700	0	50.0	TCS-3A	Hill
116700	116775	2.6	72.4	TCS-3	Hill
116775	116825	0	50.0	TCS-4	Hill
116825	117000	2.6	172.4	TCS-3	Hill
117050	117100	0	50.0	TCS-7A	Valley
117100	117550	5.2	444.8	TCS-3	Hill
117825	118175	2.6	347.4	TCS-3	Hill
119200	119250	0	50.0	TCS-3	Hill
119375	119530	2.6	152.4	TCS-3A	Hill
119530	119570	0	40.0	TCS-3	Hill
119570	119790	2.7	217.3	TCS-7A	Valley
120010	120110	2.6	97.4	TCS-3A	Hill
120110	120300	2.6	187.4	TCS-3	Hill
120400	120475	0	75.0	TCS-3A	Hill
120475	120650	5.3	169.7	TCS-3	Hill
120650	120700	0	50.0	TCS-3A	Hill
120700	120750	2.6	47.4	TCS-3	Hill
120750	120810	0	120.0	TCS-12	Both
120810	121450	16.84	623.2	TCS-3	Hill
121450	121500	0	50.0	TCS-4	Hill
121500	121650	5.2	144.8	TCS-3	Hill
121650	121750	0	100.0	TCS-7A	Valley
121750	122000	5.2	244.8	TCS-3	Hill
122000	122050	0	50.0	TCS-4	Hill
122050	122100	2.6	47.4	TCS-3A	Hill
122100	122315	2.6	212.4	TCS-3	Hill
122315	122435	2.6	117.4	TCS-4	Hill
122435	122550	2.7	112.3	TCS-3	Hill
122550	122600	0	50.0	TCS-3A	Hill
122600	122645	2.7	42.3	TCS-3	Hill
122645	122705	0	120.0	TCS-12	Both
122705	122805	0	100.0	TCS-4	Hill
122805	122945	2.6	137.4	TCS-3	Hill
122945	123000	0	55.0	TCS-3A	Hill
123000	123100	0	100.0	TCS-3	Hill
123100	123155	0	110.0	TCS-12	Both
123155	123200	2.6	42.4	TCS-3	Hill
123200	123255	0	110.0	TCS-12	Both
123255	123310	6.06	48.9	TCS-3	Hill
123310	123375	0	130.0	TCS-12	Both
123375	123425	0	50.0	TCS-3	Hill
123425	123675	0	250.0	TCS-7A	Valley
123675	124025	0	700.0	TCS-12	Both
124025	124125	0	100.0	TCS-4	Hill
124125	124200	2.7	72.3	TCS-3	Hill



124200	124250	0	50.0	TCS-7A	Valley
124250	124305	0	55.0	TCS-3	Hill
124305	124375	2.6	67.4	TCS-3A	Hill
124425	125015	10.6	579.4	TCS-3	Hill
125015	125065	0	50.0	TCS-4	Hill
125065	125125	2.6	57.4	TCS-3A	Hill
125125	125725	9.14	590.9	TCS-3	Hill
125725	125775	0	50.0	TCS-3A	Hill
125775	126575	10.6	789.4	TCS-3	Hill
126575	126625	0	50.0	TCS-4	Hill
126625	126775	2.7	147.3	TCS-3	Hill
126775	126850	0	75.0	TCS-3A	Hill
126850	126975	9.26	115.7	TCS-3	Hill
126975	127025	0	100.0	TCS-12	Both
127025	127125	2.6	97.4	TCS-3A	Hill
127125	127205	2.6	77.4	TCS-3	Hill
127205	127325	0	120.0	TCS-7A	Valley
127325	127475	2.6	147.4	TCS-3A	Hill
127475	127550	6.56	68.4	TCS-3	Hill
127550	127700	0	150.0	TCS-7A	Valley
127700	127800	2.6	97.4	TCS-3	Hill
127800	128045	0	245.0	TCS-3A	Hill
128045	128195	2.7	147.3	TCS-4	Hill
128195	128595	7.96	392.0	TCS-3	Hill
128595	128645	0	50.0	TCS-3A	Hill
128645	128695	2.7	47.3	TCS-3	Hill
128695	128745	0	50.0	TCS-3A	Hill
128745	128775	2.7	27.3	TCS-4	Hill
128775	128825	0	50.0	TCS-3A	Hill
128825	128945	0	120.0	TCS-3	Hill
128945	129025	3.96	76.0	TCS-3A	Hill
129025	129150	0	250.0	TCS-12	Both
129150	129515	33.94	331.1	TCS-3	Hill
129515	129550	0	35.0	TCS-3A	Hill
129550	129775	2.6	222.4	TCS-3	Hill
129775	129850	0	75.0	TCS-3A	Hill
129850	129925	3.96	71.0	TCS-4	Hill
129925	130100	3.96	171.0	TCS-3	Hill
130465	130595	14.5	115.5	TCS-7A	Valley
130875	131125	2.6	247.4	TCS-3	Hill
131225	131279	0	54.0	TCS-3	Hill
Total =			25587		

Catchwater Drain

Chainage (m)		Length of CD	Net Length (m)
From	To		
101350	101480	0	130.0
101675	101750	6.06	68.9
101800	101875	0	75.0
101950	102000	0	50.0
102000	102125	2.6	122.4
102210	102250	0	40.0
102400	102450	0	50.0
102750	102800	0	50.0
102940	103020	0	80.0
103075	103275	3.96	196.0
103350	103450	0	100.0
103580	103640	0	60.0
103700	103775	0	75.0
103875	103925	0	50.0
104470	104625	3.96	151.0
105025	105120	2.6	92.4
105120	105170	0	50.0
105170	105220	5	45.0
105220	105270	0	50.0
105360	105485	0	125.0
105725	105900	2.7	172.3
106030	106100	0	70.0
106300	106350	0	50.0
106450	106525	5.26	69.7
106600	106675	0	75.0
106675	106775	0	100.0
106775	106850	0	75.0
107680	107740	2.6	57.4
108025	108175	0	150.0
108825	108920	2.6	92.4
109235	109275	0	40.0
109610	109670	0	60.0
109825	109875	0	50.0
109980	110100	0	120.0
110100	110325	3.96	221.0
110400	110475	0	75.0
110700	110750	0	50.0
110800	110950	0	150.0
111050	111125	0	75.0
111125	111225	2.7	97.3
111225	111280	0	55.0
111400	111460	0	60.0
111460	111800	5.3	334.7
112150	112550	3.84	396.2
112925	113000	0	75.0
113050	113100	0	50.0
113100	113480	5.2	374.8



113625	113800	6.14	168.9
113975	114150	0	175.0
114150	114225	0	75.0
114880	114960	0	80.0
114960	115010	2.6	47.4
115725	115790	0	65.0
115850	115900	2.7	47.3
115900	115950	0	50.0
116085	116280	0	195.0
116280	116325	3.84	41.2
116325	116375	0	50.0
116375	116465	0	90.0
116465	116515	0	50.0
116650	116700	0	50.0
117000	117050	2.7	47.3
117050	117100	0	50.0
117550	117780	2.6	227.4
117780	117825	0	45.0
118460	118525	0	65.0
118525	118575	2.6	47.4
118575	118630	0	55.0
118630	118700	2.6	67.4
118700	118760	0	60.0
118760	118820	0	60.0
118820	118870	0	50.0
118870	118925	0	55.0
119000	119050	2.6	47.4
119050	119100	2.6	47.4
119100	119150	0	50.0
119150	119200	0	50.0
119250	119375	2.6	122.4
119375	119530	2.6	152.4
119570	119790	2.7	217.3
119790	120010	7.8	212.2
120010	120110	2.6	97.4
120300	120400	5.2	94.8
120400	120475	0	75.0
120650	120700	0	50.0
120750	120810	0	60.0
121650	121750	0	100.0
122050	122100	2.6	47.4
122550	122600	0	50.0
122645	122705	0	60.0
122945	123000	0	55.0
123100	123155	0	55.0
123200	123255	0	55.0
123310	123375	0	65.0
123425	123675	0	250.0
123675	124025	0	350.0
124200	124250	0	50.0



124305	124375	2.6	67.4
124375	124425	0	50.0
125065	125125	2.6	57.4
125725	125775	0	50.0
126775	126850	0	75.0
126975	127025	0	50.0
127025	127125	2.6	97.4
127205	127325	0	120.0
127325	127475	2.6	147.4
127550	127700	0	150.0
127800	128045	0	245.0
128595	128645	0	50.0
128695	128745	0	50.0
128775	128825	0	50.0
128945	129025	3.96	76.0
129025	129150	0	125.0
129515	129550	0	35.0
129775	129850	0	75.0
130465	130595	14.5	115.5
Total =			10971

Total Length of Triangular Drain = 36557 m
Chute Drain (of avg 8 m height @ 50m
1755 Interval) = m



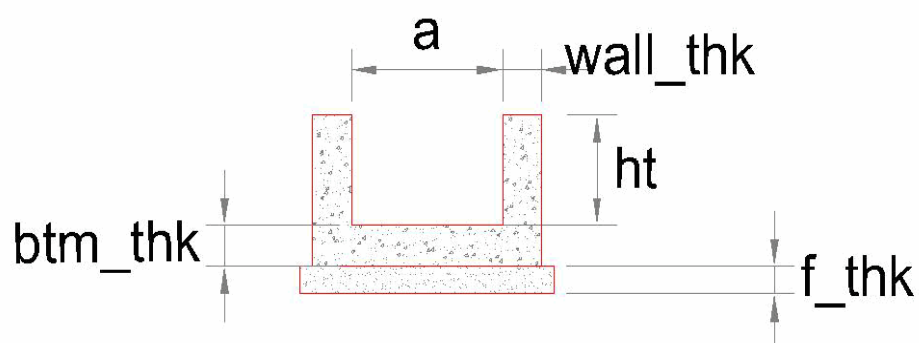
Variable Declaration

PCC Chut Drain

SI 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	1755.000	m



Variable Declaration



CHUT DRAIN

[Signature]

CETEST ENGINEERING CONSULTANTS
KOLKATA
700 092
INDIA

Trapezoidal Drain

Chainage (m)		Length of CD	Net Length (m)	TCS No.	Side
From	To				
101280	101350	2.7	67.3	TCS-3	Hill
101350	101480	0	130.0	TCS-3A	Hill
101480	101530	0	50.0	TCS-4	Hill
101530	101675	0	145.0	TCS-3	Hill
101675	101750	6.06	68.9	TCS-3A	Hill
101750	101800	0	50.0	TCS-3	Hill
101800	101875	0	75.0	TCS-3A	Hill
101875	101950	5.3	69.7	TCS-4	Hill
102125	102210	5.26	79.7	TCS-3	Hill
102210	102250	0	40.0	TCS-3A	Hill
102250	102350	7.96	92.0	TCS-3	Hill
102350	102400	0	50.0	TCS-4	Hill
102400	102450	0	50.0	TCS-3A	Hill
102450	102625	0	175.0	TCS-3	Hill
102700	102750	2.6	47.4	TCS-3	Hill
102750	102800	0	50.0	TCS-3A	Hill
102800	102940	2.6	137.4	TCS-3	Hill
102940	103020	0	80.0	TCS-3A	Hill
103020	103075	0	55.0	TCS-3	Hill
103075	103275	3.96	196.0	TCS-3A	Hill
103275	103350	2.7	72.3	TCS-3	Hill
103350	103450	0	100.0	TCS-3A	Hill
103450	103580	7.7	122.3	TCS-3	Hill
103580	103640	0	60.0	TCS-3A	Hill
103640	103700	0	60.0	TCS-4	Hill
103700	103775	0	75.0	TCS-3A	Hill
103775	103875	9	91.0	TCS-3	Hill
103875	103925	0	50.0	TCS-3A	Hill
103925	104000	2.6	72.4	TCS-3	Hill
104000	104050	2.6	47.4	TCS-4	Hill
104050	104270	5	215.0	TCS-3	Hill
104270	104320	0	50.0	TCS-4	Hill
104320	104470	5	145.0	TCS-3	Hill
104470	104625	3.96	151.0	TCS-3A	Hill
104625	104875	2.6	247.4	TCS-3	Hill
104875	105025	2.6	147.4	TCS-3	Hill
105120	105170	0	50.0	TCS-7A	Valley
105170	105220	5	45.0	TCS-3A	Hill
105220	105270	0	50.0	TCS-7A	Valley
105270	105360	2.6	87.4	TCS-3	Hill
105360	105485	0	250.0	TCS-12	Both
105485	105550	6.06	58.9	TCS-3	Hill
105550	105725	2.6	172.4	TCS-13	Hill
105900	106030	2.6	127.4	TCS-13	Hill
106100	106225	6.4	118.6	TCS-13	Hill
106225	106300	5.4	69.6	TCS-3	Hill
106300	106350	0	100.0	TCS-12	Both



106350	106450	2.6	97.4	TCS-3	Hill
106450	106525	5.26	69.7	TCS-3A	Hill
106525	106600	2.6	72.4	TCS-3	Hill
106600	106675	0	75.0	TCS-3A	Hill
106850	107600	19.24	730.8	TCS-3	Hill
107600	107680	0	80.0	TCS-4	Hill
107680	107740	2.6	57.4	TCS-3A	Hill
107740	107790	2.7	47.3	TCS-4	Hill
107790	108025	13.06	221.9	TCS-3	Hill
108025	108175	0	150.0	TCS-3A	Hill
108175	108825	14.3	635.7	TCS-3	Hill
108825	108920	2.6	92.4	TCS-3A	Hill
108920	109235	14.04	301.0	TCS-3	Hill
109235	109275	0	40.0	TCS-3A	Hill
109275	109610	5.12	329.9	TCS-3	Hill
109610	109670	0	120.0	TCS-12	Both
109670	109825	8.66	146.3	TCS-3	Hill
109825	109875	0	50.0	TCS-3A	Hill
109875	109930	2.6	52.4	TCS-3	Hill
109930	109980	2.6	47.4	TCS-4	Hill
109980	110100	0	240.0	TCS-12	Both
110100	110325	3.96	221.0	TCS-3A	Hill
110325	110400	2.6	72.4	TCS-4	Hill
110400	110475	0	75.0	TCS-7A	Valley
110475	110700	9	216.0	TCS-3	Hill
110700	110750	0	50.0	TCS-3A	Hill
110750	110800	8	42.0	TCS-3	Hill
110800	110950	0	150.0	TCS-3A	Hill
110950	111050	2.6	97.4	TCS-3	Hill
111050	111125	0	75.0	TCS-3A	Hill
111125	111225	2.7	97.3	TCS-7A	Valley
111280	111400	2.6	117.4	TCS-3	Hill
111400	111460	0	60.0	TCS-3A	Hill
111800	112150	2.6	347.4	TCS-3	Hill
112550	112925	8	367.0	TCS-3	Hill
112925	113000	0	75.0	TCS-3A	Hill
113000	113050	2.6	47.4	TCS-3	Hill
113050	113100	0	50.0	TCS-3A	Hill
113480	113530	0	50.0	TCS-3	Hill
113530	113625	3.84	91.2	TCS-4	Hill
113625	113800	6.14	168.9	TCS-3A	Hill
113800	113900	2.7	97.3	TCS-4	Hill
113900	113975	0	75.0	TCS-3	Hill
114225	114880	14.56	640.4	TCS-3	Hill
114960	115010	2.6	47.4	TCS-7A	Valley
115010	115725	10.5	704.5	TCS-3	Hill
115725	115790	0	65.0	TCS-3A	Hill
115790	115850	0	60.0	TCS-4	Hill
115850	115900	2.7	47.3	TCS-3A	Hill
115900	115950	0	50.0	TCS-7A	Valley



115950	116030	0	80.0	TCS-3	Hill
116030	116085	2.6	52.4	TCS-4	Hill
116085	116280	0	195.0	TCS-7A	Valley
116280	116325	3.84	41.2	TCS-3A	Hill
116515	116650	2.6	132.4	TCS-3	Hill
116650	116700	0	50.0	TCS-3A	Hill
116700	116775	2.6	72.4	TCS-3	Hill
116775	116825	0	50.0	TCS-4	Hill
116825	117000	2.6	172.4	TCS-3	Hill
117050	117100	0	50.0	TCS-7A	Valley
117100	117550	5.2	444.8	TCS-3	Hill
117825	118175	2.6	347.4	TCS-3	Hill
119200	119250	0	50.0	TCS-3	Hill
119375	119530	2.6	152.4	TCS-3A	Hill
119530	119570	0	40.0	TCS-3	Hill
119570	119790	2.7	217.3	TCS-7A	Valley
120010	120110	2.6	97.4	TCS-3A	Hill
120110	120300	2.6	187.4	TCS-3	Hill
120400	120475	0	75.0	TCS-3A	Hill
120475	120650	5.3	169.7	TCS-3	Hill
120650	120700	0	50.0	TCS-3A	Hill
120700	120750	2.6	47.4	TCS-3	Hill
120750	120810	0	120.0	TCS-12	Both
120810	121450	16.84	623.2	TCS-3	Hill
121450	121500	0	50.0	TCS-4	Hill
121500	121650	5.2	144.8	TCS-3	Hill
121650	121750	0	100.0	TCS-7A	Valley
121750	122000	5.2	244.8	TCS-3	Hill
122000	122050	0	50.0	TCS-4	Hill
122050	122100	2.6	47.4	TCS-3A	Hill
122100	122315	2.6	212.4	TCS-3	Hill
122315	122435	2.6	117.4	TCS-4	Hill
122435	122550	2.7	112.3	TCS-3	Hill
122550	122600	0	50.0	TCS-3A	Hill
122600	122645	2.7	42.3	TCS-3	Hill
122645	122705	0	120.0	TCS-12	Both
122705	122805	0	100.0	TCS-4	Hill
122805	122945	2.6	137.4	TCS-3	Hill
122945	123000	0	55.0	TCS-3A	Hill
123000	123100	0	100.0	TCS-3	Hill
123100	123155	0	110.0	TCS-12	Both
123155	123200	2.6	42.4	TCS-3	Hill
123200	123255	0	110.0	TCS-12	Both
123255	123310	6.06	48.9	TCS-3	Hill
123310	123375	0	130.0	TCS-12	Both
123375	123425	0	50.0	TCS-3	Hill
123425	123675	0	250.0	TCS-7A	Valley
123675	124025	0	700.0	TCS-12	Both
124025	124125	0	100.0	TCS-4	Hill
124125	124200	2.7	72.3	TCS-3	Hill



124200	124250	0	50.0	TCS-7A	Valley
124250	124305	0	55.0	TCS-3	Hill
124305	124375	2.6	67.4	TCS-3A	Hill
124425	125015	10.6	579.4	TCS-3	Hill
125015	125065	0	50.0	TCS-4	Hill
125065	125125	2.6	57.4	TCS-3A	Hill
125125	125725	9.14	590.9	TCS-3	Hill
125725	125775	0	50.0	TCS-3A	Hill
125775	126575	10.6	789.4	TCS-3	Hill
126575	126625	0	50.0	TCS-4	Hill
126625	126775	2.7	147.3	TCS-3	Hill
126775	126850	0	75.0	TCS-3A	Hill
126850	126975	9.26	115.7	TCS-3	Hill
126975	127025	0	100.0	TCS-12	Both
127025	127125	2.6	97.4	TCS-3A	Hill
127125	127205	2.6	77.4	TCS-3	Hill
127205	127325	0	120.0	TCS-7A	Valley
127325	127475	2.6	147.4	TCS-3A	Hill
127475	127550	6.56	68.4	TCS-3	Hill
127550	127700	0	150.0	TCS-7A	Valley
127700	127800	2.6	97.4	TCS-3	Hill
127800	128045	0	245.0	TCS-3A	Hill
128045	128195	2.7	147.3	TCS-4	Hill
128195	128595	7.96	392.0	TCS-3	Hill
128595	128645	0	50.0	TCS-3A	Hill
128645	128695	2.7	47.3	TCS-3	Hill
128695	128745	0	50.0	TCS-3A	Hill
128745	128775	2.7	27.3	TCS-4	Hill
128775	128825	0	50.0	TCS-3A	Hill
128825	128945	0	120.0	TCS-3	Hill
128945	129025	3.96	76.0	TCS-3A	Hill
129025	129150	0	250.0	TCS-12	Both
129150	129515	33.94	331.1	TCS-3	Hill
129515	129550	0	35.0	TCS-3A	Hill
129550	129775	2.6	222.4	TCS-3	Hill
129775	129850	0	75.0	TCS-3A	Hill
129850	129925	3.96	71.0	TCS-4	Hill
129925	130100	3.96	171.0	TCS-3	Hill
130465	130595	14.5	115.5	TCS-7A	Valley
130875	131125	2.6	247.4	TCS-3	Hill
131225	131279	0	54.0	TCS-3	Hill
Total =			25587		



Catchwater Drain

Chainage (m)		Length of CD	Net Length (m)
From	To		
101350	101480	0	130.0
101675	101750	6.06	68.9
101800	101875	0	75.0
101950	102000	0	50.0
102000	102125	2.6	122.4
102210	102250	0	40.0
102400	102450	0	50.0
102750	102800	0	50.0
102940	103020	0	80.0
103075	103275	3.96	196.0
103350	103450	0	100.0
103580	103640	0	60.0
103700	103775	0	75.0
103875	103925	0	50.0
104470	104625	3.96	151.0
105025	105120	2.6	92.4
105120	105170	0	50.0
105170	105220	5	45.0
105220	105270	0	50.0
105360	105485	0	125.0
105725	105900	2.7	172.3
106030	106100	0	70.0
106300	106350	0	50.0
106450	106525	5.26	69.7
106600	106675	0	75.0
106675	106775	0	100.0
106775	106850	0	75.0
107680	107740	2.6	57.4
108025	108175	0	150.0
108825	108920	2.6	92.4
109235	109275	0	40.0
109610	109670	0	60.0
109825	109875	0	50.0
109980	110100	0	120.0
110100	110325	3.96	221.0
110400	110475	0	75.0
110700	110750	0	50.0
110800	110950	0	150.0
111050	111125	0	75.0
111125	111225	2.7	97.3
111225	111280	0	55.0
111400	111460	0	60.0
111460	111800	5.3	334.7
112150	112550	3.84	396.2
112925	113000	0	75.0
113050	113100	0	50.0
113100	113480	5.2	374.8



113625	113800	6.14	168.9
113975	114150	0	175.0
114150	114225	0	75.0
114880	114960	0	80.0
114960	115010	2.6	47.4
115725	115790	0	65.0
115850	115900	2.7	47.3
115900	115950	0	50.0
116085	116280	0	195.0
116280	116325	3.84	41.2
116325	116375	0	50.0
116375	116465	0	90.0
116465	116515	0	50.0
116650	116700	0	50.0
117000	117050	2.7	47.3
117050	117100	0	50.0
117550	117780	2.6	227.4
117780	117825	0	45.0
118460	118525	0	65.0
118525	118575	2.6	47.4
118575	118630	0	55.0
118630	118700	2.6	67.4
118700	118760	0	60.0
118760	118820	0	60.0
118820	118870	0	50.0
118870	118925	0	55.0
119000	119050	2.6	47.4
119050	119100	2.6	47.4
119100	119150	0	50.0
119150	119200	0	50.0
119250	119375	2.6	122.4
119375	119530	2.6	152.4
119570	119790	2.7	217.3
119790	120010	7.8	212.2
120010	120110	2.6	97.4
120300	120400	5.2	94.8
120400	120475	0	75.0
120650	120700	0	50.0
120750	120810	0	60.0
121650	121750	0	100.0
122050	122100	2.6	47.4
122550	122600	0	50.0
122645	122705	0	60.0
122945	123000	0	55.0
123100	123155	0	55.0
123200	123255	0	55.0
123310	123375	0	65.0
123425	123675	0	250.0
123675	124025	0	350.0
124200	124250	0	50.0



124305	124375	2.6	67.4
124375	124425	0	50.0
125065	125125	2.6	57.4
125725	125775	0	50.0
126775	126850	0	75.0
126975	127025	0	50.0
127025	127125	2.6	97.4
127205	127325	0	120.0
127325	127475	2.6	147.4
127550	127700	0	150.0
127800	128045	0	245.0
128595	128645	0	50.0
128695	128745	0	50.0
128775	128825	0	50.0
128945	129025	3.96	76.0
129025	129150	0	125.0
129515	129550	0	35.0
129775	129850	0	75.0
130465	130595	14.5	115.5
Total =			10971

Total Length of Trapezoidal Drain =
Chute Drain (of avg 8 m height @ 50m
Interval) =

36557 m
1755 m



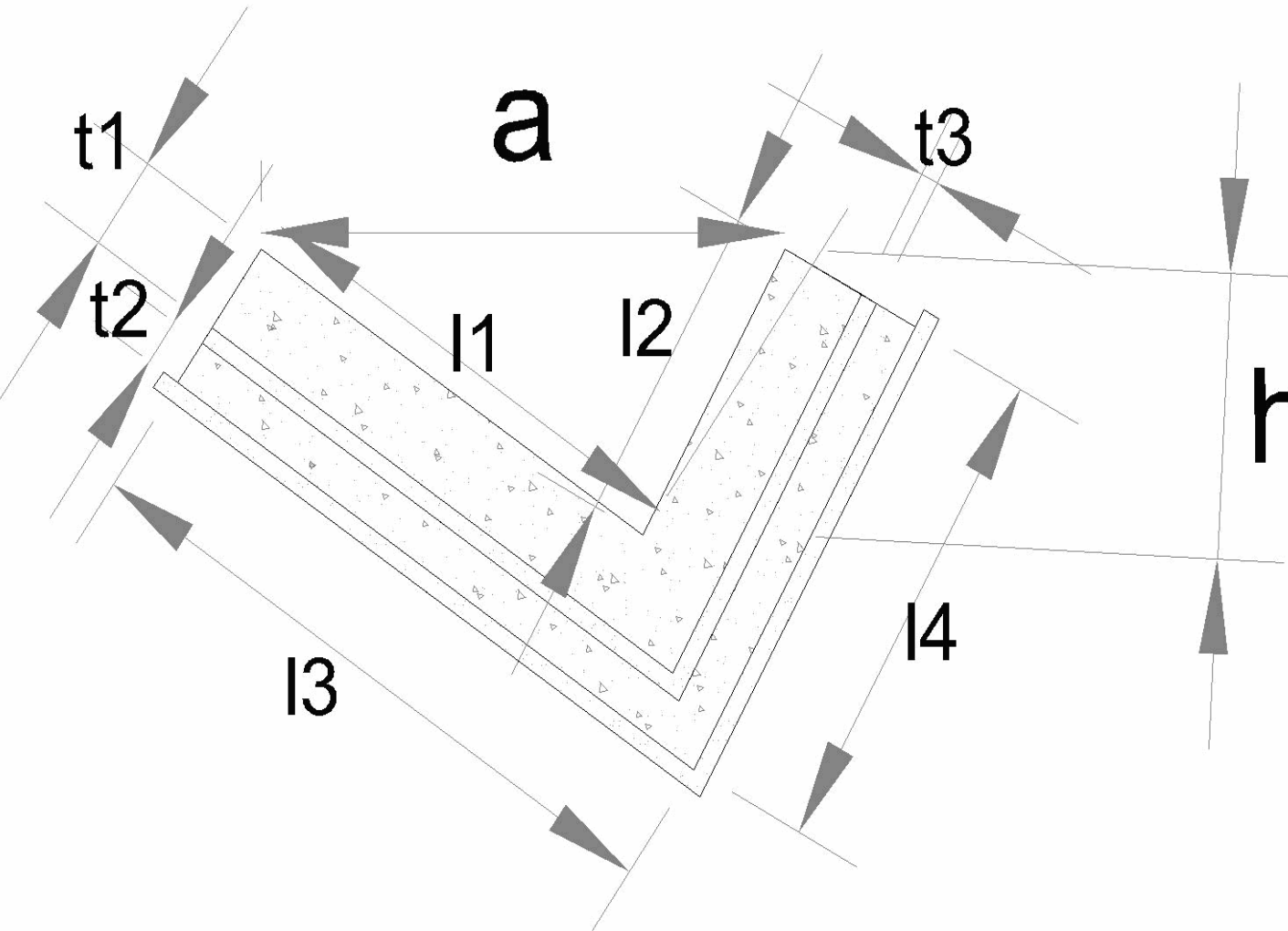
Variable Declaration

Triangular Shaped Drain

Sl No	Variable Description	Variable	Dimension	Unit
1	Ref Drawing	a	0.600	m
2	Ref Drawing	h	0.300	m
3	Ref Drawing	t1	0.100	m
4	Length	l	36557.000	m
5	Ref Drawing	t2	0.050	m
6	Ref Drawing	t3	0.025	m
7	Ref Drawing	l1	0.530	m
8	Ref Drawing	l2	0.342	
9	Ref Drawing	l3	0.712	
10	Ref Drawing	l4	0.530	
11	sand bed at bottom thickness	t4	0.025	



Variable Declaration



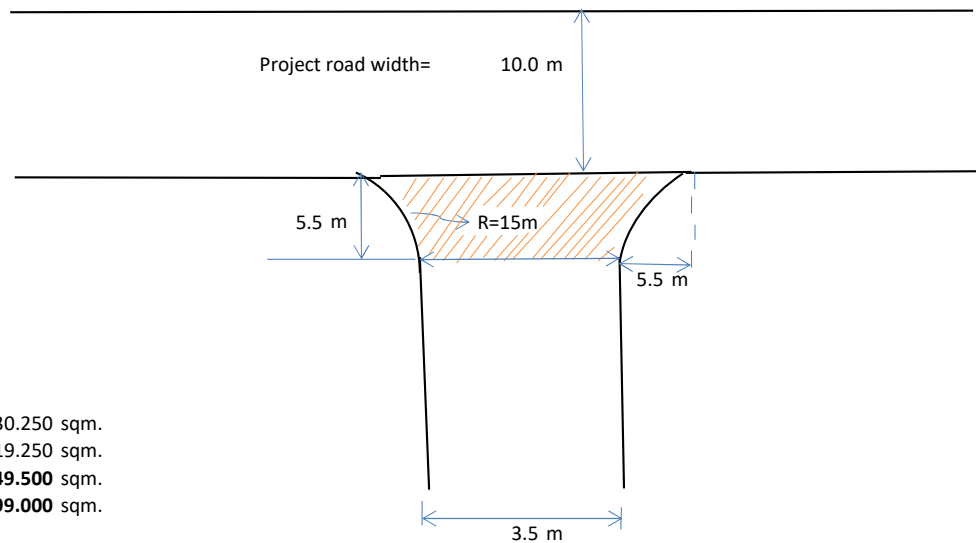
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Minor Junction

Sl No	Survey ch.	Design ch	Type
1	109.504	106.950	3-legged
2	121.454	118.320	4-legged
3	121.555	118.420	3-legged
4	131.655	128.105	3-legged
5	133.832	130.211	3-legged
6	134.381	130.775	3-legged
7	134.593	130.987	3-legged
8	134.625	131.018	3-legged

Pavement Layer	Thickness (m)
GSB =	0.200
WMM-II =	0.125
WMM-I =	0.125
DBM=	0.070
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	7	49.50	347							
4 legged	1	99.000	99							
		Total =	446							

HP Culvert in cross road= 32



Variable Declaration

Minor Junction

SI No	Variable Description	Variable	Dimension	Unit
1	Total_area	tot_area	446.000	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	11.690	



RR Masonry Retaining Wall

Chainage (m)		Length of CD (m)	Net Length (m)	TCS No.	Side	Avg. Height (m)
From	To					
101480	101530	0	50.0	TCS-4	Valley	2
101875	101950	5.3	69.7	TCS-4	Valley	2
102350	102400	0	50.0	TCS-4	Valley	2
102625	102700	0	75.0	TCS-11	Valley	2
103640	103700	0	60.0	TCS-4	Valley	2
104000	104050	2.6	47.4	TCS-4	Valley	2
104270	104320	0	50.0	TCS-4	Valley	2
107600	107680	0	80.0	TCS-4	Valley	2
107740	107790	2.7	47.3	TCS-4	Valley	2
109930	109980	2.6	47.4	TCS-4	Valley	2
110325	110400	2.6	72.4	TCS-4	Valley	2
113530	113625	3.84	91.2	TCS-4	Valley	2
113800	113900	2.7	97.3	TCS-4	Valley	2
115790	115850	0	60.0	TCS-4	Valley	2
116030	116085	2.6	52.4	TCS-4	Valley	2
116775	116825	0	50.0	TCS-4	Valley	2
121450	121500	0	50.0	TCS-4	Valley	2
122000	122050	0	50.0	TCS-4	Valley	3
122315	122435	2.6	117.4	TCS-4	Valley	2
122705	122805	0	100.0	TCS-4	Valley	2
124025	124125	0	100.0	TCS-4	Valley	2
125015	125065	0	50.0	TCS-4	Valley	2
126575	126625	0	50.0	TCS-4	Valley	2
128045	128195	2.7	147.3	TCS-4	Valley	2
128745	128775	2.7	27.3	TCS-4	Valley	2
129850	129925	3.96	71.0	TCS-4	Valley	2
Total =			1763			

Length of 2.0 m Retaining Wall =

1713 m

Length of 3.0 m Retaining Wall =

50 m



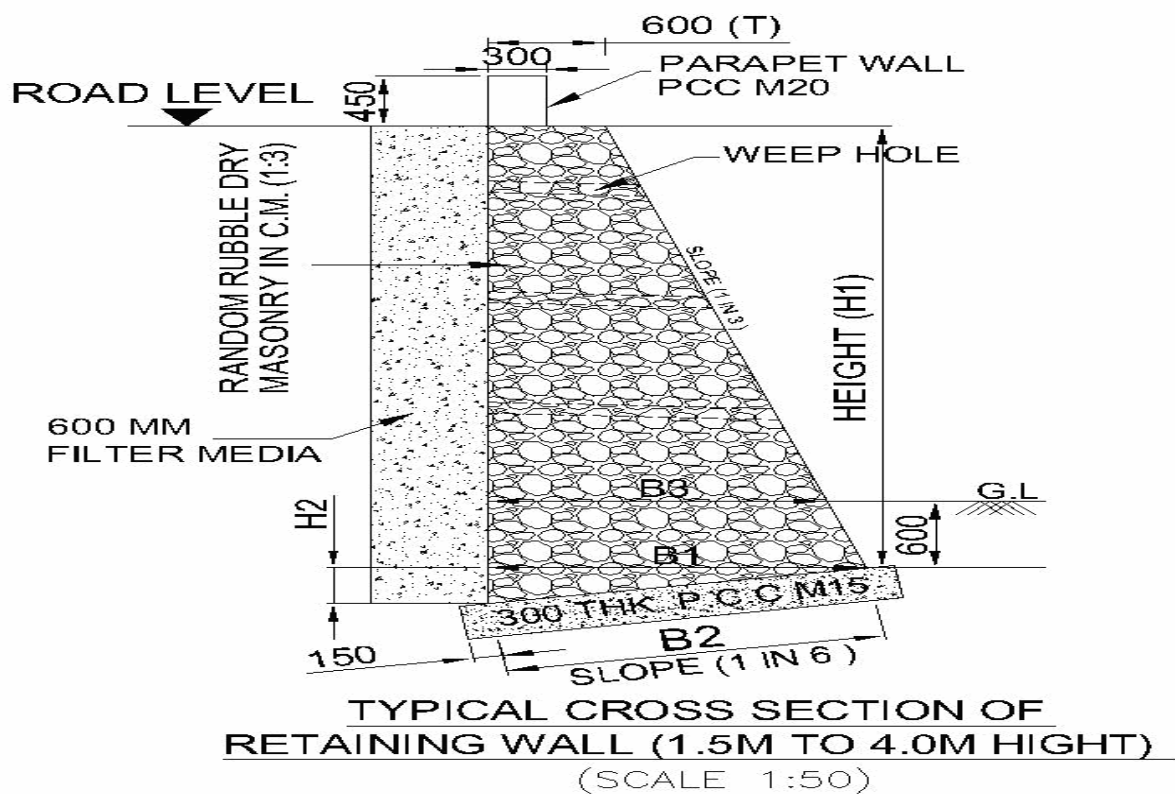
Variable Declaration

Retaining Wall 2.0m

Sl 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	1713.000	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



Signature

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KOLKATA
700 092

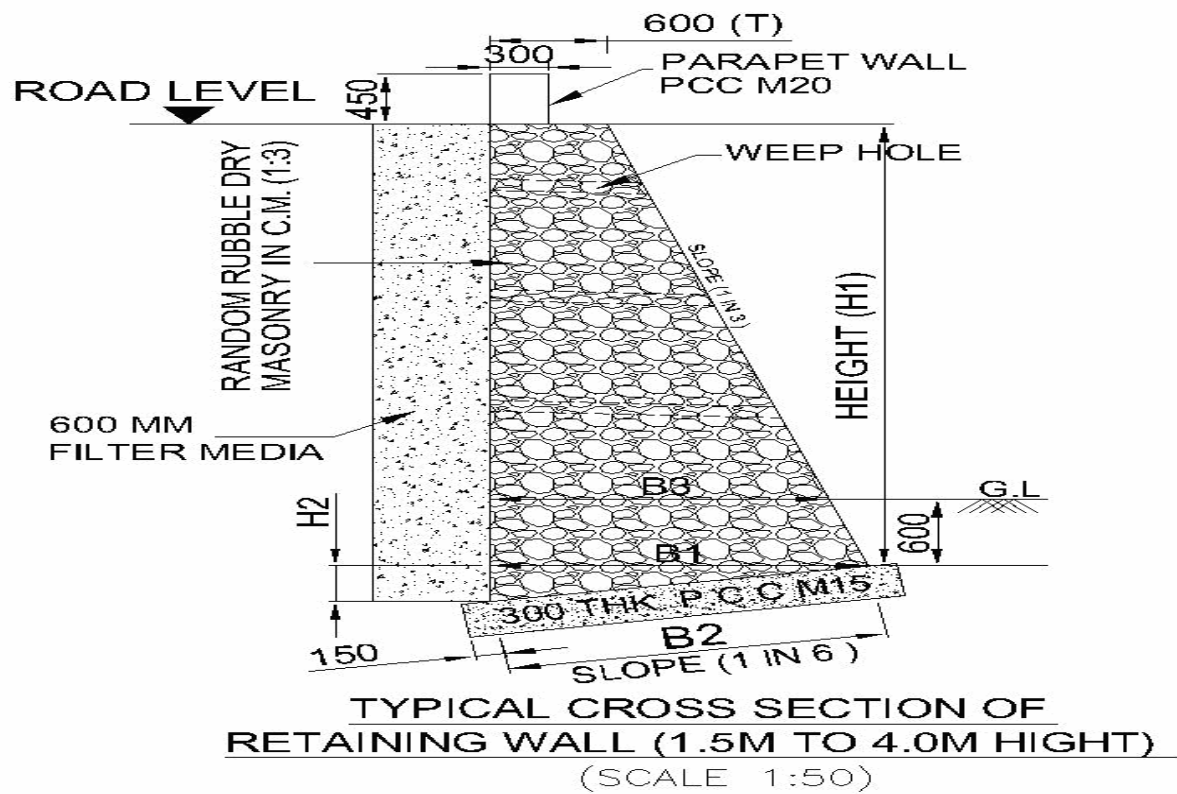
Variable Declaration

Retaining Wall 3.0m

Sl 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	50.000	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



Breast Wall						
Chainage (m)		Length of CD	Net Length (m)	TCS No.	Side	Avg. Height (m)
From	To					
101950	102000	0	50.0	TCS-5	Hill	2
102000	102125	2.6	122.4	TCS-5A	Hill	2
102625	102700	0	75.0	TCS-11	Hill	2
105025	105120	2.6	92.4	TCS-5	Hill	2
105120	105170	0	50.0	TCS-7A	Hill	2
105220	105270	0	50.0	TCS-7A	Hill	2
105725	105900	2.7	172.3	TCS-7B	Hill	2
106030	106100	0	70.0	TCS-7B	Hill	2
106675	106775	0	100.0	TCS-5	Hill	2
106775	106850	0	75.0	TCS-5A	Hill	2
110400	110475	0	75.0	TCS-7A	Hill	2
111125	111225	2.7	97.3	TCS-7A	Hill	2
111225	111280	0	55.0	TCS-5	Hill	2
111460	111800	5.3	334.7	TCS-7	Hill	2
112150	112550	3.84	396.2	TCS-5	Hill	2
113100	113480	5.2	374.8	TCS-5	Hill	2
113975	114150	0	175.0	TCS-5	Hill	2
114150	114225	0	75.0	TCS-5A	Hill	2
114880	114960	0	80.0	TCS-5A	Hill	2
114960	115010	2.6	47.4	TCS-7A	Hill	2
115900	115950	0	50.0	TCS-7A	Hill	2
116085	116280	0	195.0	TCS-7A	Hill	2
116325	116375	0	50.0	TCS-5A	Hill	2
116375	116465	0	90.0	TCS-5	Hill	2
116465	116515	0	50.0	TCS-5A	Hill	2
117000	117050	2.7	47.3	TCS-5	Hill	2
117050	117100	0	50.0	TCS-7A	Hill	2
117550	117780	2.6	227.4	TCS-5	Hill	2
117780	117825	0	45.0	TCS-5A	Hill	2
118460	118525	0	65.0	TCS-7B	Hill	2
118525	118575	2.6	47.4	TCS-7	Hill	2
118575	118630	0	55.0	TCS-7B	Hill	2
118630	118700	2.6	67.4	TCS-7	Hill	2
118700	118760	0	60.0	TCS-7B	Hill	2
118760	118820	0	60.0	TCS-7	Hill	2
118820	118870	0	50.0	TCS-7B	Hill	2
118870	118925	0	55.0	TCS-7	Hill	2
119000	119050	2.6	47.4	TCS-7B	Hill	2
119050	119100	2.6	47.4	TCS-7	Hill	2
119100	119150	0	50.0	TCS-7B	Hill	2
119150	119200	0	50.0	TCS-7	Hill	2
119250	119375	2.6	122.4	TCS-5A	Hill	2
119570	119790	2.7	217.3	TCS-7A	Hill	2
119790	120010	7.8	212.2	TCS-7	Hill	2
120300	120400	5.2	94.8	TCS-5A	Hill	2
121650	121750	0	100.0	TCS-7A	Hill	2
123425	123675	0	250.0	TCS-7A	Hill	2
124200	124250	0	50.0	TCS-7A	Hill	2
124375	124425	0	50.0	TCS-5	Hill	2
127205	127325	0	120.0	TCS-7A	Hill	2
127550	127700	0	150.0	TCS-7A	Hill	2
130465	130595	14.5	115.5	TCS-7A	Hill	2
Total =			5509			



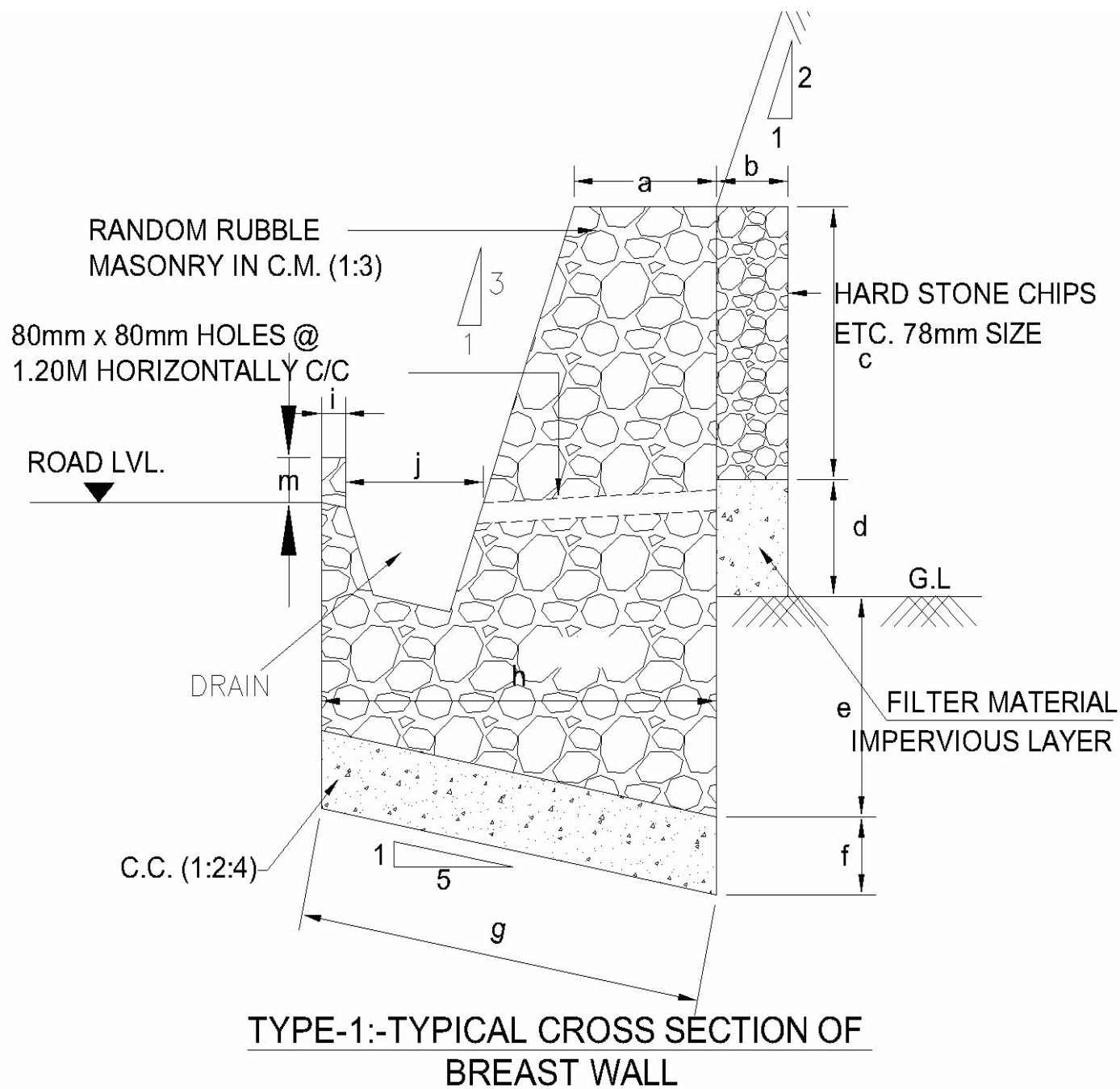
Variable Declaration

Breast Wall 2.0m 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	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	5509.000	m
12	Percentage of Earthwork in Ordinary Rock(20%)	p	0.200	
13	From Diagram	m	0.000	m



Variable Declaration



Signature: 

Stamp: 

BUSBAY and PASSENGER SHELTER

Chainage	Side	Name of Place
105+760	Both Side	Rengpang
118+820	Both Side	Nungba
130+840	Both Side	Kambiron

Total no= 6



Variable Declaration

Passenger Shelter

SI No	Variable Description	Variable	Dimension	Unit
1	No of Passenger Shelter	n	6.000	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	fcoll_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
37	Thickness of Roof slab	roof_thk	0.110	m

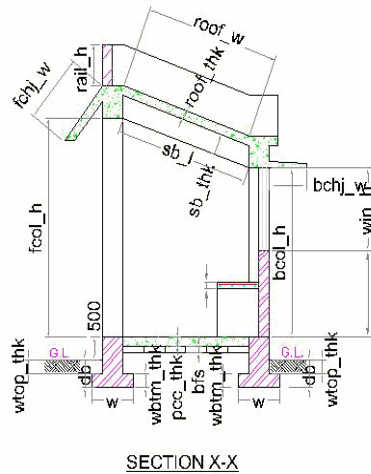
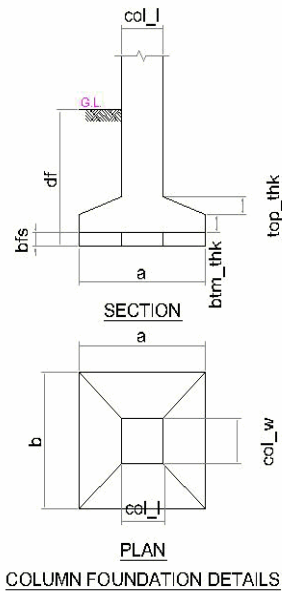
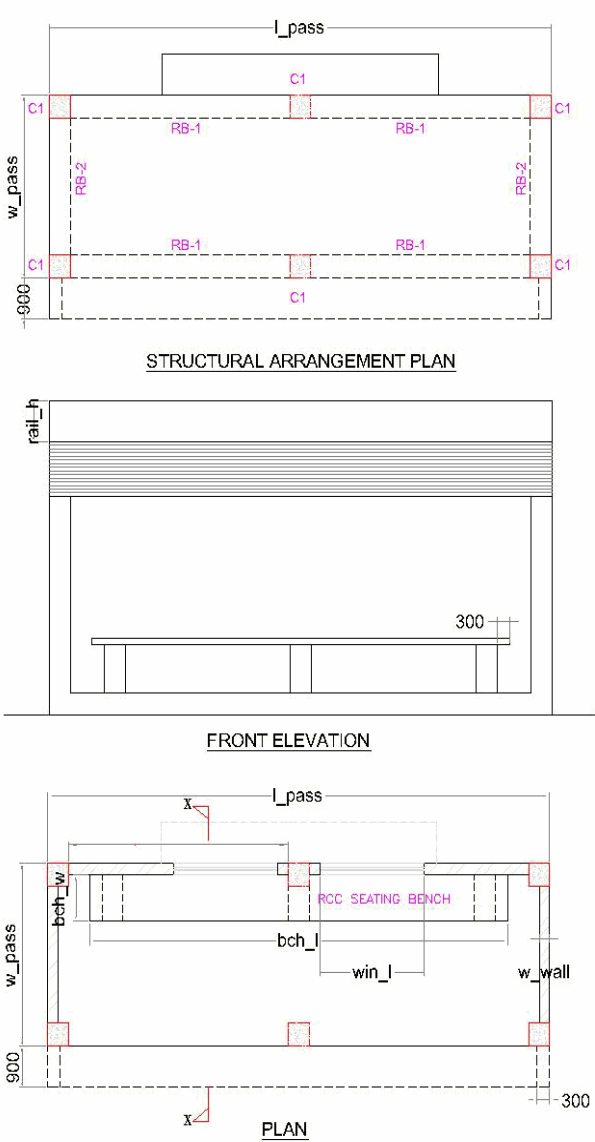


Variable Declaration

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
105+760	Both Side	Rengpang
118+820	Both Side	Nungba
130+840	Both Side	Kambiron

Total no= 6



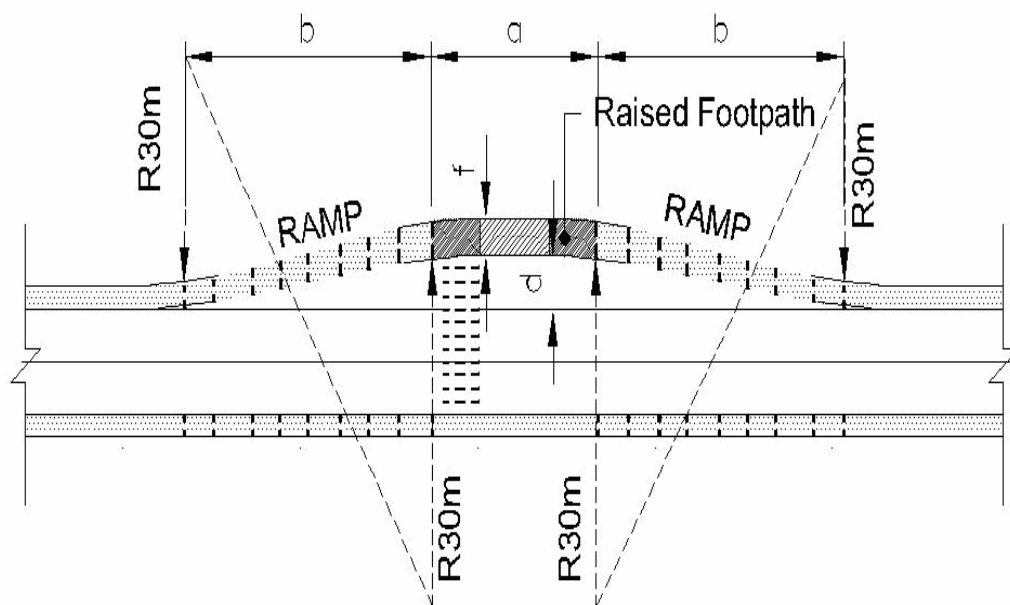
Variable Declaration

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	6.000	nos
8	Width Footpath	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	11.690	percentage



Variable Declaration



TYPICAL LAYOUT OF PICK-UP BUS STOP ON HILLY AREA

[Signature]



Traffic Signs and Other Appurtenance

Summary Of Traffic Signs

Total No of Street Light=	190	Nos	Bill No- 06, Sl. No- 10
Kilometer stones=	28	Nos	Bill No- 06, Sl. No- 2
5th Kilometer stones=	7	Nos	Bill No- 06, Sl. No- 1
Boundary Stones=	354	Nos	Bill No- 06, Sl. No- 3
Delineators (100 cm long and circular shaped)+Hazard marker =	3290	Nos	Bill No- 06, Sl. No- 8
Road Stud=	16491	Nos	Bill No- 06, Sl. No- 9
900 mm Octagonal	14	Nos	Bill No- 06, Sl. No- 8
600 mm circular	56	Nos	Bill No- 06, Sl. No- 5
900 mm Tringular	381	Nos	Bill No- 06, Sl. No- 5
800 mm x 600 mm rectangular	4	Nos	Bill No- 06, Sl. No- 6
Convex Mirror for Blind Curve	0	Nos	Bill No- 06, Sl. No- 16
Rumble Strip=	500	sqm	Bill No- 06, Sl. No- 13



Traffic sign Calculation

SI No	Type	IRC-67 2012 Specification	Dimension	Chainage / Location	No	Remarks
1	Right Hand Side Curve	fig 15.02	900 mm Tringular		135	@ 2per location
2	Left Hand Side Curve	fig 15.01	900 mm Tringular		135	@ 2per location
3	Zig-Zag Curve	fig 15.07	900 mm Tringular		7	@ 1per location
4	Reverse Curve	fig 15.06 & 15.05	900 mm Tringular		13	@ 1per location
5	Built-up area	fig 15.35	900 mm Tringular		18	@ 2per location
6	Side road	fig 15.09 & 15.10	900 mm Tringular		14	@ 2per location
7	Pedestain Crossing		900 mm Tringular	side road, bus bay	18	@ 2per location
8	Bus Stop	fig 17.35	800x600 rectangular		4	@ 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	732	@ 4 per structure
12	Stop Sign	fig 14.01	900 mm Octagonal	Side road & cross road	14	@ 1 per location
13	Speed limit	fig 14.37	600mm Cicular		56	@ 2per location
14	Rumble strip	fig 15.50	900 Tringular		25	@ 2per location in Built Up Area & @ 1per location in Side Road
15	Hair pin Bend	fig 15.03 & 15.04	900 mm Tringular		16	@ 2per location
16	Convex Mirror for Blind Curve				0	@ 1per location

SUMMARY			
90 cm equilateral triangle		381	nos
Stop Sign (90 cm high octagon)		14	nos
60 cm circular		56	nos
80 cm x 60 cm rectangular		4	nos
Direction Sign	<.0.9 sqm	0	nos
Direction Sign	>0.9 sqm	0	nos
Hazard Marker		732	nos
Convex Mirror for Blind Curve		0	nos
Rumble Strip		25	nos

Calculation of km Stone, Hectometer Stone and Boundary Stone

Item	Remarks	Nos
Kilometer stones	Total KM Stone- No. of 5th KM stone	28
5th Kilometer stones	(km stone 5th, 10th , 15th, 20th etc)	7
Boundary stones	(Total Lengthx5x2) + 2x1	354



CALCULATION FOR ROAD STUD

SL. No.	Description of section	START	END	Transition length	START CH.	END CH.	Length	Radius	Spacing on Curve (S)	Total On centreline (nos)	Total On shoulder (nos)
		CHAINAGE (m)	CHAINAGE (m)		Road Stud	Road stud					
		101325.145	101381.324	30	101275.145	101431.324	156.18	30	6	27	54
		101542.857	101607.577	15	101507.857	101642.577	134.72	30	6	23	46
		101652.748	101665.329	30	101602.748	101715.329	112.58	30	6	19	38
		101706.77	101734.222	0	101686.770	101754.222	67.45	180	6	12	24
		101769.751	101778.406	30	101719.751	101828.406	108.65	30	6	19	38
		101853.834	101862.59	30	101803.834	101912.59	108.76	30	6	19	38
		101913.048	101929.777	15	101878.048	101964.777	86.73	125	6	15	30
		101985.113	102031.548	40	101925.113	102091.548	166.43	50	6	28	56
		102168.579	102184.811	30	102118.579	102234.811	116.23	30	6	20	40
		102222.228	102253.694	0	102202.228	102273.694	71.47	180	6	12	24
		102294.452	102324.073	30	102244.452	102374.073	129.62	30	6	22	44
		102422.518	102430.432	30	102372.518	102480.432	107.91	30	6	18	36
		102491.336	102510.542	25	102446.336	102555.542	109.21	40	6	19	38
		102597.266	102651.497	30	102547.266	102701.497	154.23	30	6	26	52
		102710.104	102714.199	20	102670.104	102754.199	84.09	50	6	15	30
		102758.761	102775.54	20	102718.761	102815.54	96.78	50	6	17	34
		102817.446	102824.952	20	102777.446	102864.952	87.51	50	6	15	30
		102865.343	102892.375	20	102825.343	102932.375	107.03	50	6	18	36
		102944.196	103026.41	15	102909.196	103061.41	152.21	60	6	26	52
		103061.575	103077.68	20	103021.575	103117.68	96.10	50	6	17	34
		103132.978	103179.789	30	103082.978	103229.789	146.81	30	6	25	50
		103248.556	103265.605	35	103193.556	103320.605	127.05	60	6	22	44
		103398.542	103479.432	20	103358.542	103519.432	160.89	100	6	27	54
		103571.769	103656.107	30	103521.769	103706.107	184.34	37	6	31	62
		103828.704	103865.736	30	103778.704	103915.736	137.03	30	6	23	46
		103905.901	103943.474	0	103885.901	103963.474	77.57	300	6	13	26
		103982.36	104015.819	35	103927.360	104070.819	143.46	60	6	24	48
		104095.261	104107.163	30	104045.261	104157.163	111.90	30	6	19	38
		104164.402	104168.19	20	104124.402	104208.19	83.79	50	6	14	28
		104203.816	104256.008	15	104168.816	104291.008	122.19	30	6	21	42
		104364.372	104424.384	30	104314.372	104474.384	160.01	35	6	27	54
		104485.413	104488.289	30	104435.413	104538.289	102.88	30	6	18	36
		104549.718	104563.918	30	104499.718	104613.918	114.20	30	6	20	40
		104683.862	104685.899	25	104638.862	104730.899	92.04	40	6	16	32
		104711.627	104742.388	0	104691.627	104762.388	70.76	180	6	12	24
		104780.151	104808.796	30	104730.151	104858.796	128.65	30	6	22	44
		104854.34	104862.512	0	104834.340	104882.512	48.17	180	6	9	18
		104897.505	104920.614	25	104852.505	104965.614	113.11	40	6	19	38
		104965.673	104977.861	20	104925.673	105017.861	92.19	50	6	16	32
		105058.879	105064.5	30	105008.879	105114.5	105.62	30	6	18	36
		105109.207	105137.324	0	105089.207	105157.324	68.12	180	6	12	24
		105173.648	105181.645	30	105123.648	105231.645	108.00	30	6	18	36
		105382.028	105413.519	40	105322.028	105473.519	151.49	50	6	26	52
		105498.721	105506.852	30	105448.721	105556.852	108.13	30	6	19	38
		105566.872	105577.425	30	105516.872	105627.425	110.55	70	6	19	38
		105649.111	105694.296	40	105589.111	105754.296	165.18	50	6	28	56
		105815.828	105957.936	35	105760.828	106012.936	252.11	60	6	43	86
		106139.349	106218.407	40	106079.349	106278.407	199.06	50	6	34	68
		106352.813	106362.026	30	106302.813	106412.026	109.21	30	6	19	38
		106446.082	106496.947	30	106396.082	106546.947	150.87	30	6	26	52
		106570.787	106608.282	20	106530.787	106648.282	117.50	20	6	20	40

SL. No.	Description of section	START	END	Transition length	START CH.	END CH.	Length	Radius	Spacing on Curve (S)	Total On centreline (nos)	Total On shoulder (nos)
		CHAINAGE (m)	CHAINAGE (m)		Road Stud	Road stud					
		106751.935	106777.068	40	106691.935	106837.068	145.13	50	6	25	50
		106953.39	107000.262	30	106903.390	107050.262	146.87	30	6	25	50
		107064.759	107081.032	25	107019.759	107126.032	106.27	40	6	18	36
		107132.488	107148.102	25	107087.488	107193.102	105.61	80	6	18	36
		107229.43	107283.008	30	107179.430	107333.008	153.58	30	6	26	52
		107335.001	107344.824	20	107295.001	107384.824	89.82	50	6	15	30
		107393.216	107396.345	25	107348.216	107441.345	93.13	40	6	16	32
		107449.399	107458.973	25	107404.399	107503.973	99.57	40	6	17	34
		107496.156	107518.655	0	107476.156	107538.655	62.50	300	6	11	22
		107561.914	107592.699	40	107501.914	107652.699	150.78	50	6	26	52
		107659.048	107669.682	25	107614.048	107714.682	100.63	80	6	17	34
		107733.07	107780.585	35	107678.070	107835.585	157.51	60	6	27	54
		107835.944	107844.558	20	107795.944	107884.558	88.61	100	6	15	30
		107921.281	107941.105	15	107886.281	107976.105	89.82	60	6	15	30
		107992.181	108003.352	30	107942.181	108053.352	111.17	30	6	19	38
		108051.482	108139.444	15	108016.482	108174.444	157.96	60	6	27	54
		108194.911	108227.495	30	108144.911	108277.495	132.58	30	6	23	46
		108257.784	108264.011	0	108237.784	108284.011	46.23	180	6	8	16
		108304.984	108343.442	40	108244.984	108403.442	158.46	50	6	27	54
		108531.687	108558.951	15	108496.687	108593.951	97.26	125	6	17	34
		108595.455	108636.478	20	108555.455	108676.478	121.02	50	6	21	42
		108681.663	108694.344	25	108636.663	108739.344	102.68	40	6	18	36
		108745.402	108810.512	25	108700.402	108855.512	155.11	40	6	26	52
		108932.248	108958.003	30	108882.248	109008.003	125.75	70	6	21	42
		109069.48	109150.329	25	109024.480	109195.329	170.85	45	6	29	58
		109211.834	109237.349	35	109156.834	109292.349	135.51	60	6	23	46
		109396.964	109436.632	20	109356.964	109476.632	119.67	20	6	20	40
		109517.731	109560.483	20	109477.731	109600.483	122.75	50	6	21	42
		109581.644	109600.277	0	109561.644	109620.277	58.63	180	6	10	20
		109630.73	109645.825	30	109580.730	109695.825	115.10	30	6	20	40
		109764.786	109825.1	30	109714.786	109875.1	160.31	30	6	27	54
		109891.261	109915.611	30	109841.261	109965.611	124.35	30	6	21	42
		109962.375	109976.274	15	109927.375	110011.274	83.90	60	6	14	28
		110012.247	110142.253	20	109972.247	110182.253	210.01	100	6	36	72
		110205.325	110234.176	40	110145.325	110294.176	148.85	50	6	25	50
		110391.862	110439.044	25	110346.862	110484.044	137.18	40	6	23	46
		110497.202	110532.17	30	110447.202	110582.17	134.97	30	6	23	46
		110612.323	110642.371	30	110562.323	110692.371	130.05	30	6	22	44
		110772.963	110826.335	30	110722.963	110876.335	153.37	30	6	26	52
		110887.119	110917.667	30	110837.119	110967.667	130.55	30	6	22	44
		111016.244	111024.471	15	110981.244	111059.471	78.23	100	6	14	28
		111071.265	111082.336	30	111021.265	111132.336	111.07	30	6	19	38
		111129.55	111180.964	15	111094.550	111215.964	121.41	30	6	21	42
		111226.193	111235.882	30	111176.193	111285.882	109.69	30	6	19	38
		111286.687	111305.551	20	111246.687	111345.551	98.86	50	6	17	34
		111388.215	111421.487	15	111353.215	111456.487	103.27	30	6	18	36
		111452.251	111481.968	15	111417.251	111516.968	99.72	30	6	17	34
		111512.247	111528.453	15	111477.247	111563.453	86.21	60	6	15	30
		111586.705	111608.963	30	111536.705	111658.963	122.26	30	6	21	42
		111654.809	111675.485	15	111619.809	111710.485	90.68	60	6	16	32
		111721.141	111727.928	30	111671.141	111777.928	106.79	30	6	18	36
		111789.563	111796.894	20	111749.563	111836.894	87.33	100	6	15	30
		111837.047	111869.094	20	111797.047	111909.094	112.05	100	6	19	38
		111972.92	112029.168	30	111922.920	112079.168	156.25	70	6	27	54

SL. No.	Description of section	START	END	Transition length	START CH.	END CH.	Length	Radius	Spacing on Curve (S)	Total On centreline (nos)	Total On shoulder (nos)
		CHAINAGE (m)	CHAINAGE (m)		Road Stud	Road stud					
		112089.681	112092.628	30	112039.681	112142.628	102.95	30	6	18	36
		112148.103	112160.12	25	112103.103	112205.12	102.02	40	6	18	36
		112200.788	112213.121	0	112180.788	112233.121	52.33	300	6	9	18
		112282.81	112307.62	30	112232.810	112357.62	124.81	30	6	21	42
		112413.947	112456.567	40	112353.947	112516.567	162.62	50	6	28	56
		112564.826	112567.449	30	112514.826	112617.449	102.62	30	6	18	36
		112599.015	112627.79	0	112579.015	112647.79	68.77	180	6	12	24
		112657.861	112679.702	30	112607.861	112729.702	121.84	30	6	21	42
		112744.641	112788.205	30	112694.641	112838.205	143.56	30	6	24	48
		112904.994	112910.711	25	112859.994	112955.711	95.72	40	6	16	32
		112962.203	112965.994	25	112917.203	113010.994	93.79	40	6	16	32
		113022.467	113042.847	30	112972.467	113092.847	120.38	30	6	21	42
		113093.262	113101.472	20	113053.262	113141.472	88.21	50	6	15	30
		113157.072	113158.951	25	113112.072	113203.951	91.88	40	6	16	32
		113215.491	113235.172	30	113165.491	113285.172	119.68	30	6	20	40
		113271.395	113307.623	0	113251.395	113327.623	76.23	180	6	13	26
		113359.477	113429.353	20	113319.477	113469.353	149.88	50	6	25	50
		113475.547	113531.621	25	113430.547	113576.621	146.07	40	6	25	50
		113581.395	113623.922	20	113541.395	113663.922	122.53	100	6	21	42
		113684.713	113712.003	30	113634.713	113762.003	127.29	30	6	22	44
		113831.477	113879.142	25	113786.477	113924.142	137.67	40	6	23	46
		113927.856	113931.531	20	113887.856	113971.531	83.68	50	6	14	28
		113971.359	113992.447	15	113936.359	114027.447	91.09	60	6	16	32
		114048.47	114077.822	30	113998.470	114127.822	129.35	30	6	22	44
		114297.092	114319.848	30	114247.092	114369.848	122.76	70	6	21	42
		114371.561	114378.375	20	114331.561	114418.375	86.81	100	6	15	30
		114442.101	114446.222	40	114382.101	114506.222	124.12	50	6	21	42
		114586.908	114612.207	30	114536.908	114662.207	125.30	70	6	21	42
		114813.783	114823.39	40	114753.783	114883.39	129.61	50	6	22	44
		114904.505	114991.631	35	114849.505	115046.631	197.13	125	6	33	66
		115218.802	115329.064	30	115168.802	115379.064	210.26	150	6	36	72
		115430.724	115494.068	20	115390.724	115534.068	143.34	200	6	24	48
		115725.155	115742.9	40	115665.155	115802.9	137.74	50	6	23	46
		115932.668	115941.646	30	115882.668	115991.646	108.98	30	6	19	38
		115995.143	116050.695	15	115960.143	116085.695	125.55	60	6	21	42
		116086.947	116113.284	20	116046.947	116153.284	106.34	20	6	18	36
		116161.956	116165.006	20	116121.956	116205.006	83.05	50	6	14	28
		116208.75	116223.684	20	116168.750	116263.684	94.93	50	6	16	32
		116285.072	116329.426	30	116235.072	116379.426	144.35	70	6	25	50
		116467.783	116491.996	15	116432.783	116526.996	94.21	125	6	16	32
		116535.59	116577.139	25	116490.590	116622.139	131.55	80	6	22	44
		116708.193	116733.699	30	116658.193	116783.699	125.51	30	6	21	42
		116801.27	116822.501	35	116746.270	116877.501	131.23	60	6	22	44
		116875.97	116898.515	15	116840.970	116933.515	92.54	60	6	16	32
		116944.127	116951.235	30	116894.127	117001.235	107.11	30	6	18	36
		117007.196	117033.256	25	116962.196	117078.256	116.06	40	6	20	40
		117086.426	117121.238	25	117041.426	117166.238	124.81	80	6	21	42
		117217.34	117221.045	25	117172.340	117266.045	93.71	80	6	16	32
		117276.236	117303.976	30	117226.236	117353.976	127.74	30	6	22	44
		117449.793	117459.435	40	117389.793	117519.435	129.64	50	6	22	44
		117532.035	117562.788	30	117482.035	117612.788	130.75	70	6	22	44
		117635.23	117662.18	15	117600.230	117697.18	96.95	125	6	17	34
		117978.619	118105.235	30	117928.619	118155.235	226.62	70	6	38	76
		118192.199	118229.752	40	118132.199	118289.752	157.55	50	6	27	54

SL. No.	Description of section	START	END	Transition length	START CH.	END CH.	Length	Radius	Spacing on Curve (S)	Total On centreline (nos)	Total On shoulder (nos)
		CHAINAGE (m)	CHAINAGE (m)		Road Stud	Road stud					
		118270.391	118275.601	40	118210.391	118335.601	125.21	300	6	21	42
		118317.389	118341.862	40	118257.389	118401.862	144.47	50	6	25	50
		118451.239	118493.946	15	118416.239	118528.946	112.71	125	6	19	38
		118618.493	118672.655	40	118558.493	118732.655	174.16	50	6	30	60
		118748.367	118764.427	35	118693.367	118819.427	126.06	60	6	22	44
		118867.097	118877.586	30	118817.097	118927.586	110.49	70	6	19	38
		118924.391	119050.192	15	118889.391	119085.192	195.80	60	6	33	66
		119095.791	119114.04	30	119045.791	119164.04	118.25	30	6	20	40
		119185.137	119197.815	35	119130.137	119252.815	122.68	60	6	21	42
		119283.564	119342.604	30	119233.564	119392.604	159.04	30	6	27	54
		119442.602	119457.696	25	119397.602	119502.696	105.09	40	6	18	36
		119500.438	119522.386	15	119465.438	119557.386	91.95	60	6	16	32
		119574.047	119609.05	30	119524.047	119659.05	135.00	30	6	23	46
		119664.425	119676.925	25	119619.425	119721.925	102.50	40	6	18	36
		119801.362	119893.825	40	119741.362	119953.825	212.46	50	6	36	72
		119999.983	120070.017	25	119954.983	120115.017	160.03	40	6	27	54
		120129.788	120175.692	20	120089.788	120215.692	125.90	23	6	21	42
		120228.617	120313.856	20	120188.617	120353.856	165.24	50	6	28	56
		120366.672	120378.781	25	120321.672	120423.781	102.11	40	6	18	36
		120437.11	120448.172	25	120392.110	120493.172	101.06	40	6	17	34
		120495.441	120506.847	20	120455.441	120546.847	91.41	50	6	16	32
		120558.936	120602.22	30	120508.936	120652.22	143.28	30	6	24	48
		120683.866	120722.555	20	120643.866	120762.555	118.69	100	6	20	40
		120778.729	120788.282	35	120723.729	120843.282	119.55	60	6	20	40
		120891.529	120900.531	30	120841.529	120950.531	109.00	150	6	19	38
		120974.617	120986.629	30	120924.617	121036.629	112.01	150	6	19	38
		121169.278	121194.535	30	121119.278	121244.535	125.26	150	6	21	42
		121294.279	121303.039	25	121249.279	121348.039	98.76	80	6	17	34
		121376.968	121438.917	30	121326.968	121488.917	161.95	30	6	27	54
		121559.376	121609.631	30	121509.376	121659.631	150.25	30	6	26	52
		121756.748	121777.054	30	121706.748	121827.054	120.31	30	6	21	42
		121823.395	121861.546	15	121788.395	121896.546	108.15	60	6	19	38
		121892.952	121965.93	15	121857.952	122000.93	142.98	125	6	24	48
1	Horizontal curve ::	122018.627	122054.839	15	121983.627	122089.839	106.21	125	6	18	36
		122173.258	122203.865	15	122138.258	122238.865	100.61	125	6	17	34
		122260.786	122274.81	20	122220.786	122314.81	94.02	100	6	16	32
		122359.948	122418.558	25	122314.948	122463.558	148.61	40	6	25	50
		122540.104	122561.011	40	122480.104	122621.011	140.91	50	6	24	48
		122628.238	122662.434	25	122583.238	122707.434	124.20	80	6	21	42
		122742.849	122788.89	30	122692.849	122838.89	146.04	150	6	25	50
		122901.69	122936.958	35	122846.690	122991.958	145.27	60	6	25	50
		123153.294	123207.214	40	123093.294	123267.214	173.92	50	6	29	58
		123309.184	123315.542	40	123249.184	123375.542	126.36	50	6	22	44
		123429.66	123474.225	30	123379.660	123524.225	144.57	30	6	25	50
		123641.348	123738.764	40	123581.348	123798.764	217.42	55	6	37	74
		123838.41	123878.249	20	123798.410	123918.249	119.84	20	6	20	40
		123956.039	123992.204	20	123916.039	124032.204	116.16	20	6	20	40
		124102.864	124153.576	40	124042.864	124213.576	170.71	50	6	29	58
		124253.28	124263.989	25	124208.280	124308.989	100.71	40	6	17	34
		124322.118	124350.356	30	124272.118	124400.356	128.24	30	6	22	44
		124467.609	124479.161	30	124417.609	124529.161	111.55	30	6	19	38
		124530.058	124544.095	15	124495.058	124579.095	84.04	60	6	15	30
		124599.699	124644.258	25	124554.699	124689.258	134.56	40	6	23	46
	Curve radii 751 to 2000m & critical sections, spacing =18m	124690.991	124702.126	20	124650.991	124742.126	91.14	50	6	16	32
		124801.984	124815.786	25	124756.984	124860.786	103.80	40	6	18	36

SL. No.	Description of section	START	END	Transition length	START CH.	END CH.	Length	Radius	Spacing on Curve (S)	Total On centreline (nos)	Total On shoulder (nos)
		CHAINAGE (m)	CHAINAGE (m)		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	124886.502	124962.692	35	124831.502	125017.692	186.19	125	6	32	64
		125071.306	125079.391	15	125036.306	125114.391	78.09	80	6	14	28
		125115.931	125124.691	20	125075.931	125164.691	88.76	50	6	15	30
		125171.201	125173.668	25	125126.201	125218.668	92.47	40	6	16	32
		125223.878	125234.298	25	125178.878	125279.298	100.42	80	6	17	34
		125289.303	125336.256	25	125244.303	125381.256	136.95	80	6	23	46
		125418.41	125437.342	35	125363.410	125492.342	128.93	125	6	22	44
		125552.473	125558.892	25	125507.473	125603.892	96.42	170	6	17	34
		125603.386	125656.556	0	125583.386	125676.556	93.17	300	6	16	32
		125806.124	125819.383	35	125751.124	125874.383	123.26	60	6	21	42
		125900.921	125913.037	30	125850.921	125963.037	112.12	70	6	19	38
		125967.334	126031.798	0	125947.334	126051.798	104.46	300	6	18	36
		126111.993	126115.457	15	126076.993	126150.457	73.46	80	6	13	26
		126158.283	126166.716	25	126113.283	126211.716	98.43	40	6	17	34
		126217.543	126223.757	25	126172.543	126268.757	96.21	40	6	17	34
		126265.254	126286.817	15	126230.254	126321.817	91.56	80	6	16	32
		126349.331	126381.155	25	126304.331	126426.155	121.82	40	6	21	42
		126432.975	126475.28	20	126392.975	126515.28	122.30	20	6	21	42
		126514.915	126558.367	0	126494.915	126578.367	83.45	180	6	14	28
		126578.458	126580.642	15	126543.458	126615.642	72.18	110	6	13	26
		126621.677	126637.547	25	126576.677	126682.547	105.87	40	6	18	36
		126681.953	126805.636	15	126646.953	126840.636	193.68	125	6	33	66
		127566.182	127685.149	20	127526.182	127725.149	198.97	100	6	34	68
		127723.803	127732.331	0	127703.803	127752.331	48.53	300	6	9	18
		127772.839	127789.213	30	127722.839	127839.213	116.37	30	6	20	40
		127919.97	127960.727	20	127879.970	128000.727	120.76	20	6	21	42
		128013.455	128042.275	30	127963.455	128092.275	128.82	30	6	22	44
		128202.071	128231.451	30	128152.071	128281.451	129.38	30	6	22	44
		128336.933	128379.548	30	128286.933	128429.548	142.61	30	6	24	48
		128458.919	128503.174	40	128398.919	128563.174	164.26	50	6	28	56
		128637.623	128659.342	25	128592.623	128704.342	111.72	80	6	19	38
		128724.113	128735.838	30	128674.113	128785.838	111.73	30	6	19	38
		128924.374	128964.473	40	128864.374	129024.473	160.10	50	6	27	54
		129127.689	129190.116	30	129077.689	129240.116	162.43	30	6	28	56
		129280.736	129332.677	30	129230.736	129382.677	151.94	30	6	26	52
129394.093	129420.507	30	129344.093	129470.507	126.41	30	6	22	44		
129542.083	129552.009	20	129502.083	129592.009	89.93	50	6	15	30		
129617.286	129634.574	30	129567.286	129684.574	117.29	30	6	20	40		
129719.566	129731.228	30	129669.566	129781.228	111.66	30	6	19	38		
129790.08	129802.128	25	129745.080	129847.128	102.05	40	6	18	36		
129848.748	129892.775	15	129813.748	129927.775	114.03	125	6	20	40		
130052.67	130082.482	0	130032.670	130102.482	69.81	300	6	12	24		
1	Horizontal curve :: Curve radii upto 450 , spacing =6m. Curve radii 451 to 750 , spacing =9m. Curve radii 751 to 2000m & critical sections	130117.892	130133.331	25	130072.892	130178.331	105.44	80	6	18	36
		130204.427	130214.628	25	130159.427	130259.628	100.20	40	6	17	34
		130362.92	130379.791	25	130317.920	130424.791	106.87	40	6	18	36
		130443.992	130493.042	25	130398.992	130538.042	139.05	40	6	24	48
		130628.467	130646.823	30	130578.467	130696.823	118.36	30	6	20	40
		130838.732	130882.938	15	130803.732	130917.938	114.21	125	6	20	40
		130930.621	130977.268	30	130880.621	131027.268	146.65	70	6	25	50
		131028.95	131120.601	20	130988.950	131160.601	171.65	100	6	29	58
Total=										5489	11002

Total no. of Road stud = 16491 nos.

CALCULATION FOR DELINEATOR														
In Horizontal Curves (radius 300 m or less)														
HIP / CURVE NO.	ELEMENT	START	END	RADIUS (m)	Spacing on Curve (s)	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
		CHAINAGE (m)	CHAINAGE (m)											
7	Arc	101325.145	101381.324	30	6	56.179	9	5	1	1	1	1	1	1
9	Arc	101542.857	101607.577	30	6	64.720	11	5	1	1	1	0	1	0
10	Arc	101652.748	101665.329	30	6	12.581	2	1	1	1	1	0	0	0
11	Arc	101706.77	101734.222	180	12	27.452	2	1	0	0	1	0	0	0
18	Arc	101769.751	101778.406	30	6	8.655	1	1	1	1	1	1	0	0
19	Arc	101853.834	101862.59	30	6	8.756	1	1	1	1	1	0	0	0
20	Arc	101913.048	101929.777	125	12	16.729	1	1	1	1	1	0	0	0
21	Arc	101985.113	102031.548	50	8	46.435	6	3	1	1	1	1	0	0
22	Arc	102168.579	102184.811	30	6	16.232	3	1	1	1	1	0	1	0
23	Arc	102222.228	102253.694	180	12	31.466	3	1	0	0	1	0	0	0
24	Arc	102294.452	102324.073	30	6	29.621	5	2	1	1	1	1	0	0
25	Arc	102422.518	102430.432	30	6	7.914	1	1	1	1	1	1	0	0
26	Arc	102491.336	102510.542	40	6	19.206	3	2	1	1	1	1	0	0
27	Arc	102597.266	102651.497	30	6	54.231	9	5	1	1	1	1	0	0
28	Arc	102710.104	102714.199	50	8	4.095	1	0	1	1	1	0	0	0
29	Arc	102758.761	102775.54	50	8	16.779	2	1	1	1	1	0	0	0
30	Arc	102817.446	102824.952	50	8	7.506	1	0	1	1	1	0	0	0
31	Arc	102865.343	102892.375	50	8	27.032	3	2	1	1	1	0	0	0
32	Arc	102944.196	103026.41	60	8	82.214	10	5	1	1	1	0	0	0
33	Arc	103061.575	103077.68	50	8	16.105	2	1	1	1	1	0	0	0
34	Arc	103132.978	103179.789	30	6	46.811	8	4	1	1	1	1	0	0
35	Arc	103248.556	103265.605	60	8	17.049	2	1	1	1	1	1	0	0
36	Arc	103398.542	103479.432	100	12	80.890	7	3	1	1	1	0	0	0
37	Arc	103571.769	103656.107	37	6	84.338	14	7	1	1	1	1	0	1
38	Arc	103828.704	103865.736	30	6	37.032	6	3	1	1	1	0	1	0
39	Arc	103905.901	103943.474	300	25	37.573	2	1	0	0	1	0	0	0
40	Arc	103982.36	104015.819	60	8	33.459	4	2	1	1	1	1	0	0
41	Arc	104095.261	104107.163	30	6	11.902	2	1	1	1	1	0	0	0
42	Arc	104164.402	104168.19	50	8	3.788	1	0	1	1	1	0	0	0
43	Arc	104203.816	104256.008	30	6	52.192	9	4	1	1	1	1	0	0

HIP / CURVE NO.	ELEMENT	START	END	RADIUS (m)	Spacing on Curve (S)	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
		CHAINAGE (m)	CHAINAGE (m)											
44	Arc	104364.372	104424.384	35	6	60.012	10	5	1	1	1	1	0	0
45	Arc	104485.413	104488.289	30	6	2.876	1	0	1	1	1	1	0	0
46	Arc	104549.718	104563.918	30	6	14.200	2	1	1	1	1	1	0	0
47	Arc	104683.862	104685.899	40	6	2.037	1	0	1	1	1	0	0	0
48	Arc	104711.627	104742.388	180	12	30.761	3	1	0	0	1	0	0	0
49	Arc	104780.151	104808.796	30	6	28.645	5	2	1	1	1	0	0	0
50	Arc	104854.34	104862.512	180	12	8.172	1	0	1	0	1	0	0	0
51	Arc	104897.505	104920.614	40	6	23.109	4	2	1	1	1	0	0	0
52	Arc	104965.673	104977.861	50	8	12.188	2	1	1	1	1	1	0	0
53	Arc	105058.879	105064.5	30	6	5.621	1	0	1	1	1	0	0	0
54	Arc	105109.207	105137.324	180	12	28.117	2	1	1	0	1	0	0	0
55	Arc	105173.648	105181.645	30	6	7.997	1	1	1	1	1	1	0	1
56	Arc	105382.028	105413.519	50	8	31.491	4	2	1	1	1	1	1	0
57	Arc	105498.721	105506.852	30	6	8.131	1	1	1	1	1	1	0	0
58	Arc	105566.872	105577.425	70	8	10.553	1	1	1	1	1	0	0	0
59	Arc	105649.111	105694.296	50	8	45.185	6	3	1	1	1	1	0	0
60	Arc	105815.828	105957.936	60	8	142.108	18	9	1	1	1	1	0	1
61	Arc	106139.349	106218.407	50	8	79.058	10	5	1	1	1	1	1	0
62	Arc	106352.813	106362.026	30	6	9.213	2	1	1	1	1	1	1	0
63	Arc	106446.082	106496.947	30	6	50.865	8	4	1	1	1	1	0	0
64	Arc	106570.787	106608.282	20	6	37.495	6	3	1	1	1	1	0	1
65	Arc	106751.935	106777.068	50	8	25.133	3	2	1	1	1	1	0	1
66	Arc	106953.39	107000.262	30	6	46.872	8	4	1	1	1	1	1	0
67	Arc	107064.759	107081.032	40	6	16.273	3	1	1	1	1	0	0	0
68	Arc	107132.488	107148.102	80	8	15.614	2	1	1	1	1	1	0	0
69	Arc	107229.43	107283.008	30	6	53.578	9	4	1	1	1	0	0	0
70	Arc	107335.001	107344.824	50	8	9.823	1	1	1	1	1	0	0	0
71	Arc	107393.216	107396.345	40	6	3.129	1	0	1	1	1	0	0	0
72	Arc	107449.399	107458.973	40	6	9.574	2	1	1	1	1	0	0	0
73	Arc	107496.156	107518.655	300	25	22.499	1	0	0	0	1	0	0	0
74	Arc	107561.914	107592.699	50	8	30.785	4	2	1	1	1	0	0	0
75	Arc	107659.048	107669.682	80	8	10.634	1	1	1	1	1	0	0	0
76	Arc	107733.07	107780.585	60	8	47.515	6	3	1	1	1	0	0	0
77	Arc	107835.944	107844.558	100	12	8.614	1	0	1	1	1	0	0	0
78	Arc	107921.281	107941.105	60	8	19.824	2	1	1	1	1	0	0	0

HIP / CURVE NO.	ELEMENT	START	END	RADIUS (m)	Spacing on Curve (S)	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
		CHAINAGE (m)	CHAINAGE (m)											
79	Arc	107992.181	108003.352	30	6	11.171	2	1	1	1	1	0	0	0
80	Arc	108051.482	108139.444	60	8	87.962	11	5	1	1	1	0	0	0
81	Arc	108194.911	108227.495	30	6	32.584	5	3	1	1	1	0	0	0
82	Arc	108257.784	108264.011	180	12	6.227	1	0	0	0	1	0	0	0
83	Arc	108304.984	108343.442	50	8	38.458	5	2	1	1	1	1	0	1
84	Arc	108531.687	108558.951	125	12	27.264	2	1	1	0	1	0	0	0
85	Arc	108595.455	108636.478	50	8	41.023	5	3	1	1	1	0	0	0
86	Arc	108681.663	108694.344	40	6	12.681	2	1	1	1	1	0	0	0
87	Arc	108745.402	108810.512	40	6	65.110	11	5	1	1	1	1	0	0
88	Arc	108932.248	108958.003	70	8	25.755	3	2	1	1	1	1	0	0
89	Arc	109069.48	109150.329	45	6	80.849	13	7	1	1	1	1	0	0
90	Arc	109211.834	109237.349	60	8	25.515	3	2	1	1	1	1	0	0
91	Arc	109396.964	109436.632	20	6	39.668	7	3	1	1	1	1	1	0
92	Arc	109517.731	109560.483	50	8	42.752	5	3	1	0	1	0	0	0
93	Arc	109581.644	109600.277	180	12	18.633	2	1	0	0	1	0	0	0
94	Arc	109630.73	109645.825	30	6	15.095	3	1	1	1	1	1	0	0
95	Arc	109764.786	109825.1	30	6	60.314	10	5	1	1	1	1	0	0
96	Arc	109891.261	109915.611	30	6	24.350	4	2	1	1	1	0	0	0
97	Arc	109962.375	109976.274	60	8	13.899	2	1	1	1	1	0	0	0
98	Arc	110012.247	110142.253	100	12	130.006	11	5	0	1	1	0	0	0
99	Arc	110205.325	110234.176	50	8	28.851	4	2	1	1	1	1	0	0
100	Arc	110391.862	110439.044	40	6	47.182	8	4	1	1	1	1	1	0
101	Arc	110497.202	110532.17	30	6	34.968	6	3	1	1	1	1	0	0
102	Arc	110612.323	110642.371	30	6	30.048	5	3	1	1	1	1	0	1
103	Arc	110772.963	110826.335	30	6	53.372	9	4	1	1	1	1	1	0
104	Arc	110887.119	110917.667	30	6	30.548	5	3	1	1	1	1	0	0
105	Arc	111016.244	111024.471	100	12	8.227	1	0	1	1	1	0	0	0
106	Arc	111071.265	111082.336	30	6	11.071	2	1	1	1	1	0	0	0
107	Arc	111129.55	111180.964	30	6	51.414	9	4	1	1	1	0	0	0
108	Arc	111226.193	111235.882	30	6	9.689	2	1	1	1	1	0	0	0
109	Arc	111286.687	111305.551	50	8	18.864	2	1	1	1	1	1	0	0
110	Arc	111388.215	111421.487	30	6	33.272	6	3	1	1	1	0	0	0
111	Arc	111452.251	111481.968	30	6	29.717	5	2	1	1	1	0	0	0
112	Arc	111512.247	111528.453	60	8	16.206	2	1	1	1	1	0	0	0
113	Arc	111586.705	111608.963	30	6	22.258	4	2	1	1	1	0	0	0

HIP / CURVE NO.	ELEMENT	START	END	RADIUS (m)	Spacing on Curve (S)	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
		CHAINAGE (m)	CHAINAGE (m)											
114	Arc	111654.809	111675.485	60	8	20.676	3	1	1	1	1	0	0	0
115	Arc	111721.141	111727.928	30	6	6.787	1	1	1	1	1	1	0	0
116	Arc	111789.563	111796.894	100	12	7.331	1	0	1	0	1	0	0	0
117	Arc	111837.047	111869.094	100	12	32.047	3	1	0	1	1	0	0	0
118	Arc	111972.92	112029.168	70	8	56.248	7	4	1	1	1	0	0	0
119	Arc	112089.681	112092.628	30	6	2.947	1	0	1	1	1	0	0	0
120	Arc	112148.103	112160.12	40	6	12.017	2	1	1	1	1	0	0	0
121	Arc	112200.788	112213.121	300	25	12.333	1	0	0	0	1	0	0	0
122	Arc	112282.81	112307.62	30	6	24.810	4	2	1	1	1	1	0	0
123	Arc	112413.947	112456.567	50	8	42.620	5	3	1	1	1	1	0	0
124	Arc	112564.826	112567.449	30	6	2.623	1	0	1	1	1	0	0	0
125	Arc	112599.015	112627.79	180	12	28.775	2	1	0	0	1	0	0	0
126	Arc	112657.861	112679.702	30	6	21.841	4	2	1	1	1	1	0	0
127	Arc	112744.641	112788.205	30	6	43.564	7	4	1	1	1	1	0	0
128	Arc	112904.994	112910.711	40	6	5.717	1	0	1	1	1	0	0	0
129	Arc	112962.203	112965.994	40	6	3.791	1	0	1	1	1	0	0	0
130	Arc	113022.467	113042.847	30	6	20.380	3	2	1	1	1	0	0	0
131	Arc	113093.262	113101.472	50	8	8.210	1	1	1	1	1	0	0	0
132	Arc	113157.072	113158.951	40	6	1.879	1	0	1	1	1	0	0	0
133	Arc	113215.491	113235.172	30	6	19.681	3	2	1	1	1	0	0	0
134	Arc	113271.395	113307.623	180	12	36.228	3	2	0	1	1	0	0	0
135	Arc	113359.477	113429.353	50	8	69.876	9	4	1	1	1	0	0	0
136	Arc	113475.547	113531.621	40	6	56.074	9	5	1	1	1	0	0	0
137	Arc	113581.395	113623.922	100	12	42.527	4	2	1	1	1	0	0	0
138	Arc	113684.713	113712.003	30	6	27.290	5	2	1	1	1	1	0	0
139	Arc	113831.477	113879.142	40	6	47.665	8	4	1	1	1	0	0	0
140	Arc	113927.856	113931.531	50	8	3.675	1	0	1	1	1	0	0	0
141	Arc	113971.359	113992.447	60	8	21.088	3	1	1	1	1	0	0	0
142	Arc	114048.47	114077.822	30	6	29.352	5	2	1	1	1	1	0	1
143	Arc	114297.092	114319.848	70	8	22.756	3	1	1	1	1	0	1	0
144	Arc	114371.561	114378.375	100	12	6.814	1	0	1	1	1	0	0	0
145	Arc	114442.101	114446.222	50	8	4.121	1	0	1	1	1	1	0	0
146	Arc	114586.908	114612.207	70	8	25.299	3	2	1	1	1	1	0	1
147	Arc	114813.783	114823.39	50	8	9.607	1	1	1	1	1	1	1	0
148	Arc	114904.505	114991.631	125	12	87.126	7	4	1	1	1	1	0	0

HIP / CURVE NO.	ELEMENT	START	END	RADIUS (m)	Spacing on Curve (S)	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
		CHAINAGE (m)	CHAINAGE (m)											
149	Arc	115218.802	115329.064	150	12	110.262	9	5	1	1	1	0	0	0
150	Arc	115430.724	115494.068	200	20	63.344	3	2	1	1	1	1	0	0
151	Arc	115725.155	115742.9	50	8	17.745	2	1	1	1	1	1	1	1
152	Arc	115932.668	115941.646	30	6	8.978	1	1	1	1	1	0	1	0
153	Arc	115995.143	116050.695	60	8	55.552	7	3	1	1	1	0	0	0
154	Arc	116086.947	116113.284	20	6	26.337	4	2	1	1	1	0	0	0
155	Arc	116161.956	116165.006	50	8	3.050	1	0	1	1	1	0	0	0
156	Arc	116208.75	116223.684	50	8	14.934	2	1	1	1	1	0	0	0
157	Arc	116285.072	116329.426	70	8	44.354	6	3	1	1	1	1	0	0
158	Arc	116467.783	116491.996	125	12	24.213	2	1	1	1	1	0	0	0
159	Arc	116535.59	116577.139	80	8	41.549	5	3	1	1	1	1	0	0
160	Arc	116708.193	116733.699	30	6	25.506	4	2	1	1	1	1	1	0
161	Arc	116801.27	116822.501	60	8	21.231	3	1	1	1	1	0	0	0
162	Arc	116875.97	116898.515	60	8	22.545	3	1	1	1	1	0	0	0
163	Arc	116944.127	116951.235	30	6	7.108	1	1	1	1	1	0	0	0
164	Arc	117007.196	117033.256	40	6	26.060	4	2	1	1	1	0	0	0
165	Arc	117086.426	117121.238	80	8	34.812	4	2	1	1	1	1	0	0
166	Arc	117217.34	117221.045	80	8	3.705	1	0	1	1	1	0	0	0
167	Arc	117276.236	117303.976	30	6	27.740	5	2	1	1	1	1	0	1
168	Arc	117449.793	117459.435	50	8	9.642	1	1	1	1	1	0	0	0
169	Arc	117532.035	117562.788	70	8	30.753	4	2	1	1	1	0	0	0
170	Arc	117635.23	117662.18	125	12	26.950	2	1	1	1	1	1	0	1
171	Arc	117978.619	118105.235	70	8	126.616	16	8	1	1	1	1	1	0
172	Arc	118192.199	118229.752	50	8	37.553	5	2	1	1	1	0	0	0
173	Arc	118270.391	118275.601	300	25	5.210	1	0	0	0	1	0	0	0
174	Arc	118317.389	118341.862	50	8	24.473	3	2	1	1	1	1	0	0
175	Arc	118451.239	118493.946	125	12	42.707	4	2	1	1	1	1	0	0
176	Arc	118618.493	118672.655	50	8	54.162	7	3	1	1	1	0	0	0
177	Arc	118748.367	118764.427	60	8	16.060	2	1	1	1	1	1	0	0
178	Arc	118867.097	118877.586	70	8	10.489	1	1	1	1	1	0	0	0
179	Arc	118924.391	119050.192	60	8	125.801	16	8	1	1	1	0	0	0
180	Arc	119095.791	119114.04	30	6	18.249	3	2	1	1	1	1	0	0
181	Arc	119185.137	119197.815	60	8	12.678	2	1	1	1	1	1	0	0
182	Arc	119283.564	119342.604	30	6	59.040	10	5	1	1	1	1	0	0
183	Arc	119442.602	119457.696	40	6	15.094	3	1	1	1	1	0	0	0

HIP / CURVE NO.	ELEMENT	START	END	RADIUS (m)	Spacing on Curve (S)	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
		CHAINAGE (m)	CHAINAGE (m)											
184	Arc	119500.438	119522.386	60	8	21.948	3	1	1	1	1	0	0	0
185	Arc	119574.047	119609.05	30	6	35.003	6	3	1	1	1	0	0	0
186	Arc	119664.425	119676.925	40	6	12.500	2	1	1	1	1	1	0	0
187	Arc	119801.362	119893.825	50	8	92.463	12	6	1	1	1	1	0	0
188	Arc	119999.983	120070.017	40	6	70.034	12	6	1	1	1	1	0	0
189	Arc	120129.788	120175.692	23	6	45.904	8	4	1	1	1	0	0	0
190	Arc	120228.617	120313.856	50	8	85.239	11	5	1	1	1	0	0	0
191	Arc	120366.672	120378.781	40	6	12.109	2	1	1	1	1	1	0	0
192	Arc	120437.11	120448.172	40	6	11.062	2	1	1	1	1	0	0	0
193	Arc	120495.441	120506.847	50	8	11.406	1	1	1	1	1	0	0	0
194	Arc	120558.936	120602.22	30	6	43.284	7	4	1	1	1	1	0	0
195	Arc	120683.866	120722.555	100	12	38.689	3	2	1	1	1	0	0	0
196	Arc	120778.729	120788.282	60	8	9.553	1	1	1	1	1	1	0	0
197	Arc	120891.529	120900.531	150	12	9.002	1	0	1	1	1	0	0	0
198	Arc	120974.617	120986.629	150	12	12.012	1	1	1	1	1	1	0	0
199	Arc	121169.278	121194.535	150	12	25.257	2	1	1	1	1	0	0	0
200	Arc	121294.279	121303.039	80	8	8.760	1	1	1	1	1	0	0	0
201	Arc	121376.968	121438.917	30	6	61.949	10	5	1	1	1	1	0	0
202	Arc	121559.376	121609.631	30	6	50.255	8	4	1	1	1	1	0	1
203	Arc	121756.748	121777.054	30	6	20.306	3	2	1	1	1	0	1	0
204	Arc	121823.395	121861.546	60	8	38.151	5	2	1	1	1	0	0	0
205	Arc	121892.952	121965.93	125	12	72.978	6	3	0	1	1	0	0	0
206	Arc	122018.627	122054.839	125	12	36.212	3	2	1	1	1	1	0	0
207	Arc	122173.258	122203.865	125	12	30.607	3	1	1	1	1	0	0	0
208	Arc	122260.786	122274.81	100	12	14.024	1	1	1	1	1	0	0	0
209	Arc	122359.948	122418.558	40	6	58.610	10	5	1	1	1	1	0	0
210	Arc	122540.104	122561.011	50	8	20.907	3	1	1	1	1	0	0	0
211	Arc	122628.238	122662.434	80	8	34.196	4	2	1	1	1	1	0	0
212	Arc	122742.849	122788.89	150	12	46.041	4	2	1	1	1	0	0	0
213	Arc	122901.69	122936.958	60	8	35.268	4	2	1	1	1	1	0	1
214	Arc	123153.294	123207.214	50	8	53.920	7	3	1	1	1	1	1	0
215	Arc	123309.184	123315.542	50	8	6.358	1	0	1	1	1	1	0	0
216	Arc	123429.66	123474.225	30	6	44.565	7	4	1	1	1	1	0	1
217	Arc	123641.348	123738.764	55	8	97.416	12	6	1	1	1	1	0	0
218	Arc	123838.41	123878.249	20	6	39.839	7	3	1	1	1	1	0	0

HIP / CURVE NO.	ELEMENT	START	END	RADIUS (m)	Spacing on Curve (S)	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
		CHAINAGE (m)	CHAINAGE (m)											
219	Arc	123956.039	123992.204	20	6	36.165	6	3	1	1	1	1	0	0
220	Arc	124102.864	124153.576	50	8	50.712	6	3	1	1	1	1	0	0
221	Arc	124253.28	124263.989	40	6	10.709	2	1	1	1	1	1	0	0
222	Arc	124322.118	124350.356	30	6	28.238	5	2	1	1	1	1	0	0
223	Arc	124467.609	124479.161	30	6	11.552	2	1	1	1	1	0	0	0
224	Arc	124530.058	124544.095	60	8	14.037	2	1	1	1	1	0	0	0
225	Arc	124599.699	124644.258	40	6	44.559	7	4	1	1	1	0	0	0
226	Arc	124690.991	124702.126	50	8	11.135	1	1	1	1	1	1	0	0
227	Arc	124801.984	124815.786	40	6	13.802	2	1	1	1	1	1	0	0
228	Arc	124886.502	124962.692	125	12	76.190	6	3	1	1	1	0	0	0
229	Arc	125071.306	125079.391	80	8	8.085	1	1	1	1	1	0	0	0
230	Arc	125115.931	125124.691	50	8	8.760	1	1	1	1	1	0	0	0
231	Arc	125171.201	125173.668	40	6	2.467	1	0	1	1	1	0	0	0
232	Arc	125223.878	125234.298	80	8	10.420	1	1	1	1	1	0	0	0
233	Arc	125289.303	125336.256	80	8	46.953	6	3	1	1	1	1	0	0
234	Arc	125418.41	125437.342	125	12	18.932	2	1	1	1	1	0	0	0
235	Arc	125552.473	125558.892	170	12	6.419	1	0	1	1	1	0	0	0
236	Arc	125603.386	125656.556	300	25	53.170	2	1	0	1	1	0	0	0
237	Arc	125806.124	125819.383	60	8	13.259	2	1	1	1	1	1	0	0
238	Arc	125900.921	125913.037	70	8	12.116	2	1	1	1	1	0	0	0
239	Arc	125967.334	126031.798	300	25	64.464	3	1	0	0	1	0	0	0
240	Arc	126111.993	126115.457	80	8	3.464	1	0	1	1	1	0	0	0
241	Arc	126158.283	126166.716	40	6	8.433	1	1	1	1	1	0	0	0
242	Arc	126217.543	126223.757	40	6	6.214	1	1	1	1	1	0	0	0
243	Arc	126265.254	126286.817	80	8	21.563	3	1	1	1	1	0	0	0
244	Arc	126349.331	126381.155	40	6	31.824	5	3	1	1	1	0	0	0
245	Arc	126432.975	126475.28	20	6	42.305	7	4	1	1	1	0	0	0
246	Arc	126514.915	126558.367	180	12	43.452	4	2	0	0	1	0	0	0
247	Arc	126578.458	126580.642	110	12	2.184	1	0	0	0	1	0	0	0
248	Arc	126621.677	126637.547	40	6	15.870	3	1	1	1	1	0	0	0
249	Arc	126681.953	126805.636	125	12	123.683	10	5	1	1	1	1	0	1
250	Arc	127566.182	127685.149	100	12	118.967	10	5	1	0	1	0	1	0
251	Arc	127723.803	127732.331	300	25	8.528	1	0	0	0	1	0	0	0
252	Arc	127772.839	127789.213	30	6	16.374	3	1	1	1	1	1	0	1
253	Arc	127919.97	127960.727	20	6	40.757	7	3	1	1	1	0	1	0

HIP / CURVE NO.	ELEMENT	START	END	RADIUS (m)	Spacing on Curve (S)	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
		CHAINAGE (m)	CHAINAGE (m)											
254	Arc	128013.455	128042.275	30	6	28.820	5	2	1	1	1	1	0	1
255	Arc	128202.071	128231.451	30	6	29.380	5	2	1	1	1	1	1	0
256	Arc	128336.933	128379.548	30	6	42.615	7	4	1	1	1	1	0	0
257	Arc	128458.919	128503.174	50	8	44.255	6	3	1	1	1	1	0	0
258	Arc	128637.623	128659.342	80	8	21.719	3	1	1	1	1	0	0	0
259	Arc	128724.113	128735.838	30	6	11.725	2	1	1	1	1	1	0	1
260	Arc	128924.374	128964.473	50	8	40.099	5	3	1	1	1	1	1	0
261	Arc	129127.689	129190.116	30	6	62.427	10	5	1	1	1	1	1	0
262	Arc	129280.736	129332.677	30	6	51.941	9	4	1	1	1	1	0	0
263	Arc	129394.093	129420.507	30	6	26.414	4	2	1	1	1	1	0	0
264	Arc	129542.083	129552.009	50	8	9.926	1	1	1	1	1	0	0	0
265	Arc	129617.286	129634.574	30	6	17.288	3	1	1	1	1	1	0	0
266	Arc	129719.566	129731.228	30	6	11.662	2	1	1	1	1	1	0	0
267	Arc	129790.08	129802.128	40	6	12.048	2	1	1	1	1	0	0	0
268	Arc	129848.748	129892.775	125	12	44.027	4	2	1	1	1	1	0	0
269	Arc	130052.67	130082.482	300	25	29.812	1	1	1	0	1	0	0	0
270	Arc	130117.892	130133.331	80	8	15.439	2	1	1	1	1	0	0	0
271	Arc	130204.427	130214.628	40	6	10.201	2	1	1	1	1	1	0	1
272	Arc	130362.92	130379.791	40	6	16.871	3	1	1	1	1	1	1	0
273	Arc	130443.992	130493.042	40	6	49.050	8	4	1	1	1	1	0	1
274	Arc	130628.467	130646.823	30	6	18.356	3	2	1	1	1	1	1	1
275	Arc	130838.732	130882.938	125	12	44.206	4	2	1	1	1	0	0	0
276	Arc	130930.621	130977.268	70	8	46.647	6	3	1	1	1	0	0	0
277	Arc	131028.95	131120.601	100	12	91.651	8	4	1	1	1	0	0	0
278	Arc	131171.008	131179.469	30	6	8.461	1	1	1	0	1	0	0	0
				TOTAL =		8316.6	1100	542	246	243	265	113	26	23

Total no. of delineator = 2558 nos.

CALCULATION FOR STREET LIGHTING

Street light in Built Up Location:

TCS Type	Length	Length (m)
TCS-13, TCS-7B, TCS-7, TCS-6, TCS-6A	4043	8085.76
	Total =	8085.76

Total length = 8086 m

Assuming , street lights @= 50m interval

for 8086 m 163 nos

At Busbay location=
(@ 5 nos per Busbay) 15 nos

At Bridge Portion =
(@ 6 nos per Bridge) 12 nos

Total nos of street light= 190 nos



Crash Barrier

Chainage (m)		Net Length (m)	Side
From	To		
102550	102625	75.0	Valley
104050	104150	100.0	Valley
106900	107050	150.0	Valley
107530	107600	70.0	Valley
108700	108850	150.0	Valley
109050	109200	150.0	Valley
109500	109600	100.0	Valley
112220	112370	150.0	Valley
112050	112150	100.0	Valley
112400	112500	100.0	Valley
113350	113450	100.0	Valley
113800	113900	100.0	Valley
116150	116250	100.0	Valley
117230	117330	100.0	Valley
121800	121900	100.0	Valley
122430	122530	100.0	Valley
122920	123070	150.0	Valley
123720	123820	100.0	Valley
124640	124740	100.0	Valley
126470	126570	100.0	Valley
128220	128370	150.0	Valley
128770	128845	75.0	Valley
129320	129420	100.0	Valley
Total =		2520.0	

Total no. of Bridges on the project= 3 nos.
 Approach length on valley side for each bridge (25 m on both side) 50 m
 Hence, Crash barrier length for 3 bridges = 300 m
Therefore, total length of crash barrier = 2820 m



**Reusable Sub-base Base Calculation
GSB Calculation**

	Required GSB Qty	Reusable GSB Quantity	
TCS-03	38710.805	4525.293	Cum
TCS-03A	11144.91	1302.840	Cum
TCS-04	4312.84	504.171	Cum
TCS-05	4236.19	495.211	Cum
TCS-05A	1826.825	213.556	Cum
TCS-06	2086	243.853	Cum
TCS-06A	94	10.989	Cum
TCS-07	1748	204.341	Cum
TCS-07A	3236	378.288	Cum
TCS-07B	1140	133.266	Cum
TCS-11	191.625	22.401	Cum
TCS-12	2350	274.715	Cum
TCS-13	836	97.728	Cum
Busbay (2 Lane)	424.8	49.659	Cum
Diversion Work	61	7.131	Cum
Extra Widening on Flexible Pavement	3472.4	405.924	Cum
Minor Junction	89.2	10.427	Cum
	75961	8880	

Reuseable GSB Quantity= 11.69%

Total Dismantle Granular Quantity(cum)= **14791**
use 60% of Total Dismantle Granular Quantity for GSB (cum)= **8875**

Total Required GSB Qty (Cum)= **75961**
11.69 % of this required quantity will be bought from dismantle material i.e **8880**

Re Useable Quantity of GSB Material(cum)= **8880**
Remaining Quantity of GSB(cum) = **67081**



ERROSION CONTROL

Hydroseeding

Chainage (m)		Length of CD	Net Length (m)	TCS No.
From	To			
101950	102000		50	TCS-5
102000	102125	2.6	122.4	TCS-5A
102625	102700		75	TCS-11
105025	105120	2.6	92.4	TCS-5
105120	105170		50	TCS-7A
105220	105270		50	TCS-7A
106675	106775		100	TCS-5
106775	106850		75	TCS-5A
110400	110475		75	TCS-7A
111125	111225	2.7	97.3	TCS-7A
111225	111280		55	TCS-5
112150	112550	3.84	396.16	TCS-5
113100	113480	5.2	374.8	TCS-5
113975	114150		175	TCS-5
114150	114225		75	TCS-5A
114880	114960		80	TCS-5A
114960	115010	2.6	47.4	TCS-7A
115900	115950		50	TCS-7A
116085	116280		195	TCS-7A
116325	116375		50	TCS-5A
116375	116465		90	TCS-5
116465	116515		50	TCS-5A
117000	117050	2.7	47.3	TCS-5
117050	117100		50	TCS-7A
117550	117780	2.6	227.4	TCS-5
117780	117825		45	TCS-5A
119250	119375	2.6	122.4	TCS-5A
119570	119790		50	TCS-7A
120300	120400		50	TCS-7A
121650	121750	5.2	94.8	TCS-5A
123425	123675		100	TCS-7A
124200	124250		250	TCS-7A
124375	124425		50	TCS-7A
127205	127325	2.6	47.4	TCS-5
127550	127700		120	TCS-7A
130465	130595		150	TCS-7A
Total =			3830	

Avg. Height of Hydroseeding =

8 m

Area of Hydroseeding =

30638 sqm



VOLUME VIII
BILL OF QUANTITY



BILL OF QUANTITY (ROAD PART)



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	16.00		
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	25.00		
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	59.00		
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	8.00		
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	4.00		
6	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	45.21		



Bill No : 01. Site Clearance and Dismantling

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
7	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	371.00		
8	02.04/iii/b	Dismantling stone masonry b) Rubble stone masonry in cement mortar	Cum	9,842.00		
9	02.04/vii/a	Removing hume pipes class NP-3 a) 300mm to 600mm dia	rm	192.00		
10	02.04/vii/b	Removing hume pipes class NP-4 b) Above 600mm to 900mm dia	rm	689.00		
11	02.04/vii/c	Removing hume pipes class NP-5 c) Above 900mm dia	rm	552.00		
12	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	98,610.00		
13	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	161,365.00		
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	30,638.00		
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	241,411.00		
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	7,449.44		
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	82,328.40		
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	2,212,600.00		
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	553,150.00		
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	66,573.02		
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	8,641.83		
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	78,934.05		
		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	311,302.00		
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	293,940.00		
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	21,791.14		



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	12,452.08		
		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/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	78.77		
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	10.43		
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	111.50		
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	446.00		



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	446.00		
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	31.22		
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	17.84		
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	7.00		
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	28.00		
3	08.04	Reinforced Cement Concrete M15 Boundary pillars of standard design, fixed in position including finishing but excluding painting	each	354.00		
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	381.00		
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	56.00		



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	4.00		
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	14.00		
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	9,800.60		



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	3,290.00		
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	2,820.00		
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	16,491.00		
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	190.00		



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/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	500.00		
		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	396.41		
2	10.16	Cement Plaster 12mm Thick in Cement Mortar 1:3	sqm	396.41		
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	59.45		
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	9.11		
5	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	6.04		
6	14.03/e/l	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M25Grade	cum	4.16		
7	14.08	HYSD bar reinforcement in foundation complete as per drawing and technical specification	MT	0.50		
8	14/nsc2	Brick Flat Soling at Foundation	Sqm	80.63		
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	19.43		



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 complete as per drawing and technical specification RCC Grade M25 For solid slab super-structure Upto 5m Upto 5m	cum	24.91		
11	16.03	HYSD bar reinforcement in super-structure complete as per drawing and technical specifications	MT	2.49		
		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	1,062.00		
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	375.14		
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	49.66		
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	531.00		



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	885.00		
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	2,124.00		
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	2,124.00		
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	148.68		



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	84.96		
		Total of Bill 08. Bus Bay				



Bill No : 09. Longitudinal Drains

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1				46,538.89		
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	11,229.65		
3	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	2,822.20		
4	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	2,967.18		
5	14.03/b	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M20 Grade	cum	193.05		
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	447.53		
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	3,401.17		
8	15.05	HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification	MT	170.06		



Bill No : 09. Longitudinal Drains

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
9	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	2,022.50		
10	24/i/b	Galvanised Mild steel J /L hook	kg	323.44		
11	40	Gextextile material (fine net)	sqm	363.87		
		Total of Bill 09. Longitudinal Drains				



Bill No : 10. 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	2,757.64		
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	683.71		
3	13.04	Filter medium behind abutment, wing wall and return wall complete as per drawing and technical specification .	cum	2,370.48		
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	1,486.18		
5	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	842.85		
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	2,118.90		
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	230.87		
8	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	3,576.00		



		Total of Bill	10. Retaining wall	




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	14,647.33		
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	3,661.83		
3	13.03/a	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials	cum	2,561.69		
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	743.72		
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	6,882.34		
6	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	3,194.67		
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	10,531.37		
8	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	5,463.09		
		Total of Bill 11. Breast 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: 16	16	16.00	Each
			Total :	16.00	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: 25	25	25.00	Each
			Total :	25.00	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: 59	59	59.00	Each
			Total :	59.00	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: 8	8	8.00	Each
			Total :	8.00	Each



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
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			
		Refer: Site Clearance and Dismantling Formula: 4	4	4.00	Each
			Total :	4.00	Each
6	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: 45.21	45.21	45.21	Ha
			Total :	45.21	Ha
7	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: 371	371	371.00	cum
			Total :	371.00	cum
8	02.04/iii/b	Dismantling stone masonry b) Rubble stone masonry in cement mortar			
		Refer: Site Clearance and Dismantling Formula: 9842	9842	9,842.00	Cum
			Total :	9,842.00	Cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
9	02.04/vii/a	Removing hume pipes class NP-3 a) 300mm to 600mm dia			
		Refer: Site Clearance and Dismantling Formula: 192	192	192.00	rm
			Total :	192.00	rm
10	02.04/vii/b	Removing hume pipes class NP-4 b) Above 600mm to 900mm dia			
		Refer: Site Clearance and Dismantling Formula: 689	689	689.00	rm
			Total :	689.00	rm
11	02.04/vii/c	Removing hume pipes class NP-5 c) Above 900mm dia			
		Refer: Site Clearance and Dismantling Formula: 552	552	552.00	rm
			Total :	552.00	rm
12	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: 98610	98610	98,610.00	sqm
			Total :	98,610.00	sqm



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
13	12.04/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: 161365	161365	161,365.00	sqm
			Total :	161,365.00	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: 30638	30638	30,638.00	sqm
			Total :	30,638.00	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	241411.000	241,411.00	cum
			Total :	241,411.00	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*15151.000	4,772.57	cum
		Refer: TCS-03A Formula: (cw+2*ps+1*es+ (bc+dbm+wmm1+wmm2+gsb+0.5*sg)*1*2) *I*sg*0+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) *4362.000*0.500*0+0.315*1*4362.000	1,374.03	cum
		Refer: TCS-04 Formula: es_area*1*I	0.315*1*1688.000	531.72	cum
		Refer: TCS-05 Formula: (cw+2*ps+1*es-ext_pav+ (bc+dbm+wmm1+wmm2+gsb+0.5*sg)*1*2) *I*sg*0+es_area*1*I	(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) *1658.000*0.500*0+0.315*1*1658.000	522.27	cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-05A Formula: $(cw+2*ps+1*es-ext\_pav+(bc+dbm+wmm1+wmm2+gsb+0.5*sg)*1*2)*1*sg*0+es\_area*1*I$	$(7.000+2*1.500+1*1.000-0.000+(0.040+0.070+0.125+0.125+0.200+0.5*0.500)*1*2)*715.000*0.500*0+0.315*1*715.000$	225.23	cum
		Refer: TCS-11 Formula: $es\_area*1*I$	$0.315*1*75.000$	23.63	cum
			Total :	7,449.44	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: $(cw+2*ps-ext\_pav)*sg*I$	$(7.000+2*1.500-6.700)*0.500*15151.000$	24,999.15	cum
		Refer: TCS-03A Formula: $(cw+2*ps-ext\_pav)*sg*I$	$(7.000+2*1.500-0.000)*0.500*4362.000$	21,810.00	cum
		Refer: TCS-04 Formula: $(cw+2*ps-ext\_pav)*sg*I$	$(7.000+2*1.500-6.700)*0.500*1688.000$	2,785.20	cum
		Refer: TCS-05 Formula: $(cw+2*ps-ext\_pav*0)*sg*I$	$(7.000+2*1.500-6.700*0)*0.500*1658.000$	8,290.00	cum
		Refer: TCS-05A Formula: $(cw+2*ps-ext\_pav*0)*sg*I$	$(7.000+2*1.500-0.000*0)*0.500*715.000$	3,575.00	cum
		Refer: TCS-06 Formula: $(cw+2*ps-ext\_pav)*sg*I$	$(7.000+2*1.500-6.700)*0.500*1043.000$	1,720.95	cum
		Refer: TCS-06A Formula: $(cw+2*ps-ext\_pav)*sg*I$	$(7.000+2*1.500-6.700)*0.500*47.000$	77.55	cum
		Refer: TCS-07 Formula: $(cw+2*ps-ext\_pav)*sg*I$	$(7.000+2*1.500-6.700)*0.500*874.000$	1,442.10	cum
		Refer: TCS-07A Formula: $(cw+2*ps-ext\_pav*0)*sg*I$	$(7.000+2*1.500-6.700*0)*0.500*1618.000$	8,090.00	cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-07B Formula: $(cw+2*ps-ext_{pav}*0)*sg*I$	$(7.000+2*1.500-6.700*0)*0.500*570.000$	2,850.00	cum
		Refer: TCS-11 Formula: $(cw+2*ps-ext_{pav})*sg*I$	$(7.000+2*1.500-6.700)*0.500*75.000$	123.75	cum
		Refer: TCS-12 Formula: $(cw+2*ps-ext_{pav}*0)*sg*I$	$(7.000+2*1.500-6.700*0)*0.500*1175.000$	5,875.00	cum
		Refer: TCS-13 Formula: $(cw+2*ps-ext_{pav})*sg*I$	$(7.000+2*1.500-6.700)*0.500*418.000$	689.70	cum
			Total :	82,328.40	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: $tot\_cut*(1-per\_rock/100)$	$2765750.000*(1-20.000/100)$	2,212,600.00	cum
			Total :	2,212,600.00	cum
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: $tot\_cut*(per\_rock/100)$	$2765750.000*(20.000/100)$	553,150.00	cum
			Total :	553,150.00	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 $ew\_area * gsb * (1 - gsb\_per / 100)$	$17362.000 * 0.200 * (1 - 11.690 / 100)$	3,066.48	Cum
		Refer: TCS-03 Formula: $((cw + 2 * ps + 1 * es + (bc + dbm + wmm1 + wmm2 + gsb * 0.5) * 2 * 1) * l * gsb + es\_gsb * 1 * l) * (1 - gsb\_per / 100)$	$((7.000 + 2 * 1.500 + 1 * 1.000 + (0.040 + 0.070 + 0.125 + 0.125 + 0.200 * 0.5) * 2 * 1) * 15151.000 * 0.200 + 0.171 * 1 * 15151.000) * (1 - 11.690 / 100)$	34,185.51	Cum
		Refer: TCS-03A Formula: $((cw + 2 * ps + 1 * es + (bc + dbm + wmm1 + wmm2 + gsb * 0.5) * 2 * 1) * l * gsb + es\_gsb * 1 * l) * (1 - gsb\_per / 100)$	$((7.000 + 2 * 1.500 + 1 * 1.000 + (0.040 + 0.070 + 0.125 + 0.125 + 0.200 * 0.5) * 2 * 1) * 4362.000 * 0.200 + 0.171 * 1 * 4362.000) * (1 - 11.690 / 100)$	9,842.07	Cum
		Refer: TCS-04 Formula: $((cw + 2 * ps + 1 * es + (bc + dbm + wmm1 + wmm2 + gsb * 0.5) * 2 * 1) * l * gsb + es\_gsb * 1 * l) * (1 - gsb\_per / 100)$	$((7.000 + 2 * 1.500 + 1 * 1.000 + (0.040 + 0.070 + 0.125 + 0.125 + 0.200 * 0.5) * 2 * 1) * 1688.000 * 0.200 + 0.171 * 1 * 1688.000) * (1 - 11.690 / 100)$	3,808.67	Cum
		Refer: TCS-05 Formula: $((cw + 2 * ps + 1 * es + (bc + dbm + wmm1 + wmm2 + gsb * 0.5) * 2 * 1) * l * gsb + es\_gsb * 1 * l) * (1 - gsb\_per / 100)$	$((7.000 + 2 * 1.500 + 1 * 1.000 + (0.040 + 0.070 + 0.125 + 0.125 + 0.200 * 0.5) * 2 * 1) * 1658.000 * 0.200 + 0.171 * 1 * 1658.000) * (1 - 11.690 / 100)$	3,740.98	Cum
		Refer: TCS-05A Formula: $((cw + 2 * ps + 1 * es + (bc + dbm + wmm1 + wmm2 + gsb * 0.5) * 2 * 1) * l * gsb + es\_gsb * 1 * l) * (1 - gsb\_per / 100)$	$((7.000 + 2 * 1.500 + 1 * 1.000 + (0.040 + 0.070 + 0.125 + 0.125 + 0.200 * 0.5) * 2 * 1) * 715.000 * 0.200 + 0.171 * 1 * 715.000) * (1 - 11.690 / 100)$	1,613.27	Cum
		Refer: TCS-06 Formula: $(cw + 2 * ps) * gsb * l * (1 - gsb\_per / 100)$	$(7.000 + 2 * 1.500) * 0.200 * 1043.000 * (1 - 11.690 / 100)$	1,842.15	Cum
		Refer: TCS-06A Formula: $(cw + 2 * ps) * gsb * l * (1 - gsb\_per / 100)$	$(7.000 + 2 * 1.500) * 0.200 * 47.000 * (1 - 11.690 / 100)$	83.01	Cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-07 Formula: $(cw+2*ps)*gsb*(1-gsb\_per/100)$	$(7.000+2*1.500)*0.200*874.000*$ $(1-11.690/100)$	1,543.66	Cum
		Refer: TCS-07A Formula: $(cw+2*ps)*gsb*(1-gsb\_per/100)$	$(7.000+2*1.500)*0.200*1618.000*$ $(1-11.690/100)$	2,857.71	Cum
		Refer: TCS-07B Formula: $(cw+2*ps)*gsb*(1-gsb\_per/100)$	$(7.000+2*1.500)*0.200*570.000*$ $(1-11.690/100)$	1,006.73	Cum
		Refer: TCS-11 Formula: $((cw+2*ps+1*es+$ $(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)$ $*I*gsb+es\_gsb*1*I)*(1-gsb\_per/100)$	$((7.000+2*1.500+1*1.000+$ $(0.040+0.070+0.125+0.125+0.200*0.5)$ $*2*1)*75.000*0.200+0.171*1*75.000)*$ $(1-11.690/100)$	169.22	Cum
		Refer: TCS-12 Formula: $(cw+2*ps)*gsb*(1-gsb\_per/100)$	$(7.000+2*1.500)*0.200*1175.000*$ $(1-11.690/100)$	2,075.29	Cum
		Refer: TCS-13 Formula: $(cw+2*ps)*gsb*(1-gsb\_per/100)$	$(7.000+2*1.500)*0.200*418.000*$ $(1-11.690/100)$	738.27	Cum
			Total :	66,573.02	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 $ew\_area*gsb*(gsb\_per/100)$	$17362.000*0.200*(11.690/100)$	405.92	Cum
		Refer: TCS-03 Formula: $((cw+2*ps+1*es+$ $(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)$ $*I*gsb+es\_gsb*1*I)*(gsb\_per/100)$	$((7.000+2*1.500+1*1.000+$ $(0.040+0.070+0.125+0.125+0.200*0.5)$ $*2*1)*15151.000*0.200+0.171*1*15151.000)$ $(11.690/100)$	4,525.29	Cum
		Refer: TCS-03A Formula: $((cw+2*ps+1*es+$ $(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)$ $*I*gsb+es\_gsb*1*I)*(gsb\_per/100)$	$((7.000+2*1.500+1*1.000+$ $(0.040+0.070+0.125+0.125+0.200*0.5)$ $*2*1)*4362.000*0.200+0.171*1*4362.000)*$ $(11.690/100)$	1,302.84	Cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-04 Formula: $((cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es\_gsb*1*I)*(gsb\_per/100)$	$((7.000+2*1.500+1*1.000+(0.040+0.070+0.125+0.125+0.200*0.5)*2*1)*1688.000*0.200+0.171*1*1688.000)*(11.690/100)$	504.17	Cum
		Refer: TCS-05 Formula: $((cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es\_gsb*1*I)*(gsb\_per/100)$	$((7.000+2*1.500+1*1.000+(0.040+0.070+0.125+0.125+0.200*0.5)*2*1)*1658.000*0.200+0.171*1*1658.000)*(11.690/100)$	495.21	Cum
		Refer: TCS-05A Formula: $((cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es\_gsb*1*I)*(gsb\_per/100)$	$((7.000+2*1.500+1*1.000+(0.040+0.070+0.125+0.125+0.200*0.5)*2*1)*715.000*0.200+0.171*1*715.000)*(11.690/100)$	213.56	Cum
		Refer: TCS-06 Formula: $(cw+2*ps-ext\_pav)*gsb*I*(gsb\_per/100)$	$(7.000+2*1.500-6.700)*0.200*1043.000*(11.690/100)$	80.47	Cum
		Refer: TCS-06A Formula: $(cw+2*ps-ext\_pav)*gsb*I*(gsb\_per/100)$	$(7.000+2*1.500-6.700)*0.200*47.000*(11.690/100)$	3.63	Cum
		Refer: TCS-07 Formula: $(cw+2*ps)*gsb*I*(gsb\_per/100)$	$(7.000+2*1.500)*0.200*874.000*(11.690/100)$	204.34	Cum
		Refer: TCS-07A Formula: $(cw+2*ps)*gsb*I*(gsb\_per/100)$	$(7.000+2*1.500)*0.200*1618.000*(11.690/100)$	378.29	Cum
		Refer: TCS-07B Formula: $(cw+2*ps)*gsb*I*(gsb\_per/100)$	$(7.000+2*1.500)*0.200*570.000*(11.690/100)$	133.27	Cum
		Refer: TCS-11 Formula: $((cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es\_gsb*1*I)*(gsb\_per/100)$	$((7.000+2*1.500+1*1.000+(0.040+0.070+0.125+0.125+0.200*0.5)*2*1)*75.000*0.200+0.171*1*75.000)*(11.690/100)$	22.40	Cum
		Refer: TCS-12 Formula: $(cw+2*ps)*gsb*I*(gsb\_per/100)$	$(7.000+2*1.500)*0.200*1175.000*(11.690/100)$	274.72	Cum
		Refer: TCS-13 Formula: $(cw+2*ps)*gsb*I*(gsb\_per/100)$	$(7.000+2*1.500)*0.200*418.000*(11.690/100)$	97.73	Cum
			Total :	8,641.83	Cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
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 $ew\_area*(wmm1+wmm2)$	$17362.000*(0.125+0.125)$	4,340.50	Cum
		Refer: TCS-03 Formula: $((((cw+2*ps+0.125*1)*wmm1)+((cw+2*ps+0.250*1)*wmm2))*I)$	$((((7.000+2*1.500+0.125*1)*0.125)+((7.000+2*1.500+0.250*1)*0.125))*15151.000)$	38,587.70	Cum
		Refer: TCS-03A Formula: $((((cw+2*ps+0.125*1)*wmm1)+((cw+2*ps+0.250*1)*wmm2))*I)$	$((((7.000+2*1.500+0.125*1)*0.125)+((7.000+2*1.500+0.250*1)*0.125))*4362.000)$	11,109.47	Cum
		Refer: TCS-04 Formula: $((((cw+2*ps+0.125*1)*wmm1)+((cw+2*ps+0.250*1)*wmm2))*I)$	$((((7.000+2*1.500+0.125*1)*0.125)+((7.000+2*1.500+0.250*1)*0.125))*1688.000)$	4,299.13	Cum
		Refer: TCS-05 Formula: $((((cw+2*ps+0.125*1)*wmm1)+((cw+2*ps+0.250*1)*wmm2))*I)$	$((((7.000+2*1.500+0.125*1)*0.125)+((7.000+2*1.500+0.250*1)*0.125))*1658.000)$	4,222.72	Cum
		Refer: TCS-05A Formula: $((((cw+2*ps+0.125*1)*wmm1)+((cw+2*ps+0.250*1)*wmm2))*I)$	$((((7.000+2*1.500+0.125*1)*0.125)+((7.000+2*1.500+0.250*1)*0.125))*715.000)$	1,821.02	Cum
		Refer: TCS-06 Formula: $((((cw+2*ps)*wmm1)+((cw+2*ps)*wmm2))*I)$	$((((7.000+2*1.500)*0.125)+((7.000+2*1.500)*0.125))*1043.000)$	2,607.50	Cum
		Refer: TCS-06A Formula: $((((cw+2*ps)*wmm1)+((cw+2*ps)*wmm2))*I)$	$((((7.000+2*1.500)*0.125)+((7.000+2*1.500)*0.125))*47.000)$	117.50	Cum
		Refer: TCS-07 Formula: $((((cw+2*ps)*wmm1)+((cw+2*ps)*wmm2))*I)$	$((((7.000+2*1.500)*0.125)+((7.000+2*1.500)*0.125))*874.000)$	2,185.00	Cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-07A Formula: $(((cw+2*ps)*wmm1)+((cw+2*ps)*wmm2))*I)$	$(((7.000+2*1.500)*0.125)+((7.000+2*1.500)*0.125))*1618.000)$	4,045.00	Cum
		Refer: TCS-07B Formula: $(((cw+2*ps)*wmm1)+((cw+2*ps)*wmm2))*I)$	$(((7.000+2*1.500)*0.125)+((7.000+2*1.500)*0.125))*570.000)$	1,425.00	Cum
		Refer: TCS-11 Formula: $(((cw+2*ps+0.125*1)*wmm1)+((cw+2*ps+0.250*1)*wmm2))*I)$	$(((7.000+2*1.500+0.125*1)*0.125)+((7.000+2*1.500+0.250*1)*0.125))*75.000)$	191.02	Cum
		Refer: TCS-12 Formula: $(((cw+2*ps)*wmm1)+((cw+2*ps)*wmm2))*I)$	$(((7.000+2*1.500)*0.125)+((7.000+2*1.500)*0.125))*1175.000)$	2,937.50	Cum
		Refer: TCS-13 Formula: $(((cw+2*ps)*wmm1)+((cw+2*ps)*wmm2))*I)$	$(((7.000+2*1.500)*0.125)+((7.000+2*1.500)*0.125))*418.000)$	1,045.00	Cum
			Total :	78,934.05	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	17362.000	17,362.00	sqm
		Refer: TCS-03 Formula: (cw+2*ps)*l	(7.000+2*1.500)*15151.000	151,510.00	sqm
		Refer: TCS-03A Formula: (cw+2*ps)*l	(7.000+2*1.500)*4362.000	43,620.00	sqm
		Refer: TCS-04 Formula: (cw+2*ps)*l	(7.000+2*1.500)*1688.000	16,880.00	sqm
		Refer: TCS-05 Formula: (cw+2*ps)*l	(7.000+2*1.500)*1658.000	16,580.00	sqm
		Refer: TCS-05A Formula: (cw+2*ps)*l	(7.000+2*1.500)*715.000	7,150.00	sqm
		Refer: TCS-06 Formula: (cw+2*ps)*l	(7.000+2*1.500)*1043.000	10,430.00	sqm
		Refer: TCS-06A Formula: (cw+2*ps)*l	(7.000+2*1.500)*47.000	470.00	sqm
		Refer: TCS-07 Formula: (cw+2*ps)*l	(7.000+2*1.500)*874.000	8,740.00	sqm
		Refer: TCS-07A Formula: (cw+2*ps)*l	(7.000+2*1.500)*1618.000	16,180.00	sqm
		Refer: TCS-07B Formula: (cw+2*ps)*l	(7.000+2*1.500)*570.000	5,700.00	sqm
		Refer: TCS-11 Formula: (cw+2*ps)*l	(7.000+2*1.500)*75.000	750.00	sqm



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-12 Formula: (cw+2*ps)*l	(7.000+2*1.500)*1175.000	11,750.00	sqm
		Refer: TCS-13 Formula: (cw+2*ps)*l	(7.000+2*1.500)*418.000	4,180.00	sqm
			Total :	311,302.00	sqm
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)*15151.000	151,510.00	sqm
		Refer: TCS-03A Formula: (cw+2*ps)*l	(7.000+2*1.500)*4362.000	43,620.00	sqm
		Refer: TCS-04 Formula: (cw+2*ps)*l	(7.000+2*1.500)*1688.000	16,880.00	sqm
		Refer: TCS-05 Formula: (cw+2*ps)*l	(7.000+2*1.500)*1658.000	16,580.00	sqm
		Refer: TCS-05A Formula: (cw+2*ps)*l	(7.000+2*1.500)*715.000	7,150.00	sqm
		Refer: TCS-06 Formula: (cw+2*ps)*l	(7.000+2*1.500)*1043.000	10,430.00	sqm
		Refer: TCS-06A Formula: (cw+2*ps)*l	(7.000+2*1.500)*47.000	470.00	sqm
		Refer: TCS-07 Formula: (cw+2*ps)*l	(7.000+2*1.500)*874.000	8,740.00	sqm
		Refer: TCS-07A Formula: (cw+2*ps)*l	(7.000+2*1.500)*1618.000	16,180.00	sqm
		Refer: TCS-07B Formula: (cw+2*ps)*l	(7.000+2*1.500)*570.000	5,700.00	sqm



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-11 Formula: (cw+2*ps)*l	(7.000+2*1.500)*75.000	750.00	sqm
		Refer: TCS-12 Formula: (cw+2*ps)*l	(7.000+2*1.500)*1175.000	11,750.00	sqm
		Refer: TCS-13 Formula: (cw+2*ps)*l	(7.000+2*1.500)*418.000	4,180.00	sqm
			Total :	293,940.00	sqm
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	17362.000*0.070	1,215.34	cum
		Refer: TCS-03 Formula: (cw+2*ps)*dbm*l	(7.000+2*1.500)*0.070*15151.000	10,605.70	cum
		Refer: TCS-03A Formula: (cw+2*ps)*dbm*l	(7.000+2*1.500)*0.070*4362.000	3,053.40	cum
		Refer: TCS-04 Formula: (cw+2*ps)*dbm*l	(7.000+2*1.500)*0.070*1688.000	1,181.60	cum
		Refer: TCS-05 Formula: (cw+2*ps)*dbm*l	(7.000+2*1.500)*0.070*1658.000	1,160.60	cum
		Refer: TCS-05A Formula: (cw+2*ps)*dbm*l	(7.000+2*1.500)*0.070*715.000	500.50	cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-06 Formula: (cw+2*ps)*dbm*I	(7.000+2*1.500)*0.070*1043.000	730.10	cum
		Refer: TCS-06A Formula: (cw+2*ps)*dbm*I	(7.000+2*1.500)*0.070*47.000	32.90	cum
		Refer: TCS-07 Formula: (cw+2*ps)*dbm*I	(7.000+2*1.500)*0.070*874.000	611.80	cum
		Refer: TCS-07A Formula: (cw+2*ps)*dbm*I	(7.000+2*1.500)*0.070*1618.000	1,132.60	cum
		Refer: TCS-07B Formula: (cw+2*ps)*dbm*I	(7.000+2*1.500)*0.070*570.000	399.00	cum
		Refer: TCS-11 Formula: (cw+2*ps)*dbm*I	(7.000+2*1.500)*0.070*75.000	52.50	cum
		Refer: TCS-12 Formula: (cw+2*ps)*dbm*I	(7.000+2*1.500)*0.070*1175.000	822.50	cum
		Refer: TCS-13 Formula: (cw+2*ps)*dbm*I	(7.000+2*1.500)*0.070*418.000	292.60	cum
			Total :	21,791.14	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	17362.000*0.040	694.48	cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-03 Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*15151.000$	6,060.40	cum
		Refer: TCS-03A Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*4362.000$	1,744.80	cum
		Refer: TCS-04 Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*1688.000$	675.20	cum
		Refer: TCS-05 Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*1658.000$	663.20	cum
		Refer: TCS-05A Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*715.000$	286.00	cum
		Refer: TCS-06 Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*1043.000$	417.20	cum
		Refer: TCS-06A Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*47.000$	18.80	cum
		Refer: TCS-07 Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*874.000$	349.60	cum
		Refer: TCS-07A Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*1618.000$	647.20	cum
		Refer: TCS-07B Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*570.000$	228.00	cum
		Refer: TCS-11 Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*75.000$	30.00	cum
		Refer: TCS-12 Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*1175.000$	470.00	cum
		Refer: TCS-13 Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*418.000$	167.20	cum
			Total :	12,452.08	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: $\text{tot\_area} * \text{gsb} * (1 - \text{gsb\_per} / 100)$	$446.000 * 0.200 * (1 - 11.690 / 100)$	78.77	Cum
			Total :	78.77	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: $\text{tot\_area} * \text{gsb} * (\text{gsb\_per} / 100)$	$446.000 * 0.200 * (11.690 / 100)$	10.43	Cum
			Total :	10.43	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: $\text{tot\_area} * (\text{wmm1} + \text{wmm2})$	$446.000 * (0.125 + 0.125)$	111.50	Cum
			Total :	111.50	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	446.000	446.00	sqm
			Total :	446.00	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	446.000	446.00	sqm
			Total :	446.00	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	446.000*0.070	31.22	cum
			Total :	31.22	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	446.000*0.040	17.84	cum
			Total :	17.84	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: 7	7	7.00	each
			Total :	7.00	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: 28	28	28.00	each
			Total :	28.00	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: 354	354	354.00	each
			Total :	354.00	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: 381	381	381.00	each
			Total :	381.00	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: 56	56	56.00	each
			Total :	56.00	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: 4	4	4.00	each
			Total :	4.00	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 inforatory 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 6mm 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: 14	14	14.00	each
			Total :	14.00	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: $((l+6)/9)*lc*wc)+(nc*l*wid\_mar)$	$((15151.000+6)/9)*3.000*0.100)+(2.000*15151.000*0.150)$	5,050.53	sqm
		Refer: TCS-03A Formula: $((l+6)/9)*lc*wc)+(nc*l*wid\_mar)$	$((4362.000+6)/9)*3.000*0.100)+(2.000*4362.000*0.150)$	1,454.20	sqm
		Refer: TCS-04 Formula: $((l+6)/9)*lc*wc)+(nc*l*wid\_mar)$	$((1688.000+6)/9)*3.000*0.100)+(2.000*1688.000*0.150)$	562.87	sqm
		Refer: TCS-05 Formula: $((l+6)/9)*lc*wc)+(nc*l*wid\_mar)$	$((1658.000+6)/9)*3.000*0.100)+(2.000*1658.000*0.150)$	552.87	sqm
		Refer: TCS-05A Formula: $((l+6)/9)*lc*wc)+(nc*l*wid\_mar)$	$((715.000+6)/9)*3.000*0.100)+(2.000*715.000*0.150)$	238.53	sqm
		Refer: TCS-06 Formula: $((l+6)/9)*lc*wc)+(nc*l*wid\_mar)$	$((1043.000+6)/9)*3.000*0.100)+(2.000*1043.000*0.150)$	347.87	sqm

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-06A Formula: $((l+6)/9)*lc*wc+(nc*l*wid\_mar)$	$((47.000+6)/9)*3.000*0.100)+$ $(2.000*47.000*0.150)$	15.87	sqm
		Refer: TCS-07 Formula: $((l+6)/9)*lc*wc+(nc*l*wid\_mar)$	$((874.000+6)/9)*3.000*0.100)+$ $(2.000*874.000*0.150)$	291.53	sqm
		Refer: TCS-07A Formula: $((l+6)/9)*lc*wc+(nc*l*wid\_mar)$	$((1618.000+6)/9)*3.000*0.100)+$ $(2.000*1618.000*0.150)$	539.53	sqm
		Refer: TCS-07B Formula: $((l+6)/9)*lc*wc+(nc*l*wid\_mar)$	$((570.000+6)/9)*3.000*0.100)+$ $(2.000*570.000*0.150)$	190.20	sqm
		Refer: TCS-11 Formula: $((l+6)/9)*lc*wc+(nc*l*wid\_mar)$	$((75.000+6)/9)*3.000*0.100)+$ $(2.000*75.000*0.150)$	25.20	sqm
		Refer: TCS-12 Formula: $((l+6)/9)*lc*wc+(nc*l*wid\_mar)$	$((1175.000+6)/9)*3.000*0.100)+$ $(2.000*1175.000*0.150)$	391.87	sqm
		Refer: TCS-13 Formula: $((l+6)/9)*lc*wc+(nc*l*wid\_mar)$	$((418.000+6)/9)*3.000*0.100)+$ $(2.000*418.000*0.150)$	139.53	sqm
			Total :	9,800.60	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: 3290	3290	3,290.00	each
			Total :	3,290.00	each



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
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			
		Refer: Crash Barrier Formula: 2820	2820	2,820.00	Rm
			Total :	2,820.00	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: 16491	16491	16,491.00	nos
			Total :	16,491.00	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: 190	190	190.00	nos
			Total :	190.00	nos

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
13	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.			
		Refer: Traffic Signs Formula: 500	500	500.00	sqm
			Total :	500.00	sqm



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: $((sw\_in*sw\_ht*2)+(w\_pass*sw\_ht*2)+(bw\_in*bw\_ht)+(l\_pass*bw\_ht)+(col\_l*fcol\_h*6)+(l\_pass*roof\_w)-(2*win\_n*win\_l*win\_h))*n$	$((1.875*3.830*2)+(2.000*3.830*2)+(5.800*2.350)+(6.000*2.350)+(0.250*2.650*6)+(6.000*1.530)-(2*2.000*1.250*0.900))*6.000$	396.41	sqm
			Total :	396.41	sqm
2	10.16	Cement Plaster 12mm Thick in Cement Mortar 1:3			
		Refer: Passenger Shelter Formula: $((sw\_in*sw\_ht*2)+(w\_pass*sw\_ht*2)+(bw\_in*bw\_ht)+(l\_pass*bw\_ht)+(col\_l*fcol\_h*6)+(l\_pass*roof\_w)-(2*win\_n*win\_l*win\_h))*n$	$((1.875*3.830*2)+(2.000*3.830*2)+(5.800*2.350)+(6.000*2.350)+(0.250*2.650*6)+(6.000*1.530)-(2*2.000*1.250*0.900))*6.000$	396.41	sqm
			Total :	396.41	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: $((a+0.25*2)*(b+0.25*2)*df*col\_n)+((l+2*0.1)*(w+2*0.1)*db))*n$	$((0.750+0.25*2)*(0.750+0.25*2)*0.750*6.000)+((13.500+2*0.1)*(0.500+2*0.1)*0.300))*6.000$	59.45	cum
			Total :	59.45	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: $((l*w*wbtm\_thk)+(l*fw\_wall*wtop\_thk))*n$	$((13.500*0.500*0.150)+(13.500*0.250*0.150))*6.000$	9.11	cum
			Total :	9.11	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*6.000	6.04	cum
			Total :	6.04	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*6.000	4.16	cum
			Total :	4.16	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*6.000)*120.000/1000	0.50	MT
			Total :	0.50	MT
8	14/nsc2	Brick Flat Soling at Foundation			

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: Passenger Shelter Formula: $(((l_{pass}-2*w_{wall})*(w_{pass}-2*w_{wall}))+ (a*b*col_n))*n$	$(((6.000-2*0.125)*(2.000-2*0.125))+ (0.750*0.750*6.000))*6.000$	80.63	Sqm
			Total :	80.63	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: $(((l*w_{wall}*wall_h)+(sw_l*2*w_{wall}*sw_h) + (bw_l*4*w_{wall}*bw_h) + (rail_l*w_{wall}*rail_h))*n) - (win_l*w_{wall}*win_h*2*n)$	$(((13.500*0.125*0.550) + (1.500*2*0.125*2.130) + (2.650*4*0.125*0.950) + (9.500*0.125*0.450))*6.000) - (1.250*0.125*0.900*2*6.000)$	19.43	cum
			Total :	19.43	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: $((col_l*col_w*fcoll_h*col_n*0.5) + (col_l*col_w*bcol_h*col_n*0.5) + (sb_l*sb_w*sb_thk*2) + (sb_a*sb_w*sb_thk*4) + (l_{pass}*roof_w*roof_thk) + (l_{pass}*fchj_w*roof_thk) + (l_{pass}*bchj_w*roof_thk) + (bch_l*bch_w*bch_thk))*n$	$((0.250*0.250*2.650*6.000*0.5) + (0.250*0.250*2.100*6.000*0.5) + (1.530*0.250*0.350*2) + (3.000*0.250*0.350*4) + (6.000*1.530*0.110) + (6.000*0.680*0.110) + (6.000*0.450*0.110) + (5.000*0.500*0.075))*6.000$	24.91	cum
			Total :	24.91	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: $((col\_l * col\_w * fcol\_h * col\_n * 0.5) +$ $(col\_l * col\_w * bcol\_h * col\_n * 0.5) +$ $(sb\_l * sb\_w * sb\_thk * 2) +$ $(sb\_a * sb\_w * sb\_thk * 4) +$ $(l\_pass * roof\_w * roof\_thk) +$ $(l\_pass * fchj\_w * roof\_thk) +$ $(l\_pass * bchj\_w * roof\_thk) +$ $(bch\_l * bch\_w * bch\_thk)) * n * srf / 1000$	$((0.250 * 0.250 * 2.650 * 6.000 * 0.5) +$ $(0.250 * 0.250 * 2.100 * 6.000 * 0.5) +$ $(1.530 * 0.250 * 0.350 * 2) +$ $(3.000 * 0.250 * 0.350 * 4) +$ $(6.000 * 1.530 * 0.110) +$ $(6.000 * 0.680 * 0.110) +$ $(6.000 * 0.450 * 0.110) +$ $(5.000 * 0.500 * 0.075))$ $* 6.000 * 100.000 / 1000$	2.49	MT
			Total :	2.49	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: $((2*b+a)*(d+f))*n*sg$	$((2*22.000+15.000)*(3.500+2.500))*6.000*0.500$	1,062.00	cum
			Total :	1,062.00	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: $((2*b+a)*(d+f))*n*gsb*(1-gsb\_per/100)$	$((2*22.000+15.000)*(3.500+2.500))*6.000*0.200*(1-11.690/100)$	375.14	Cum
			Total :	375.14	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: $((2*b+a)*(d+f))*n*gsb*(gsb\_per/100)$	$((2*22.000+15.000)*(3.500+2.500))*6.000*0.200*(11.690/100)$	49.66	Cum
			Total :	49.66	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: $((2*b+a)*(d+f))*n*(wmm1+wmm2)$	$((2*22.000+15.000)*(3.500+2.500))*6.000*(0.125+0.125)$	531.00	Cum
			Total :	531.00	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: $((2*b+a)*f)*n$	$((2*22.000+15.000)*2.500)*6.000$	885.00	sqm
			Total :	885.00	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: $((2*b+a)*(d+f))*n$	$((2*22.000+15.000)*(3.500+2.500))*6.000$	2,124.00	sqm
			Total :	2,124.00	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			
		Refer: Busbay (2 Lane) Formula: $((2*b+a)*(d+f))*n$	$((2*22.000+15.000)*(3.500+2.500))*6.000$	2,124.00	sqm



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
			Total :	2,124.00	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: $((2*b+a)*(d+f))*n*dbm$	$((2*22.000+15.000)*(3.500+2.500))*6.000*0.070$	148.68	cum
			Total :	148.68	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: $((2*b+a)*(d+f))*n*bc$	$((2*22.000+15.000)*(3.500+2.500))*6.000*0.040$	84.96	cum
			Total :	84.96	cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
1					
		Refer: Triangular Shaped Drain Formula: $(l_3+l_4)*l$	$(0.712+0.530)*36557.000$	45,403.79	
		Refer: Triangular Shaped Drain Formula: $(l_3+l_4)*t_4*l$	$(0.712+0.530)*0.025*36557.000$	1,135.10	
			Total :	46,538.89	
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			
		Refer: PCC Chut Drain Formula: $(a+2*wall\_thk+0.1*2)*f\_thk*l$	$(0.600+2*0.150+0.1*2)*0.100*1755.000$	193.05	cum
		Refer: RCC Cover Drain 1.0m Formula: $(t\_width+off*2)*((ht+b\_slab\_thk)/2)*l$	$(1.750+0.100*2)*((0.900+0.150)/2)*4043.000$	4,139.02	cum
		Refer: Triangular Shaped Drain Formula: $0.5*l_4*l_3*l$	$0.5*0.530*0.712*36557.000$	6,897.58	cum
			Total :	11,229.65	cum
3	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: Triangular Shaped Drain Formula: $(l_1*t_1+(l_2-t_1)*t_1)*l$	$(0.530*0.100+(0.342-0.100)*0.100)*36557.000$	2,822.20	cum
			Total :	2,822.20	cum
4	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade			



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: RCC Cover Drain 1.0m Formula: $(t\_width+off*2)*pcc\_thk*I$	$(1.750+0.100*2)*0.100*4043.000$	788.39	cum
		Refer: Triangular Shaped Drain Formula: $(I3*t2+(I4-t2)*t2)*I$	$(0.712*0.050+(0.530-0.050)*0.050)*36557.000$	2,178.80	cum
			Total :	2,967.18	cum
5	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: $(a+2*wall\_thk+0.1*2)*f\_thk*I$	$(0.600+2*0.150+0.1*2)*0.100*1755.000$	193.05	cum
			Total :	193.05	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: $((a+wall\_thk*2)*btm\_thk+ht*wall\_thk*2)*I$	$((0.600+0.150*2)*0.150+0.400*0.150*2)*1755.000$	447.53	cum
			Total :	447.53	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: $(ht*w\_thk*2+t\_width*b\_slab\_thk+t\_width*t\_slab\_thk)*I$	$(0.900*0.200*2+1.750*0.150+1.750*0.125)*4043.000$	3,401.17	cum
			Total :	3,401.17	cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
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)*4043.000*0.050	170.06	MT
			Total :	170.06	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)	(4043.000/2+1)	2,022.50	Rm
			Total :	2,022.50	Rm
10	24/i/b	Galvanised Mild steel J /L hook			
		Refer: RCC Cover Drain 1.0m Formula: l/15*4*.3	4043.000/15*4*.3	323.44	kg
			Total :	323.44	kg
11	40	Gextextile material (fine net)			
		Refer: RCC Cover Drain 1.0m Formula: (l/1)*4*(150*150/1000^2)	(4043.000/1)*4*(150*150/1000^2)	363.87	sqm
			Total :	363.87	sqm



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: $(((0.5*((pcc\_thk+H2+d)+(pcc\_thk+d))*((0.211+0.600)*(0.600-0.150)))+(B1+2*o))+((H2+d)*(mw-o)))*I*(1-p\_c)$	$(((0.5*((0.300+0.211+0.600)+(0.300+0.600))*(1.270+2*0.150))+((0.211+0.600)*(0.600-0.150)))*1713.000)*(1-0.200)$	2,663.49	cum
		Refer: Retaining Wall 3.0m Formula: $(((0.5*((pcc\_thk+H2+d)+(pcc\_thk+d))*((0.267+0.600)*(0.600-0.150)))+(B1+2*o))+((H2+d)*(mw-o)))*I*(1-p\_c)$	$(((0.5*((0.300+0.267+0.600)+(0.300+0.600))*(1.600+2*0.150))+((0.267+0.600)*(0.600-0.150)))*50.000)*(1-0.200)$	94.15	cum
			Total :	2,757.64	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: $(((0.5*((pcc\_thk+H2+d)+(pcc\_thk+d))*((0.211+0.600)*(0.600-0.150)))+(B1+2*o))+((H2+d)*(mw-o)))*I*p\_c$	$(((0.5*((0.300+0.211+0.600)+(0.300+0.600))*(1.270+2*0.150))+((0.211+0.600)*(0.600-0.150)))*1713.000)*0.200$	665.87	cum
		Refer: Retaining Wall 3.0m Formula: $(((0.5*((pcc\_thk+H2+d)+(pcc\_thk+d))*((0.267+0.600)*(0.600-0.150)))+(B1+2*o))+((H2+d)*(mw-o)))*I*p\_c$	$(((0.5*((0.267+0.600)+(0.600))*(1.600+2*0.150))+((0.267+0.600)*(0.600-0.150)))*50.000)*0.200$	17.84	cum
			Total :	683.71	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: $mw*(H2+H1)*I$	$0.600*(0.211+2.000)*1713.000$	2,272.47	cum
		Refer: Retaining Wall 3.0m Formula: $mw*(H2+H1)*I$	$0.600*(0.267+3.000)*50.000$	98.01	cum
			Total :	2,370.48	cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
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: $((0.5*(B1+e)*d)+(0.5*B1*H2))*l$	$((0.5*(1.270+1.067)*0.600)+(0.5*1.270*0.211))*1713.000$	1,430.50	cum
		Refer: Retaining Wall 3.0m Formula: $((0.5*(B1+B3)*d)+(0.5*B1*H2))*l$	$((0.5*(1.600+1.400)*0.600)+(0.5*1.600*0.267))*50.000$	55.68	cum
			Total :	1,486.18	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: $(B2+2*o)*pcc\_thk*l$	$(1.284+2*0.150)*0.300*1713.000$	814.02	cum
		Refer: Retaining Wall 3.0m Formula: $(B2+2*o)*pcc\_thk*l$	$(1.622+2*0.150)*0.300*50.000$	28.83	cum
			Total :	842.85	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: $(0.5*(T+e)*(H1-d))*l$	$(0.5*(0.600+1.067)*(2.000-0.600))*1713.000$	1,998.90	cum
		Refer: Retaining Wall 3.0m Formula: $(0.5*(T+B3)*(H1-d))*l$	$(0.5*(0.600+1.400)*(3.000-0.600))*50.000$	120.00	cum
			Total :	2,118.90	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: $(l-(l/10*\text{gap}))*\text{para\_ht}*\text{para\_w}$	$(1713.000-(1713.000/10*0.300))$ $*0.450*0.300$	224.32	cum
		Refer: Retaining Wall 3.0m Formula: $(l-(l/10*\text{gap}))*\text{para\_ht}*\text{para\_w}$	$(50.000-(50.000/10*0.300))$ $*0.450*0.300$	6.55	cum
			Total :	230.87	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: $n*l$	$2.000*1713.000$	3,426.00	Rm
		Refer: Retaining Wall 3.0m Formula: $n*l$	$3.000*50.000$	150.00	Rm
			Total :	3,576.00	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: $(h+2*0.5)*(e+f)*(1-p)*l$	$(1.890+2*0.5)*(0.850+0.300)*(1-0.200)*5509.000$	14,647.33	cum
			Total :	14,647.33	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: $(h+2*0.5)*(e+f)*p*l$	$(1.890+2*0.5)*(0.850+0.300)*0.200*5509.000$	3,661.83	cum
			Total :	3,661.83	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: $c*b*l$	$1.550*0.300*5509.000$	2,561.69	cum
			Total :	2,561.69	cum
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: $d*b*l$	$0.450*0.300*5509.000$	743.72	cum
			Total :	743.72	cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
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: $0.5*(e+(e-(h/5)))*h*I$	$0.5*(0.850+(0.850-(1.890/5)))*1.890*5509.000$	6,882.34	cum
			Total :	6,882.34	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: $g*f*I$	$1.933*0.300*5509.000$	3,194.67	cum
			Total :	3,194.67	cum
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: $(0.5*((a+(c+d)/3)+a)*(d+c)+i*d+i*m)*I$	$(0.5*((0.600+(1.550+0.450)/3)+0.600)*(0.450+1.550)+0.100*0.450+0.100*0.000)*5509.000$	10,531.37	cum
			Total :	10,531.37	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: $(l/1.2)*(h-j-i)$	$(5509.000/1.2)*(1.890-0.600-0.100)$	5,463.09	Rm
			Total :	5,463.09	Rm



BILL OF QUANTITY (STRUCTURE PART)



Bill No : 12. 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	1,528.00		
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	13,900.00		
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	797.00		
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	4,701.00		
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	12,407.00		
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	9,956.00		
7	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications				



Bill No : 12. Culvert

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
			Rm	6,120.00		
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	5,116.00		
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	205.00		
10	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.	sqm	2,679.00		
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 : 12. Culvert

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
			m	1,047.00		
12	10.06/b	Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Super-Structure	Ton	226.00		
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	2,819.00		
14	16.11	Drainage Spouts complete as per drawing and Technical specification	each	346.00		
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	5,116.00		
Sub Total of				Super Structure		
		Protection Work				
16	10.19	Dry Boulder pitching	cum	1,410.00		
17	13.01/a/i /Nsc	Earth work in excavation Ordinary soil For Protection Work	cum	8,340.00		

Bill No : 12. 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	2,462.00		
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	2,679.00		
20	09.01/nsc 1	Laying Reinforced Cement Concrete Pipe NP4 / Prestressed Concrete Pipe on First Class Bedding in Single Row . B)1200 mm dia	Rm	32.00		
Sub Total of Miscellaneous Work						
Total of Bill 12. Culvert						



Bill No : 13. 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	810.00		
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	198.00		
3	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	34.00		
4	14.03/g	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M30 Grade	cum	225.00		
5	14.08	HYSD bar reinforcement in foundation complete as per drawing and technical specification	MT	27.00		
Sub Total of Foundation						
Sub Structure						
6	13.03/a	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials	cum	60.00		
7	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	345.00		
8	13.04	Filter medium behind abutment, wing wall and return wall complete as per drawing and technical specification .	cum	113.00		

Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
9	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	160.00		
10	15.03/i/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 M40 Grade upto 5m height	cum	7.00		
11	15.05	HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification	MT	26.00		
12	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	51,960.00		
13	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	1,440.00		
14	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	118.00		



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
Sub Total of			Sub Structure			
		Super Structure				
15	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	456.00		
16	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	18.00		
17	14/nsc1/i	Filler joint i)Providing & fixing 2 mm thick corrugated copper plate in expansion joint complete as per drawing & Technical Specification.	m	45.00		
18	14/nsc1/i	Filler joint Providing & fixing 20 mm thick compressible fibre board in expansion joint complete as per drawing & Technical Specification.	m	45.00		
19	14/nsc1/i 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	45.00		



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
20	14/nsc1/i	iv)Providing and filling joint sealing compound as per drawings and technical specifications with coarse sand and 6 per cent bitumen by weight.	m	45.00		
21	16.01/b/i /c2/ii	RCC Grade M30 For solid slab super-structure Approach Slab	cum	209.00		
22	16.03	HYSD bar reinforcement in super-structure complete as per drawing and technical specifications	MT	42.00		
23	16.05	Cement concrete wearing coat M-30 grade including reinforcement complete as per drawing and Technical Specifications	cum	8.00		
24	16.11	Drainage Spouts complete as per drawing and Technical specification	each	12.00		
25	16.12/Ns	Reinforced cement concrete approach slab M-30 including reinforcement and formwork complete as per drawing and Technical specification	cum	58.00		
26	16.13	PCC M15 ordinary Grade leveling course below approach slab complete as per drawing and Technical specification Below Approach Slab	cum	23.00		
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	48.00		



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
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	456.00		
Sub Total of			Super Structure			
		Protection Work				
29	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	83.00		
30	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	43.00		
31	17.01/a	laying apron complete as per drawing and Technical specification. Boulder				



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
			cum	189.00		
32	17.02	Filter material underneath pitching in slopes complete as per drawing and Technical specification	cum	92.00		
Sub Total of Protection Work						
		Miscellaneous Work				
33	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.	sqm	211.00		
Sub Total of Miscellaneous Work						
		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	3,101.00		
35	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	61.00		
36	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.				



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
			cum	20.00		
37	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	20.00		
38	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	409.00		
39	09.01/nsc1	Laying Reinforced Cement Concrete Pipe NP4 / Prestressed Concrete Pipe on First Class Bedding in Single Row . B)1200 mm dia	Rm	20.00		
Sub Total of				Diversion Work		
Total of Bill 13. Minor Bridge						



QUANTITY CALCULATION (STRUCTURE PART)



Summary sheet of Minor Bridges (Quantities)

		CHAINAGE	110.794	129.184	
		Span(m) x Height(m)=	1 x 10m RCC Solid Slab	1 x 16m RCC T Beam	Total Quantity
ITEM NO.	Description	Unit			
	A. Foundation				
Item no 1(a)	Excavation (upto 3 m depth)	cum	330.73	478.80	810
Item no 1(b)	Excavation (3 m to 6 m depth in soil)	cum	0.00	197.83	198
Item no 2	R.C.C M30 (Foundation)	cum	69.50	155.72	225
Item no 3	P.C.C (M-15)	cum	14.36	20.03	34
Item no 4	Pile cap(M30)	cum			0
Item no 5	Bored cast-in-situ M35 grade R.C.C. Piles	m			0
Item no 6	steel liner 6mm thick	ton			0
Item no 4	Steel (Foundation)	ton	8.34	18.69	27
	B. SubStructure				
Item no 1(a)	R.C.C M30 (Substructure) upto 5m	cum	53.99	105.54	160
Item no 1(b)	R.C.C M30 (Substructure) from 5m to 10m	cum	0.00	4.36	4
Item no 1(c)	R.C.C M30 (Substructure) above 10m	cum			0
Item no 2	R.C.C. M35 for Pedestals	cum	0.00	11.61	12
Item no 2	Steel (Substructure)	ton	8.10	18.23	26
Item no 3	Weep Holes	Rm	52.00	66.00	118
Item no 4	Backfilling - Granular Material	cum	21.84	38.43	60
Item no 5	Backfilling - Sandy Material	cum	104.92	240.20	345
Item no 6	Filter Media	cum	37.74	75.01	113
Item no 8	Pot cum PTFE type Bearing	Ton		1440.00	1440
Item no 10	Elastomeric Bearing	cucm		51960.00	51960
	C. Super Structure				
Item no 1(a)	R.C.C M30 (Superstructure)	cum	71.65	137.40	209
Item no 2	Steel (Superstructure)	ton	14.33	27.48	42
Item no 3(a)	Bituminous Concrete Wearing Coat(65mm)	cum	7.11	11.11	18
Item no 3(b)	Mastic Asphalt	sqm	177.76	277.86	456
Item no 3(c)	Tack Coat	sqm	177.76	277.86	456
Item no 3(d)	Cement Concrete Wearing Course	cum			0
Item no 4	RCC railing	metre			0
Item no 5	Crash Barrier	metre	32.32	50.52	83
Item no 6	Drainage Spout	each	4.00	8.00	12
Item no 7	PCC below approach slab	cum	11.32	11.32	23
Item no 18	R.C.C. Approach Slab with steel (M30)	cum	28.83	28.83	58
Item no 13	Strip Seal Expansion Joint	metre	24.00	24.00	48
Item no 9	Filler Joint				
	(i) copper plate	metre	22.40	22.40	45
	(ii) fibar board	metre	22.40	22.40	45
	(iii) 20mm thick premoulded joint filler	metre	22.40	22.40	45
	(iv) joint sealing compound	metre	22.40	22.40	45

Summary sheet of Minor Bridges (Quantities)

		CHAINAGE	110.794	129.184	
		Span(m) x Height(m)=	1 x 10m RCC Solid Slab	1 x 16m RCC T Beam	Total Quantity
ITEM NO.	Description	Unit			
	D. Protection Work				
Item no 1a	Boulder Pitching	cum	77.32	111.63	189
Item no 1b	Filter Blanket	cum	37.33	54.48	92
Item no 2	Falling Apron on River Bed	cum	34.28	39.71	74
Item no 3	Toe Wall	cum	20.14	23.34	43
	E. Miscellaneous				
Item no 1	Painting	sqm	82.22	128.52	211
Item no 2	Citizen information board	no.			0
Item no 3	Confirmatory Boring in soil	m			0
Item no 4	Confirmatory Boring in Hard rock	m			0
Item no 5	Dismantle of Existing Bridge				
5.1	Foundation	cum			0
5.2	RCC	cum			0
	F. Diversion Work				
Item no 1	Earth filling for Approach Road	cum		3101.24	3101
Item no 2	GRANULAR MATERIAL	cum			0
Item no 3	Hume Pipe	m		20.00	20
Item no 4	Pavement Composition				
4.1	BC	cum		408.60	409
4.2	DBM	cum		20.43	20
4.3	WBM	cum		102.15	102
4.4	GSB	cum		61.29	61

ESTIMATE OF QUANTITY OF RCC SOLID SLAB BRIDGE

Chainage_110.794 Km

1 span of 8 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity

A. FOUNDATION

1	Excavation (up to 3m)						
	Foundation A1	cum	1	13.300	4.500	2.678	160.278
	Foundation A2	cum	1	13.300	4.500	2.848	170.453
						Total	330.731

2	Foundation slab RCC-M30						
	Toe side (trapezoidal part)	cum	2	12.300	0.750		18.450
	Heel side (trapezoidal part)	cum	2	12.300	1.275		31.365
	Middle portion (rectangular)	cum	2	12.300	0.800	1.000	19.680
						Total	69.495

3	Levelling Course M15						
	Below Foundation slabs	cum	2	12.600	3.800	0.150	14.364
						Total	14.364

4	Steel Reinforcement (HYSD) for Foundation						
	@ 120 kg/cum of concrete volume for foundation slab	ton			8.339		8.339
						Total	8.339

B. SUBSTRUCTURE

5	RCC M30 for Substructure upto 5 m						
	Abutment wall	cum	2	0.800	12.000	0.900	17.280
	Abutment Cap	cum	2	0.800	12.000	0.800	15.360
	Fin wall	cum	4	3.520	0.400	1.924	10.836
	Dirt wall	cum	2	0.360	12.000	0.750	6.480
	Bracket	cum	2	0.180		11.200	4.032
						Total	53.988



ESTIMATE OF QUANTITY OF RCC SOLID SLAB BRIDGE

Chainage_110.794 Km

1 span of 8 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity

6	Steel reinforcement (HYSD Bars) for substructure						
	150 kg/cum	ton			8.098		8.098
						Total	8.098

7	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 = $12/2+1 =$					7	
	No of weep holes in vertical direction per abutment = $0.9/1 +1 =$					2	
	No of weep holes in vertical direction per Fin wall = $1.924/2+1 =$					2	
	No of weep holes in horizontal direction per fin wall = $3.52/2+1 =$					3	
	Total no of Weep holes per abutment = 7×2					14	
	Total no of Weep holes per fin wall = 2×3					6	
	Total nos of weep holes = $14 \times 2 + 6 \times 4$						52.00

8	Backfilling(Granular Material)						
	Foundations	cum	2	16.800		0.650	21.840
						Total	21.840

9	Backfilling(Sandy Material)						
	Behind Abutment & Fin wall	cum	2	2.920	11.200	2.181	142.655
	Deduction for filter media	cum					-37.738
						Total	104.917

10	Filter media						
	Behind Abutment	cum	2	12.000	0.600	1.966	28.310
	Deduction for bracket portion	cum	2	11.200	0.135		-3.024
	Behind fin Wall	cum	4	3.520	0.600	1.474	12.452
						Total	37.738



ESTIMATE OF QUANTITY OF RCC SOLID SLAB BRIDGE

Chainage_110.794 Km

1 span of 8 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity

C. SUPERSTRUCTURE

11	RCC-M30 (Up to 5M)						
	Slab	cum	1	8.400	8.530		71.652
Total							71.652

12	Superstructure Steel (HYSD Bars)						
	200 kg/cum	Ton		14.330			14.330
Total							14.330

13	Bituminus concrete wearing course						
		cum	1	16.160	11.000	0.040	7.110
Total							7.110

14	Wearing Course (Mastic Asphalt)						
		sqm	1	16.160	11.000		177.760
Total							177.760

15	Tack Coat						
		sqm	1	16.160	11.000		177.760
Total							177.760

16	Crash Barrier (RCC M40)	m	2	16.160			32.320
Total							32.320

17	Drainage Spout	nos.	4				4.000
Total							4.000

18	PCC below Approach Slab						
		cum	2	11.200	3.370	0.150	11.323
Total							11.323

19	Approach Slab						
		cum	2	11.160	3.500	0.369	28.826
Total							28.826

20	Strip Seal Expansion Joint						
		m	2	12.000			24.000
Total							24.000



ESTIMATE OF QUANTITY OF RCC SOLID SLAB BRIDGE

Chainage_110.794 Km

1 span of 8 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
21	Filler Joint						
	(i) copper plate	m	2	11.200			22.400
	(ii) fibar board	m	2	11.200			22.400
	(iii) 20mm thick pre moulded joint filler	m	2	11.200			22.400
	(iv) joint sealing compound	m	2	11.200			22.400

D. MISCELLANEOUS

22	Painting						
	Crash Barrier	sqm	2	2.544		16.16	82.22
						Total	82.220

E.PROTECTION WORK

23	Boulder Pitching						
	A1 side	cum	2	47.841		0.300	28.705
	A2 side	cum	2	42.465		0.300	25.479
	Bank protection (A1 side)	cum	1	38.556		0.300	11.567
	Bank protection (A2 side)	cum	1	38.556		0.300	11.567
						Total	77.318

24	Filter Blanket 150mm thick below pitching						
	A1 side	cum	2	47.841		0.150	14.352
	A2 side	cum	2	42.465		0.150	12.740
	Bank protection (A1 side)	cum	1	34.116		0.150	5.117
	Bank protection (A2 side)	cum	1	34.116		0.150	5.117
						Total	37.326

25	Floor Protection(A-1 & A-2 side) with stone blanket						
	A1 side	cum	2	8.415	1.016		17.099
	A2 side	cum	2	8.181	1.050		17.180
						Total	34.279

26	PCC(M15) Toe Wall						
	A1 side	cum	2	14.830	0.345		10.233
	A2 side	cum	2	14.363	0.345		9.910
						Total	20.143



ESTIMATE OF QUANTITY OF RCC SOLID SLAB BRIDGE

Chainage_129.184 Km

1 span of 16 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity

A. FOUNDATION

1	Excavation (up to 3m)						
	Foundation A1	cum	1	13.300	6.000	3.000	239.400
	Foundation A2	cum	1	13.300	6.000	3.000	239.400
						Total	478.800

2	Excavation (3 m to 6 m depth)						
	Foundation A1	cum	1	13.300	6.000	1.122	89.536
	Foundation A2	cum	1	13.300	6.000	1.357	108.289
						Total	197.825

3	Foundation slab RCC-M30						
	Toe side (trapezoidal part)	cum	2	12.300	1.800		44.280
	Heel side (trapezoidal part)	cum	2	12.300	2.880		70.848
	Middle portion (rectangular)	cum	2	12.300	1.100	1.500	40.590
						Total	155.718

4	Levelling Course M15						
	Below Foundation slabs	cum	2	12.600	5.300	0.150	20.034
						Total	20.034

5	Steel Reinforcement (HYSD) for Foundation						
	@ 120 kg/cum of concrete volume for foundation slab	ton			18.686		18.686
						Total	18.686



ESTIMATE OF QUANTITY OF RCC SOLID SLAB BRIDGE

Chainage_129.184 Km

1 span of 16 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity

B. SUBSTRUCTURE

6	RCC M30 for Substructure upto 5 m						
	Abutment wall	cum	2	1.100	12.000	1.900	50.160
	Abutment Cap	cum	2	1.100	12.000	1.000	26.400
	Fin wall	cum	4	3.520	0.400	1.924	10.836
	Dirt wall	cum	2	0.360	12.000	2.100	18.144
	Total						105.540

7	RCC M30 for Substructure (5 - 10) m						
	Dirt wall	cum	2	0.360	12.000	0.038	0.328
	Bracket	cum	2	0.180		11.200	4.032
	Total						4.360

8	RCC M-35 for Pedestal & Seismic Arrestor Blocks height upto 5.0m						
	Pedestal at Abutment	cum	4	0.800	0.800	0.300	0.768
		cum	4	0.800	0.800	0.375	0.960
	Block RB2	cum	8	1.000	0.550	1.300	5.720
	Block RB1	cum	4	0.800	1.000	1.300	4.160
	Total						11.608

9	Steel reinforcement (HYSD Bars) for substructure						
	150 kg/cum	ton		18.226			18.226
	Total						18.226

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 = $12/2+1 =$					7	
	No of weep holes in vertical direction per abutment = $1.9/1 +1 =$					3	
	No of weep holes in vertical direction per Fin wall = $1.924/2+1 =$					2	
	No of weep holes in horizontal direction per fin wall = $3.52/2+1 =$					3	
	Total no of Weep holes per abutment = 7×3					21	
	Total no of Weep holes per fin wall = 2×3					6	
	Total nos of weep holes = $21 \times 2 + 6 \times 4$						66.00

11	Backfilling(Granular Material)						
	Foundations	cum	2	18.300		1.050	38.430
	Total						38.430

12	Backfilling(Sandy Material)						
	Behind Abutment & Fin wall	cum	2	2.920	11.200	4.819	315.201
	Deduction for filter media	cum					-75.006
	Total						240.195

13	Filter media						
	Behind Abutment	cum	2	12.000	0.600	4.554	
	Deduction for bracket portion	cum	2	11.200	0.135		
	Behind fin Wall	cum	4	3.520	0.600	1.474	
	Total						75.006



ESTIMATE OF QUANTITY OF RCC SOLID SLAB BRIDGE

Chainage_129.184 Km

1 span of 16 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
14	Pot cum PTFE Bearing						
		ton capacity	8	180.00			1440.00
Total=							1440.00

15	Elastomeric Bearing						
	B2	cucm	4	35.00	42.50	4.80	28560.00
	B3	cucm	8	25.00	30.00	3.90	23400.00
Total=							51960.00

C. SUPERSTRUCTURE

16	RCC-M30						
	Long girder middle portion	cum	1	12.260	7.578		92.906
	Long girder end straight portion	cum	2	1.000	8.818		17.636
	Long girder end varrying portion	cum	2	1.200	8.198		19.675
	End cross girder	cum	2	0.300	7.688		4.613
	Intermediate cross girder	cum	1	0.300	8.576		2.573
Total							137.403

17	Superstructure Steel (HYSD Bars)						
	200 kg/cum	Ton		27.481			27.481
Total							27.481

18	Bituminus concrete wearing course						
		cum	1	25.260	11.000	0.040	11.114
Total							11.114

19	Wearing Course (Mastic Asphalt)						
		sqm	1	25.260	11.000		277.860
Total							277.860

20	Tack Coat						
		sqm	1	25.260	11.000		277.860
Total							277.860

21	Crash Barrier (RCC M40)	m	2	25.260			50.520
Total							50.520

22	Drainage Spout	nos.	8				8.000
Total							8.000



ESTIMATE OF QUANTITY OF RCC SOLID SLAB BRIDGE

Chainage_129.184 Km

1 span of 16 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
23	PCC below Approach Slab						
		cum	2	11.200	3.370	0.150	11.323
Total							11.323

24	Approach Slab						
		cum	2	11.160	3.500	0.369	28.826
Total							28.826

25	Strip Seal Expansion Joint						
		m	2	12.000			24.000
Total							24.000

26	Filler Joint						
	(i) copper plate	m	2	11.200			22.400
	(ii) fibar board	m	2	11.200			22.400
	(iii) 20mm thick premoulded joint filler	m	2	11.200			22.400
	(iv) joint sealing compound	m	2	11.200			22.400

D. MISCELLANEOUS

27	Painting						
	Crash Barrier	sqm	2	2.544		25.26	128.52
Total							128.520

E.PROTECTION WORK

28	Boulder Pitching						
	A1 side	cum	2	78.009		0.300	46.805
	A2 side	cum	2	69.480		0.300	41.688
	Bank protection (A1 side)	cum	1	38.556		0.300	11.567
	Bank protection (A2 side)	cum	1	38.556		0.300	11.567
Total							111.627

29	Filter Blanket 150mm thick below pitching						
	A1 side	cum	2	78.009		0.150	23.403
	A2 side	cum	2	69.480		0.150	20.844
	Bank protection (A1 side)	cum	1	34.116		0.150	5.117
	Bank protection (A2 side)	cum	1	34.116		0.150	5.117
Total							54.481

30	Floor Protection(A-1 & A-2 side) with stone blanket						
	A1 side	cum	2	9.616	1.050		20.194
	A2 side	cum	2	9.293	1.050		19.515
Total							39.709

31	PCC(M15) Toe Wall						
	A1 side	cum	2	17.233	0.345		
	A2 side	cum	2	16.586	0.345		
Total							23.335

F.DIVERSION ROAD



ESTIMATE OF QUANTITY OF RCC SOLID SLAB BRIDGE

Chainage_129.184 Km

1 span of 16 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
32	Total Earth Filling						Tc
		cum	1	74.290	5.500	7.590	3101.236
Total							3101.236
33	Pavement Composition						
33.1	BC	sqm	1	74.290	5.500		408.595
33.2	DBM	cum	1	74.290	5.500	0.050	20.430
33.3	WBM	cum	1	74.290	5.500	0.250	102.149
33.4	GSB	cum	1	74.290	5.500	0.150	61.289
34	Hume Pipe (1.2m Dia)						
		m	2	10.000			20.000
Total							20.000



SUMMARY FOR BOX CULVERT		Span(m) x Height(m)=	TYPE-1 2.0X2.0m_TW- 10_Catchpit with stepped_NC	TYPE-2 2.0X2.0m_TW- 10_Catchpit with stepped_SE-6.7%	TYPE-3 2.0X2.0m_TW- 10_Catchpit with stepped_SE-7%	TYPE-4 2.0X2.0m_TW- 11_Catchpit with stepped_NC	TYPE-5 2.0X2.0m_TW- 11_Catchpit with stepped_SE-5.6%	TYPE-6 2.0X2.0m_TW- 11_Catchpit with stepped_SE-5.7%	TYPE-7 2.0X2.0m_TW- 11_Catchpit with stepped_SE-6.7%	TYPE-8 2.0X2.0m_TW- 11_Catchpit with stepped_SE-7%	TYPE-9 2.0X3.0m_TW- 10_Catchpit with stepped_NC	TYPE-10 2.0X3.0m_TW- 10_Catchpit with stepped_SE-7%	TYPE-11 2.0X3.0m_TW- 11_Catchpit with stepped_SE-5.7%
			6	1	2	62	1	3	1	24	4	3	25
Sl No.	Description	Unit											
1	Excavation	cum	55.54	55.54	55.54	59.36	59.36	59.36	59.36	59.36	77.33	77.33	77.33
2	PCC-M15	cum	5.97	5.97	5.97	6.51	6.51	6.51	6.51	6.51	8.71	8.71	8.71
3	RCC-Substructure	cum	31.27	33.23	33.32	33.86	35.85	35.89	36.24	36.35	54.45	57.14	54.45
4	Steel	ton	2.50	2.66	2.67	2.71	2.87	2.87	2.90	2.91	4.36	4.57	4.36
5	Weep holes	nos	18.00	33.00	33.00	18.00	22.00	22.00	33.00	33.00	33.00	44.00	33.00
6	Filter media	cum	36.65	47.71	48.23	38.69	49.27	49.44	51.46	52.10	67.59	82.59	67.59
7	Sand Filling in Foundation Trenches	cum	21.67	20.89	20.87	22.80	22.05	22.04	21.96	21.94	29.07	28.57	29.07
8	RCC-Superstructure(up to 5m)	cum	10.79	9.33	9.33	12.05	10.26	10.26	10.26	10.26	11.73	10.22	11.73
9	Steel	ton	0.86	0.75	0.75	0.96	0.82	0.82	0.82	0.82	0.94	0.82	0.94
10	Bituminous Concrete	cum	0.94	0.94	0.94	1.04	1.04	1.04	1.04	1.04	0.97	0.97	0.97
11	Mastic Asphalt	sqm	23.40	23.40	23.40	26.00	26.00	26.00	26.00	26.00	24.30	24.30	24.30
12	Tack Coat	sqm	23.40	23.40	23.40	26.00	26.00	26.00	26.00	26.00	24.30	24.30	24.30
13	RCC M-40 Crash Barrier	m	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.40	5.40	5.40
14	Drainage Spout	nos	2.00	2.00	2.00	2.00	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	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	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	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	7.00	7.00	7.00	7.00
20	Painting	sqm	13.30	13.30	13.30	13.30	13.30	13.30	13.30	13.30	13.81	13.81	13.81



SUMMARY FOR BOX CULVERT		Span(m) x Height(m)=	TYPE-12 2.0X3.0m_TW- 11_Catchpit with stepped_SE-5.7%
			1
Sl No.	Description	Unit	
1	Excavation	cum	82.81
2	PCC-M15	cum	9.51
3	RCC-Substructure	cum	61.43
4	Steel	ton	4.91
5	Weep holes	nos	33.00
6	Filter media	cum	84.68
7	Sand Filling in Foundation Trenches	cum	30.28
8	RCC-Superstructure(up to 5m)	cum	11.24
9	Steel	ton	0.90
10	Bituminous Concrete	cum	1.08
11	Mastic Asphalt	sqm	27.00
12	Tack Coat	sqm	27.00
13	RCC M-40 Crash Barrier	m	5.40
14	Drainage Spout	nos	2.00
16	Curtain Wall PCC M-20	cum	12.55
17	Excavation in Soil	cum	43.85
18	PCC M-15 Below Curtain Wall	cum	11.64
19	300 mm Boulder Pitching	cum	7.00
20	Painting	sqm	13.81

SUMMARY FOR BOX CULVERT		Span(m) x Height(m)=	TYPE-13 2.0X3.0m_TW- 11_Catchpit with stepped_SE-6.7%	TYPE-14 2.0X3.0m_TW- 11_Catchpit with stepped_SE-7%	TYPE-15 3.0X3.0m_TW- 11_Catchpit with stepped_NC	TYPE-16 3.0X3.0m_TW- 11_Catchpit with stepped_SE-7%	TYPE-17 3.0X3.0m_TW- 11_Catchpit with stepped_NC_EC	TYPE-18 3.0X4.0m_TW- 10_Catchpit with stepped_SE-7%	TYPE-19 3.0X4.0m_TW- 11_Catchpit with stepped_NC	TYPE-20 3.0X4.0m_TW- 11_Catchpit with stepped_SE-7%	TYPE-21 4.0X3.0m_TW- 11_Catchpit with stepped_NC	TYPE-22 4.0X3.0m_TW- 11_Catchpit with stepped_SE-7%	TYPE-23 4.0X3.0m_TW- 11_Catchpit with stepped_SE_EC
			1	8	3	2	1	1	5	4	2	1	1
SI No.	Description	Unit											
1	Excavation	cum	82.81	82.81	87.25	87.25	103.18	104.99	112.73	112.73	93.20	93.20	109.52
2	PCC-M15	cum	9.51	9.51	10.11	10.11	10.11	11.94	13.04	13.04	10.33	10.33	10.33
3	RCC-Substructure	cum	61.90	62.04	64.44	66.72	63.19	91.74	95.41	99.67	71.81	75.80	71.82
4	Steel	ton	4.95	4.96	5.16	5.34	5.06	7.34	7.63	7.97	5.74	6.06	5.75
5	Weep holes	nos	52.00	52.00	33.00	52.00	39.00	65.00	52.00	65.00	33.00	52.00	39.00
6	Filter media	cum	87.24	88.05	78.35	89.73	120.65	126.73	112.51	133.81	73.03	90.59	117.49
7	Sand Filling in Foundation Trenches	cum	30.19	30.16	28.27	27.88	30.94	33.51	35.97	35.39	24.24	23.39	23.48
8	RCC-Superstructure(up to 5m)	cum	11.24	11.24	17.99	17.99	32.47	17.87	22.35	19.65	28.44	25.00	37.99
9	Steel	ton	0.90	0.90	1.44	1.44	2.60	1.43	1.79	1.57	2.27	2.00	3.04
10	Bituminous Concrete	cum	1.08	1.08	1.54	1.54		1.41	1.57	1.57	2.00	2.00	
11	Mastic Asphalt	sqm	27.00	27.00	38.40	38.40		35.28	39.20	39.20	50.00	50.00	
12	Tack Coat	sqm	27.00	27.00	38.40	38.40		35.28	39.20	39.20	50.00	50.00	
13	RCC M-40 Crash Barrier	m	5.40	5.40	7.68	7.68		7.84	7.84	7.84	10.00	10.00	
14	Drainage Spout	nos	2.00	2.00	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	13.91	13.91	13.91	13.91	13.91	13.91	15.27	15.27	15.27
17	Excavation in Soil	cum	43.85	43.85	50.80	50.80	52.56	50.80	50.80	50.80	57.74	57.74	59.90
18	PCC M-15 Below Curtain Wall	cum	11.64	11.64	14.22	14.22	14.22	14.22	14.22	14.22	16.80	16.80	16.80
19	300 mm Boulder Pitching	cum	7.00	7.00	8.96	8.96	8.96	8.96	8.96	8.96	10.93	10.93	10.93
20	Painting	sqm	13.81	13.81	19.65	19.65		20.05	20.05	20.05	25.58	25.58	



SUMMARY FOR BOX CULVERT		Span(m) x Height(m)=	TYPE-24 4.0X4.0m_TW- 11_Catchpit with stepped_SE_EC	TYPE-25 4.0X5.0m_TW- 11_Catchpit with stepped_NC	TYPE-26 4.0X5.0m_TW- 11_Catchpit with stepped_SE-7%	TYPE-27 4.0X5.0m_TW- 11_Catchpit with stepped_SE_EC	TYPE-28 4.0X5.0m_TW- 11_Catchpit with stepped_SE_EC	TYPE-29 5.0X3.0m_TW- 11_Catchpit with stepped_SE_EC	TYPE-30 5.0X4.0m_TW- 11_Catchpit with stepped_NC	TYPE-31 5.0X4.0m_TW- 11_Catchpit with stepped_SE-7%	TYPE-32 5.0X5.0m_TW- 10_Catchpit with stepped_NC	TYPE-33 5.0X5.0m_TW- 11_Catchpit with stepped_SE-7%	Total
SI No.	Description	Unit	1	3	2	1	2	2	3	1	1	3	181
1	Excavation	cum	139.93	146.78	146.78	170.93	110.04	128.62	127.66	127.66	144.93	156.68	13900
2	PCC-M15	cum	13.28	15.95	15.95	15.95	11.93	11.93	13.83	13.83	15.06	16.47	1528
3	RCC-Substructure	cum	106.60	150.12	155.77	150.18	90.89	86.41	115.81	120.87	149.66	169.10	9956
4	Steel	ton	8.53	12.01	12.46	12.01	7.27	6.91	9.26	9.67	11.97	13.53	797
5	Weep holes	nos	60.00	75.00	90.00	85.00	52.00	45.00	52.00	65.00	75.00	90.00	6120
6	Filter media	cum	179.18	162.14	187.48	235.45	91.94	138.14	115.09	136.69	158.83	190.04	12407
7	Sand Filling in Foundation Trenches	cum	34.87	37.25	38.03	42.57	23.38	22.94	28.37	27.42	32.94	34.07	4701
8	RCC-Superstructure(up to 5m)	cum	44.10	33.95	30.33	48.90	34.02	52.14	40.23	35.94	40.95	41.08	2819
9	Steel	ton	3.53	2.72	2.43	3.91	2.72	4.17	3.22	2.88	3.28	3.29	226
10	Bituminous Concrete	cum		2.10	2.10				2.50	2.50	2.30	2.56	205
11	Mastic Asphalt	sqm		52.60	52.60				62.40	62.40	57.60	64.00	5116
12	Tack Coat	sqm		52.60	52.60				62.40	62.40	57.60	64.00	5116
13	RCC M-40 Crash Barrier	m		10.52	10.52				12.48	12.48	12.80	12.80	1047
14	Drainage Spout	nos		2.00	2.00				2.00	2.00	2.00	2.00	346
16	Curtain Wall PCC M-20	cum	15.27	15.27	15.27	15.27	61.40	16.64	16.64	16.64	16.64	16.64	2462
17	Excavation in Soil	cum	59.90	57.74	57.74	59.90	2.46	67.24	64.68	64.68	64.68	64.68	8340
18	PCC M-15 Below Curtain Wall	cum	16.80	16.80	16.80	16.80	61.40	19.39	19.39	19.39	19.39	19.39	2382
19	300 mm Boulder Pitching	cum	10.93	10.93	10.93	10.93	12.28	12.89	12.89	12.89	12.89	12.89	1410
20	Painting	sqm		26.91	26.91				31.92	31.92	32.74	32.74	2679



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =10 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	11.000	0.830	42.00
	Shear Key	cum	2	4.800	1.720	0.820	13.54
	Return Wall II	cum		3.510	3.500	0.550	0.00
						Total	55.54

2	PCC-M15						
	Box culvert	cum	1	3.600	7.760	0.150	4.19
	Shear Key	cum	2	3.800	1.560	0.150	1.78
	Return Wall II	cum	0	3.110	2.700	0.150	0.00
						Total	5.97

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	3.600	10.000	0.380	13.68
	Box Side Wall	cum	2	10.00	2.000	0.300	12.00
	Base slab of Return wall II	cum	0	3.010	2.500	0.250	0.00
	Return wall I	cum	4	0.500	2.350	0.250	1.18
	Return wall II	cum	0	3.010	0.225	2.480	0.00
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	10.000	0.01125		0.23
						Total=	31.27

4	Steel						
	@ 80 Kg per cum of concrete	ton					2.50
						Total	2.50

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 = $9.5/2 =$						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	9.500	0.600	1.700	19.38
	Behind Return Wall	cum	4	3.51	2.000	2.050	17.27
						Total	36.65

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					55.54
	Less for PCC	cum					5.97
	Less for Bottom Slab RCC	cum					13.68
	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					0.00
	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	11.000	0.300	8.58
						Total	21.67

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.600	10.000	0.406	10.56
	(+)Haunch	cum	2	10.00	0.01125		0.23
						Total	10.79

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =10 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					0.86
						Total	0.86
10	Bituminous Concrete						
		cum	1	2.60	9.00	0.04	0.94
						Total	0.94
11	Mastic Asphalt						
		sqm	1	2.60	9.00		23.40
						Total	23.40
12	Tack Coat						
		sqm	1	2.60	9.00		23.40
						Total	23.40
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 =10 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 =10 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	11.000	0.830	42.00
	Shear Key	cum	2	4.800	1.720	0.820	13.54
	Return Wall II	cum		4.410	4.300	0.600	0.00
						Total	55.54

2	PCC-M15						
	Box culvert	cum	1	3.600	7.760	0.150	4.19
	Shear Key	cum	2	3.800	1.560	0.150	1.78
	Return Wall II	cum	0	4.010	3.500	0.150	0.00
						Total	5.97

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	3.600	10.000	0.380	13.68
	Box Side Wall	cum	2	10.00	2.302	0.300	13.81
	Base slab of Return wall II	cum	0	3.910	3.300	0.300	0.00
	Return wall I	cum	4	0.500	2.652	0.250	1.33
	Return wall II	cum	0	3.910	0.275	2.732	0.00
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	10.000	0.01125		0.23
						Total=	33.23

4	Steel						
	@ 80 Kg per cum of concrete	ton					2.66
						Total	2.66

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 = $9.5/2 =$					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 = 5×3					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	9.500	0.600	2.002	22.82
	Behind Return Wall	cum	4	4.410	0.600	2.352	24.89
						Total	47.71

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					55.54
	Less for PCC	cum					5.97
	Less for Bottom Slab RCC	cum					13.68
	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					0.00
	Less for Return Wall-II Stem Wall	cum	4	3.910	0.350	0.380	2.08
	Less for Box above Invert upto EGL	cum	1	2.60	11.000	0.300	8.58
						Total	20.89

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.600	10.000	0.350	9.10
	(+)Haunch	cum	2	10.00	0.01125		0.23
						Total	9.33

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =10 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					0.75
						Total	0.75
10	Bituminous Concrete						
		cum	1	2.60	9.00	0.04	0.94
						Total	0.94
11	Mastic Asphalt						
		sqm	1	2.60	9.00		23.40
						Total	23.40
12	Tack Coat						
		sqm	1	2.60	9.00		23.40
						Total	23.40
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 =10 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 =10 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	11.000	0.830	42.00
	Shear Key	cum	2	4.800	1.720	0.820	13.54
	Return Wall II	cum		4.450	4.300	0.600	0.00
						Total	55.54

2	PCC-M15						
	Box culvert	cum	1	3.600	7.760	0.150	4.19
	Shear Key	cum	2	3.800	1.560	0.150	1.78
	Return Wall II	cum	0	4.050	3.500	0.150	0.00
						Total	5.97

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	3.600	10.000	0.380	13.68
	Box Side Wall	cum	2	10.00	2.315	0.300	13.89
	Base slab of Return wall II	cum	0	3.950	3.300	0.300	0.00
	Return wall I	cum	4	0.500	2.665	0.250	1.33
	Return wall II	cum	0	3.950	0.275	2.745	0.00
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	10.000	0.01125		0.23
						Total=	33.32

4	Steel						
	@ 80 Kg per cum of concrete	ton					2.67
						Total	2.67

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 = $9.5/2 =$						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 = 5×3						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	9.500	0.600	2.015	22.97
	Behind Return Wall	cum	4	4.45	2.365		25.26
						Total	48.23

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					55.54
	Less for PCC	cum					5.97
	Less for Bottom Slab RCC	cum					13.68
	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					0.00
	Less for Return Wall-II Stem Wall	cum	4	3.950	0.350	0.380	2.10
	Less for Box above Invert upto EGL	cum	1	2.60	11.000	0.300	8.58
						Total	20.87

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.600	10.000	0.350	9.10
	(+)Haunch	cum	2	10.00	0.01125		0.23
						Total	9.33

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =10 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					0.75
						Total	0.75
10	Bituminous Concrete						
		cum	1	2.60	9.00	0.04	0.94
						Total	0.94
11	Mastic Asphalt						
		sqm	1	2.60	9.00		23.40
						Total	23.40
12	Tack Coat						
		sqm	1	2.60	9.00		23.40
						Total	23.40
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 =10 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		3.510	3.500	0.550	0.00
						Total	59.36

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	0	3.110	2.700	0.150	0.00
						Total	6.51

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	0	3.010	2.500	0.250	0.00
	Return wall I	cum	4	0.500	2.350	0.250	1.18
	Return wall II	cum	0	3.010	0.225	2.480	0.00
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	33.86

4	Steel						
	@ 80 Kg per cum of concrete	ton					2.71
						Total	2.71

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	3.51	2.050		17.27
						Total	38.69

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					59.36
	Less for PCC	cum					6.51
	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					0.00
	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	22.80

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 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 =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		4.350	4.300	0.600	0.00
						Total	59.36

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	0	3.950	3.500	0.150	0.00
						Total	6.51

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	3.600	11.000	0.380	15.05
	Box Side Wall	cum	2	11.00	2.280	0.300	15.05
	Base slab of Return wall II	cum	0	3.850	3.300	0.300	0.00
	Return wall I	cum	4	0.500	2.630	0.250	1.32
	Return wall II	cum	0	3.850	0.275	2.710	0.00
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	35.85

4	Steel						
	@ 80 Kg per cum of concrete	ton					2.87
						Total	2.87

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	1.980	24.95
	Behind Return Wall	cum	4	4.35		2.330	24.33
						Total	49.27

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					59.36
	Less for PCC	cum					6.51
	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					0.00
	Less for Return Wall-II Stem Wall	cum	4	3.850	0.350	0.380	2.05
	Less for Box above Invert upto EGL	cum	1	2.60	12.000	0.300	9.36
						Total	22.05

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 =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		4.360	4.300	0.600	0.00
						Total	59.36

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	0	3.960	3.500	0.150	0.00
						Total	6.51

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	0	3.860	3.300	0.300	0.00
	Return wall I	cum	4	0.500	2.635	0.250	1.32
	Return wall II	cum	0	3.860	0.275	2.715	0.00
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	35.89

4	Steel						
	@ 80 Kg per cum of concrete	ton					2.87
						Total	2.87

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	2.660	2.335	24.43
						Total	49.44

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					59.36
	Less for PCC	cum					6.51
	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					0.00
	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	22.04

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 =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		4.510	4.300	0.600	0.00
						Total	59.36

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	0	4.110	3.500	0.150	0.00
						Total	6.51

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	0	4.010	3.300	0.300	0.00
	Return wall I	cum	4	0.500	2.685	0.250	1.34
	Return wall II	cum	0	4.010	0.275	2.765	0.00
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	36.24

4	Steel						
	@ 80 Kg per cum of concrete	ton					2.90
						Total	2.90

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 = 5×3						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	2.035	25.64
	Behind Return Wall	cum	4	4.51	0.600	2.385	25.82
						Total	51.46

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					59.36
	Less for PCC	cum					6.51
	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					0.00
	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	21.96

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 =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		4.560	4.300	0.600	0.00
						Total	59.36

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	0	4.160	3.500	0.150	0.00
						Total	6.51

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	0	4.060	3.300	0.300	0.00
	Return wall I	cum	4	0.500	2.700	0.250	1.35
	Return wall II	cum	0	4.060	0.275	2.780	0.00
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	36.35

4	Steel						
	@ 80 Kg per cum of concrete	ton					2.91
						Total	2.91

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	2.400		26.27
						Total	52.10

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					59.36
	Less for PCC	cum					6.51
	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					0.00
	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	21.94

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:- 01/23/0 (W =10 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	11.000	0.870	60.29
	Shear Key	cum	2	6.500	1.680	0.780	17.04
	Return Wall II	cum		4.240	4.300	0.600	0.00
						Total	77.33

2	PCC-M15						
	Box culvert	cum	1	5.300	7.840	0.150	6.23
	Shear Key	cum	2	5.500	1.503	0.150	2.48
	Return Wall II	cum	0	3.840	3.500	0.150	0.00
						Total	8.71

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.300	10.000	0.420	22.26
	Box Side Wall	cum	2	10.00	3.000	0.350	21.00
	Base slab of Return wall II	cum	0	3.740	3.300	0.300	0.00
	Return wall I	cum	4	1.300	3.370	0.300	5.26
	Return wall II	cum	0	3.740	0.275	3.490	0.00
	Shear Key	cum	2	5.300	0.53820		5.70
	Haunch	cum	2	10.000	0.01125		0.23
						Total=	54.45

4	Steel						
	@ 80 Kg per cum of concrete	ton					4.36
						Total	4.36

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 = $9.4/2 =$					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	9.400	0.600	2.700	30.46
	Behind Return Wall	cum	4	5.04	0.600	3.070	37.13
						Total	67.59

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					77.33
	Less for PCC	cum					8.71
	Less for Bottom Slab RCC	cum					22.26
	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					0.00
	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	11.000	0.300	8.91
						Total	29.07

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.700	10.000	0.426	11.51
	(+)Haunch	cum	2	10.00	0.01125		0.23
						Total	11.73

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =10 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					0.94
						Total	0.94
10	Bituminous Concrete						
		cum	1	2.70	9.00	0.04	0.97
						Total	0.97
11	Mastic Asphalt						
		sqm	1	2.70	9.00		24.30
						Total	24.30
12	Tack Coat						
		sqm	1	2.70	9.00		24.30
						Total	24.30
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 =10 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 =10 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	11.000	0.870	60.29
	Shear Key	cum	2	6.500	1.680	0.780	17.04
	Return Wall II	cum		5.180	5.150	0.700	0.00
						Total	77.33

2	PCC-M15						
	Box culvert	cum	1	5.300	7.840	0.150	6.23
	Shear Key	cum	2	5.500	1.503	0.150	2.48
	Return Wall II	cum	0	4.780	4.350	0.150	0.00
						Total	8.71

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.300	10.000	0.420	22.26
	Box Side Wall	cum	2	10.00	3.315	0.350	23.21
	Base slab of Return wall II	cum	0	4.680	4.150	0.400	0.00
	Return wall I	cum	4	1.300	3.685	0.300	5.75
	Return wall II	cum	0	4.680	0.325	3.705	0.00
	Shear Key	cum	2	5.300	0.53820		5.70
	Haunch	cum	2	10.000	0.01125		0.23
						Total=	57.14

4	Steel						
	@ 80 Kg per cum of concrete	ton					4.57
						Total	4.57

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 = $9.4/2 =$						5
	No of weep holes in vertical direction per abutment = $3/1 =$						4
	No of weep holes in horizontal direction per return wall = $4.5/2 =$						3
	No of weep holes in vertical direction per return wall = $3/1 =$						4
	Total no of Weep holes per abutment = 5×4						20
	Total no of Weep holes per return wall = 3×4						12
	Total mtrs of weep holes = $20 \times 2 + 12 \times 4$						
						Total	44.00

6	Filter media						
	Behind Abutment	cum	2	9.400	0.600	3.015	34.01
	Behind Return Wall	cum	4	5.98		3.385	48.58
						Total	82.59

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					77.33
	Less for PCC	cum					8.71
	Less for Bottom Slab RCC	cum					22.26
	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					0.00
	Less for Return Wall-II Stem Wall	cum	4	4.680	0.450	0.320	2.70
	Less for Box above Invert upto EGL	cum	1	2.70	11.000	0.300	8.91
						Total	28.57

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.700	10.000	0.370	9.99
	(+)Haunch	cum	2	10.00	0.01125		0.23
						Total	10.22

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =10 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	2.70	9.00	0.04	0.97
						Total	0.97
11	Mastic Asphalt						
		sqm	1	2.70	9.00		24.30
						Total	24.30
12	Tack Coat						
		sqm	1	2.70	9.00		24.30
						Total	24.30
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 =10 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 =10 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	11.000	0.870	60.29
	Shear Key	cum	2	6.500	1.680	0.780	17.04
	Return Wall II	cum		4.240	4.300	0.600	0.00
						Total	77.33

2	PCC-M15						
	Box culvert	cum	1	5.300	7.840	0.150	6.23
	Shear Key	cum	2	5.500	1.503	0.150	2.48
	Return Wall II	cum	0	3.840	3.500	0.150	0.00
						Total	8.71

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.300	10.000	0.420	22.26
	Box Side Wall	cum	2	10.00	3.000	0.350	21.00
	Base slab of Return wall II	cum	0	3.740	3.300	0.300	0.00
	Return wall I	cum	4	1.300	3.370	0.300	5.26
	Return wall II	cum	0	3.740	0.275	3.490	0.00
	Shear Key	cum	2	5.300	0.53820		5.70
	Haunch	cum	2	10.000	0.01125		0.23
						Total=	54.45

4	Steel						
	@ 80 Kg per cum of concrete	ton					4.36
						Total	4.36

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 = $9.4/2 =$					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	9.400	0.600	2.700	30.46
	Behind Return Wall	cum	4	5.04	0.600	3.070	37.13
						Total	67.59

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					77.33
	Less for PCC	cum					8.71
	Less for Bottom Slab RCC	cum					22.26
	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					0.00
	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	11.000	0.300	8.91
						Total	29.07

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.700	10.000	0.426	11.51
	(+)Haunch	cum	2	10.00	0.01125		0.23
						Total	11.73

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =10 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					0.94
						Total	0.94
10	Bituminous Concrete						
		cum	1	2.70	9.00	0.04	0.97
						Total	0.97
11	Mastic Asphalt						
		sqm	1	2.70	9.00		24.30
						Total	24.30
12	Tack Coat						
		sqm	1	2.70	9.00		24.30
						Total	24.30
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 =10 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		5.090	5.150	0.700	0.00
						Total	82.81

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	0	4.690	4.350	0.150	0.00
						Total	9.51

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.300	11.000	0.420	24.49
	Box Side Wall	cum	2	11.00	3.285	0.350	25.29
	Base slab of Return wall II	cum	0	4.590	4.150	0.400	0.00
	Return wall I	cum	4	1.300	3.655	0.300	5.70
	Return wall II	cum	0	4.590	0.325	3.675	0.00
	Shear Key	cum	2	5.300	0.53820		5.70
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	61.43

4	Steel						
	@ 80 Kg per cum of concrete	ton					4.91
						Total	4.91

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	2.985	37.25
	Behind Return Wall	cum	4	5.89	0.600	3.355	47.43
						Total	84.68

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					82.81
	Less for PCC	cum					9.51
	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					0.00
	Less for Return Wall-II Stem Wall	cum	4	4.590	0.450	0.320	2.64
	Less for Box above Invert upto EGL	cum	1	2.70	12.000	0.300	9.72
						Total	30.28

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:- 01/23/0 (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		5.240	5.150	0.700	0.00
						Total	82.81

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	0	4.840	4.350	0.150	0.00
						Total	9.51

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.300	11.000	0.420	24.49
	Box Side Wall	cum	2	11.00	3.335	0.350	25.68
	Base slab of Return wall II	cum	0	4.740	4.150	0.400	0.00
	Return wall I	cum	4	1.300	3.705	0.300	5.78
	Return wall II	cum	0	4.740	0.325	3.725	0.00
	Shear Key	cum	2	5.300	0.53820		5.70
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	61.90

4	Steel						
	@ 80 Kg per cum of concrete	ton					4.95
						Total	4.95

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 = $3/1 =$						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 = $3/1 =$						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	3.035	37.88
	Behind Return Wall	cum	4	6.04		3.405	49.36
						Total	87.24

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					82.81
	Less for PCC	cum					9.51
	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					0.00
	Less for Return Wall-II Stem Wall	cum	4	4.740	0.450	0.320	2.73
	Less for Box above Invert upto EGL	cum	1	2.70	12.000	0.300	9.72
						Total	30.19

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:- 01/23/0 (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		5.290	5.150	0.700	0.00
						Total	82.81

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	0	4.890	4.350	0.150	0.00
						Total	9.51

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	0	4.790	4.150	0.400	0.00
	Return wall I	cum	4	1.300	3.720	0.300	5.80
	Return wall II	cum	0	4.790	0.325	3.740	0.00
	Shear Key	cum	2	5.300	0.53820		5.70
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	62.04

4	Steel						
	@ 80 Kg per cum of concrete	ton					4.96
						Total	4.96

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 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	3.050	38.06
	Behind Return Wall	cum	4	6.09	0.600	3.420	49.99
						Total	88.05

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					82.81
	Less for PCC	cum					9.51
	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					0.00
	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	30.16

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:- 01/33/0 (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		5.090	5.150	0.700	0.00
						Total	87.25

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	0	4.690	4.350	0.150	0.00
						Total	10.11

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.640	11.000	0.420	26.06
	Box Side Wall	cum	2	11.00	3.125	0.420	28.88
	Base slab of Return wall II	cum	0	4.590	4.150	0.400	0.00
	Return wall I	cum	4	0.900	3.545	0.250	3.19
	Return wall II	cum	0	4.590	0.325	3.565	0.00
	Shear Key	cum	2	5.640	0.53820		6.07
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	64.44

4	Steel						
	@ 80 Kg per cum of concrete	ton					5.16
						Total	5.16

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 = $2.8/1 =$						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 = $2.8/1 =$						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	2.825	35.60
	Behind Return Wall	cum	4	5.49	0.600	3.245	42.76
						Total	78.35

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					87.25
	Less for PCC	cum					10.11
	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					0.00
	Less for Return Wall-II Stem Wall	cum	4	4.590	0.450	0.320	2.64
	Less for Box above Invert upto EGL	cum	1	3.84	12.000	0.300	13.82
						Total	28.27

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:- 01/33/0 (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		5.760	5.150	0.700	0.00
						Total	87.25

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	0	5.360	4.350	0.150	0.00
						Total	10.11

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	0	5.260	4.150	0.400	0.00
	Return wall I	cum	4	0.900	3.770	0.250	3.39
	Return wall II	cum	0	5.260	0.325	3.790	0.00
	Shear Key	cum	2	5.640	0.53820		6.07
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	66.72

4	Steel						
	@ 80 Kg per cum of concrete	ton					5.34
						Total	5.34

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	6.16	0.600	3.470	51.30
						Total	89.73

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					87.25
	Less for PCC	cum					10.11
	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					0.00
	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	27.88

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:- 01/33/2 (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	1.070	85.26
	Shear Key	cum	2	6.840	1.680	0.780	17.93
	Return Wall II	cum		7.430	5.300	0.950	0.00
						Total	103.18

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	0	7.030	4.500	0.150	0.00
						Total	10.11

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	0	6.930	4.300	0.450	0.00
	Return wall I	cum	4	0.900	3.439	0.250	3.10
	Return wall II	cum	0	6.930	0.375	5.201	0.00
	Shear Key	cum	2	5.640	0.53820		6.07
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	63.19

4	Steel						
	@ 80 Kg per cum of concrete	ton					5.06
						Total	5.06

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 = $10.5/2 =$						5
	No of weep holes in vertical direction per abutment = $2.7/1 =$						3
	No of weep holes in horizontal direction per return wall = $4.5/2 =$						4
	No of weep holes in vertical direction per return wall = $2.5/1 =$						3
	Total no of Weep holes per abutment = 5×3						15
	Total no of Weep holes per return wall = 4×3						12
	Total mtrs of weep holes = $15 \times 2 + 12 \times 4$						
						Total	39.00

6	Filter media						
	Behind Abutment	cum	2	10.500	0.600	2.519	31.74
	Behind Return Wall	cum	4	7.800	0.600	4.731	88.91
						Total	120.65

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					103.18
	Less for PCC	cum					10.11
	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	0.500	0.45
	Less for Return Wall-II Base Slab	cum					0.00
	Less for Return Wall-II Stem Wall	cum	4	6.930	0.500	0.470	6.51
	Less for Box above Invert upto EGL	cum	1	3.84	12.000	0.500	23.04
						Total	30.94

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	3.840	11.000	0.439	18.55
	(+)Haunch	cum	2	11.00	0.01125		0.25
	(+)RCC Wall	cum	2	5.640	2.817	0.300	9.53
	(+)RCC Column	cum	4	0.600	0.900	1.917	4.14
						Total	32.47

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/33/2 (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					2.60
						Total	2.60

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:- 01/33/2 (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:- 01/34/0 (W =10 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	11.000	0.930	85.11
	Shear Key	cum	2	8.520	1.620	0.720	19.88
	Return Wall II	cum		6.400	5.300	0.750	0.00
						Total	104.99

2	PCC-M15						
	Box culvert	cum	1	7.320	7.960	0.150	8.74
	Shear Key	cum	2	7.520	1.418	0.150	3.20
	Return Wall II	cum	0	6.000	4.500	0.150	0.00
						Total	11.94

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	7.320	10.000	0.480	35.14
	Box Side Wall	cum	2	10.00	4.315	0.460	39.70
	Base slab of Return wall II	cum	0	5.900	4.300	0.450	0.00
	Return wall I	cum	4	1.700	4.765	0.300	9.72
	Return wall II	cum	0	5.900	0.375	4.795	0.00
	Shear Key	cum	2	7.320	0.47520		6.96
	Haunch	cum	2	10.000	0.01125		0.23
						Total=	91.74

4	Steel						
	@ 80 Kg per cum of concrete	ton					7.34
						Total	7.34

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 = $9.4/2 =$					5	
	No of weep holes in vertical direction per abutment = $4/1 =$					5	
	No of weep holes in horizontal direction per return wall = $6/2 =$					4	
	No of weep holes in vertical direction per return wall = $4/1 =$					5	
	Total no of Weep holes per abutment = 5×5					25	
	Total no of Weep holes per return wall = 4×5					20	
	Total mtrs of weep holes = $25 \times 2 + 20 \times 4$					Total	65.00

6	Filter media						
	Behind Abutment	cum	2	9.400	0.600	4.015	45.29
	Behind Return Wall	cum	4	7.600	0.600	4.465	81.44
						Total	126.73

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					104.99
	Less for PCC	cum					11.94
	Less for Bottom Slab RCC	cum					35.14
	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					0.00
	Less for Return Wall-II Stem Wall	cum	4	5.900	0.500	0.330	3.89
	Less for Box above Invert upto EGL	cum	1	3.92	11.000	0.300	12.94
						Total	33.51

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	3.920	10.000	0.450	17.64
	(+)Haunch	cum	2	10.00	0.01125		0.23
						Total	17.87

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =10 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					1.43
						Total	1.43
10	Bituminous Concrete						
		cum	1	3.92	9.00	0.04	1.41
						Total	1.41
11	Mastic Asphalt						
		sqm	1	3.92	9.00		35.28
						Total	35.28
12	Tack Coat						
		sqm	1	3.92	9.00		35.28
						Total	35.28
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 =10 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:- 01/34/0 (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		5.460	5.150	0.700	0.00
						Total	112.73

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	0	5.060	4.350	0.150	0.00
						Total	13.04

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	0	4.960	4.150	0.400	0.00
	Return wall I	cum	4	1.700	4.450	0.300	9.08
	Return wall II	cum	0	4.960	0.325	4.530	0.00
	Shear Key	cum	2	7.320	0.47520		6.96
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	95.41

4	Steel						
	@ 80 Kg per cum of concrete	ton					7.63
						Total	7.63

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 = 5×4						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	3.700	46.18
	Behind Return Wall	cum	4	6.66	4.150		66.33
						Total	112.51

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					112.73
	Less for PCC	cum					13.04
	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					0.00
	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	35.97

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:- 01/34/0 (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		6.510	5.300	0.750	0.00
						Total	112.73

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	0	6.110	4.500	0.150	0.00
						Total	13.04

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	7.320	11.000	0.480	38.65
	Box Side Wall	cum	2	11.00	4.350	0.460	44.02
	Base slab of Return wall II	cum	0	6.010	4.300	0.450	0.00
	Return wall I	cum	4	1.700	4.800	0.300	9.79
	Return wall II	cum	0	6.010	0.375	4.830	0.00
	Shear Key	cum	2	7.320	0.47520		6.96
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	99.67

4	Steel						
	@ 80 Kg per cum of concrete	ton					7.97
						Total	7.97

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 = $4.1/1 =$						5
	No of weep holes in horizontal direction per return wall = $6/2 =$						4
	No of weep holes in vertical direction per return wall = $4.1/1 =$						5
	Total no of Weep holes per abutment = 5×5						25
	Total no of Weep holes per return wall = 4×5						20
	Total mtrs of weep holes = $25 \times 2 + 20 \times 4$						
						Total	65.00

6	Filter media						
	Behind Abutment	cum	2	10.400	0.600	4.050	50.54
	Behind Return Wall	cum	4	7.71	4.500		83.27
						Total	133.81

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					112.73
	Less for PCC	cum					13.04
	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					0.00
	Less for Return Wall-II Stem Wall	cum	4	6.010	0.500	0.330	3.97
	Less for Box above Invert upto EGL	cum	1	3.92	12.000	0.300	14.11
						Total	35.39

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	3.920	11.000	0.450	19.40
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	19.65

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					1.57
						Total	1.57
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:- 01/43/0 (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		5.260	4.300	0.600	0.00
						Total	93.20

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	0	4.860	3.500	0.150	0.00
						Total	10.33

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.800	11.000	0.500	31.90
	Box Side Wall	cum	2	11.00	3.000	0.500	33.00
	Base slab of Return wall II	cum	0	4.760	3.300	0.300	0.00
	Return wall I	cum	4	0.400	3.450	0.250	1.38
	Return wall II	cum	0	4.760	0.275	3.650	0.00
	Shear Key	cum	2	5.800	0.45500		5.28
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	71.81

4	Steel						
	@ 80 Kg per cum of concrete	ton					5.74
						Total	5.74

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	5.16		3.150	39.01
						Total	73.03

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					93.20
	Less for PCC	cum					10.33
	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					0.00
	Less for Return Wall-II Stem Wall	cum	4	4.760	0.350	0.500	3.33
	Less for Box above Invert upto EGL	cum	1	5.00	12.000	0.300	18.00
						Total	24.24

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	5.000	11.000	0.513	28.19
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	28.44

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					2.27
						Total	2.27
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



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		6.310	5.150	0.700	0.00
						Total	93.20

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	0	5.910	4.350	0.150	0.00
						Total	10.33

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	0	5.810	4.150	0.400	0.00
	Return wall I	cum	4	0.400	3.800	0.250	1.52
	Return wall II	cum	0	5.810	0.325	3.900	0.00
	Shear Key	cum	2	5.800	0.45500		5.28
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	75.80

4	Steel						
	@ 80 Kg per cum of concrete	ton					6.06
						Total	6.06

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 = $10.5/2 =$					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	6.21	0.600	3.500	52.16
						Total	90.59

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					93.20
	Less for PCC	cum					10.33
	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					0.00
	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	23.39

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



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/43/2 (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	1.150	93.84
	Shear Key	cum	2	7.000	1.600	0.700	15.68
	Return Wall II	cum		8.070	5.300	0.950	0.00
						Total	109.52

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	0	7.670	4.500	0.150	0.00
						Total	10.33

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.800	11.000	0.500	31.90
	Box Side Wall	cum	2	11.00	3.000	0.500	33.00
	Base slab of Return wall II	cum	0	7.570	4.300	0.450	0.00
	Return wall I	cum	4	0.400	3.475	0.250	1.39
	Return wall II	cum	0	7.570	0.375	5.029	0.00
	Shear Key	cum	2	5.800	0.45500		5.28
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	71.82

4	Steel						
	@ 80 Kg per cum of concrete	ton					5.75
						Total	5.75

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 = $4.5/2 =$						4
	No of weep holes in vertical direction per return wall = $2.5/1 =$						3
	Total no of Weep holes per abutment = 5×3						15
	Total no of Weep holes per return wall = 4×3						12
	Total mtrs of weep holes = $15 \times 2 + 12 \times 4$						
						Total	39.00

6	Filter media						
	Behind Abutment	cum	2	10.500	0.600	2.525	31.82
	Behind Return Wall	cum	4	7.975	0.600	4.479	85.67
						Total	117.49

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					109.52
	Less for PCC	cum					10.33
	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	0.500	0.20
	Less for Return Wall-II Base Slab	cum					0.00
	Less for Return Wall-II Stem Wall	cum	4	7.570	0.500	0.550	8.33
	Less for Box above Invert upto EGL	cum	1	5.00	12.000	0.500	30.00
						Total	23.48

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	5.000	11.000	0.475	26.13
	(+)Haunch	cum	2	11.00	0.01125		0.25
	(+)RCC Wall	cum	2	5.800	2.404	0.300	8.37
	(+)RCC Column	cum	4	0.600	0.900	1.504	3.25
						Total	37.99

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/43/2 (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					3.04
						Total	3.04

PROTECTION WORK

Upstream side

10	Earthwork for excavation						
		cum	1	5.400	2.00	0.50	5.40
						Total	5.40

11	PCC M 15 below Catch Pit						
		cum	1	4.400	1.50	0.30	1.98
						Total	1.98

12	Catch Pit Stone Masonry/PCC M15						
	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

13	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

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:- 01/43/2 (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	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
16	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
17	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
18	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



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/44/2 (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	8.500	12.000	1.200	122.40
	Shear Key	cum	2	8.700	1.550	0.650	17.53
	Return Wall II	cum		9.140	6.300	1.150	0.00
						Total	139.93

2	PCC-M15						
	Box culvert	cum	1	7.500	9.100	0.150	10.24
	Shear Key	cum	2	7.700	1.319	0.150	3.05
	Return Wall II	cum	0	8.740	5.500	0.150	0.00
						Total	13.28

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	7.500	11.000	0.550	45.38
	Box Side Wall	cum	2	11.00	4.000	0.550	48.40
	Base slab of Return wall II	cum	0	8.640	5.300	0.650	0.00
	Return wall I	cum	4	1.200	4.506	0.300	6.49
	Return wall II	cum	0	8.640	0.450	6.124	0.00
	Shear Key	cum	2	7.500	0.40625		6.09
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	106.60

4	Steel						
	@ 80 Kg per cum of concrete	ton					8.53
						Total	8.53

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 = 5×4						20
	Total no of Weep holes per return wall = 5×4						20
	Total mtrs of weep holes = $20 \times 2 + 20 \times 4$						
						Total	60.00

6	Filter media						
	Behind Abutment	cum	2	10.400	0.600	3.526	44.00
	Behind Return Wall	cum	4	9.800	0.600	5.724	135.18
						Total	179.18

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					139.93
	Less for PCC	cum					13.28
	Less for Bottom Slab RCC	cum					45.38
	Less for Shear Key RCC	cum					6.09
	Less for Return Wall-I RCC	cum	4	1.200	0.300	0.500	0.72
	Less for Return Wall-II Base Slab	cum					0.00
	Less for Return Wall-II Stem Wall	cum	4	8.640	0.650	0.400	8.99
	Less for Box above Invert upto EGL	cum	1	5.10	12.000	0.500	30.60
						Total	34.87

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	5.100	11.000	0.506	28.36
	(+)Haunch	cum	2	11.00	0.01125		0.25
	(+)RCC Wall	cum	2	7.500	2.618	0.300	11.78
	(+)RCC Column	cum	4	0.600	0.900	1.718	3.71
						Total	44.10

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/44/2 (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					3.53
						Total	3.53

PROTECTION WORK

Upstream side

10	Earthwork for excavation						
		cum	1	5.400	2.00	0.50	5.40
						Total	5.40

11	PCC M 15 below Catch Pit						
		cum	1	4.400	1.50	0.30	1.98
						Total	1.98

12	Catch Pit Stone Masonry/PCC M15						
	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

13	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

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:- 01/44/2 (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	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
16	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
17	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
18	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



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/0 (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	10.060	12.000	1.070	129.17
	Shear Key	cum	2	10.260	1.480	0.580	17.61
	Return Wall II	cum		6.860	5.300	0.750	0.00
						Total	146.78

2	PCC-M15						
	Box culvert	cum	1	9.060	9.240	0.150	12.56
	Shear Key	cum	2	9.260	1.220	0.150	3.39
	Return Wall II	cum	0	6.460	4.500	0.150	0.00
						Total	15.95

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	9.060	11.000	0.620	61.79
	Box Side Wall	cum	2	11.00	5.000	0.630	69.30
	Base slab of Return wall II	cum	0	6.360	4.300	0.450	0.00
	Return wall I	cum	4	1.900	5.520	0.300	12.59
	Return wall II	cum	0	6.360	0.375	5.690	0.00
	Shear Key	cum	2	9.060	0.34220		6.20
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	150.12

4	Steel						
	@ 80 Kg per cum of concrete	ton					12.01
						Total	12.01

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 = $4.7/1 =$					5	
	No of weep holes in horizontal direction per return wall = $7.5/2 =$					5	
	No of weep holes in vertical direction per return wall = $4.7/1 =$					5	
	Total no of Weep holes per abutment = 5 x 5					25	
	Total no of Weep holes per return wall = 5 x 5					25	
	Total mtrs of weep holes = 25 x 2 + 25 x 4					Total	75.00

6	Filter media						
	Behind Abutment	cum	2	10.400	0.600	4.700	58.66
	Behind Return Wall	cum	4	8.26	5.220		103.48
						Total	162.14

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					146.78
	Less for PCC	cum					15.95
	Less for Bottom Slab RCC	cum					61.79
	Less for Shear Key RCC	cum					6.20
	Less for Return Wall-I RCC	cum	4	1.900	0.300	0.300	0.68
	Less for Return Wall-II Base Slab	cum					0.00
	Less for Return Wall-II Stem Wall	cum	4	6.360	0.500	0.470	5.98
	Less for Box above Invert upto EGL	cum	1	5.26	12.000	0.300	18.94
						Total	37.25

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	5.260	11.000	0.583	33.70
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	33.95

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/0 (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					2.72
						Total	2.72
10	Bituminous Concrete						
		cum	1	5.26	10.00	0.04	2.10
						Total	2.10
11	Mastic Asphalt						
		sqm	1	5.26	10.00		52.60
						Total	52.60
12	Tack Coat						
		sqm	1	5.26	10.00		52.60
						Total	52.60
13	RCC M-40 Crash Barrier	m	2	5.26			10.52
						Total	10.52
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:- 01/45/0 (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	5.26	2.558		26.91
						Total	26.91



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/0 (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	10.060	12.000	1.070	129.17
	Shear Key	cum	2	10.260	1.480	0.580	17.61
	Return Wall II	cum		7.910	6.300	0.950	0.00
						Total	146.78

2	PCC-M15						
	Box culvert	cum	1	9.060	9.240	0.150	12.56
	Shear Key	cum	2	9.260	1.220	0.150	3.39
	Return Wall II	cum	0	7.510	5.500	0.150	0.00
						Total	15.95

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	9.060	11.000	0.620	61.79
	Box Side Wall	cum	2	11.00	5.350	0.630	74.15
	Base slab of Return wall II	cum	0	7.410	5.300	0.650	0.00
	Return wall I	cum	4	1.900	5.870	0.300	13.38
	Return wall II	cum	0	7.410	0.450	5.840	0.00
	Shear Key	cum	2	9.060	0.34220		6.20
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	155.77

4	Steel						
	@ 80 Kg per cum of concrete	ton					12.46
						Total	12.46

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 = $5.1/1 =$					6	
	No of weep holes in horizontal direction per return wall = $7.5/2 =$					5	
	No of weep holes in vertical direction per return wall = $5.1/1 =$					6	
	Total no of Weep holes per abutment = 5 x 6					30	
	Total no of Weep holes per return wall = 5 x 6					30	
	Total mtrs of weep holes = 30 x 2 + 30 x 4					Total	90.00

6	Filter media						
	Behind Abutment	cum	2	10.400	0.600	5.050	63.02
	Behind Return Wall	cum	4	9.31	0.600	5.570	124.46
						Total	187.48

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					146.78
	Less for PCC	cum					15.95
	Less for Bottom Slab RCC	cum					61.79
	Less for Shear Key RCC	cum					6.20
	Less for Return Wall-I RCC	cum	4	1.900	0.300	0.300	0.68
	Less for Return Wall-II Base Slab	cum					0.00
	Less for Return Wall-II Stem Wall	cum	4	7.410	0.650	0.270	5.20
	Less for Box above Invert upto EGL	cum	1	5.26	12.000	0.300	18.94
						Total	38.03

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	5.260	11.000	0.520	30.09
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	30.33

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/0 (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					2.43
						Total	2.43
10	Bituminous Concrete						
		cum	1	5.26	10.00	0.04	2.10
						Total	2.10
11	Mastic Asphalt						
		sqm	1	5.26	10.00		52.60
						Total	52.60
12	Tack Coat						
		sqm	1	5.26	10.00		52.60
						Total	52.60
13	RCC M-40 Crash Barrier	m	2	5.26			10.52
						Total	10.52
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:- 01/45/0 (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	5.26	2.558		26.91
						Total	26.91



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/2 (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	10.060	12.000	1.270	153.31
	Shear Key	cum	2	10.260	1.480	0.580	17.61
	Return Wall II	cum		9.820	7.000	1.250	0.00
						Total	170.93

2	PCC-M15						
	Box culvert	cum	1	9.060	9.240	0.150	12.56
	Shear Key	cum	2	9.260	1.220	0.150	3.39
	Return Wall II	cum	0	9.420	6.200	0.150	0.00
						Total	15.95

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	9.060	11.000	0.620	61.79
	Box Side Wall	cum	2	11.00	5.000	0.630	69.30
	Base slab of Return wall II	cum	0	9.320	6.000	0.750	0.00
	Return wall I	cum	4	1.900	5.546	0.300	12.65
	Return wall II	cum	0	9.320	0.575	7.016	0.00
	Shear Key	cum	2	9.060	0.34220		6.20
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	150.18

4	Steel						
	@ 80 Kg per cum of concrete	ton					12.01
						Total	12.01

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 = $4.7/1 =$						5
	No of weep holes in horizontal direction per return wall = $7.5/2 =$						6
	No of weep holes in vertical direction per return wall = $4.5/1 =$						5
	Total no of Weep holes per abutment = 5 x 5						25
	Total no of Weep holes per return wall = 6 x 5						30
	Total mtrs of weep holes = 25 x 2 + 30 x 4						
						Total	85.00

6	Filter media						
	Behind Abutment	cum	2	10.400	0.600	4.526	56.49
	Behind Return Wall	cum	4	11.270	0.600	6.646	178.96
						Total	235.45

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					170.93
	Less for PCC	cum					15.95
	Less for Bottom Slab RCC	cum					61.79
	Less for Shear Key RCC	cum					6.20
	Less for Return Wall-I RCC	cum	4	1.900	0.300	0.500	1.14
	Less for Return Wall-II Base Slab	cum					0.00
	Less for Return Wall-II Stem Wall	cum	4	9.320	0.850	0.370	11.72
	Less for Box above Invert upto EGL	cum	1	5.26	12.000	0.500	31.56
						Total	42.57

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	5.260	11.000	0.546	31.61
	(+)Haunch	cum	2	11.00	0.01125		0.25
	(+)RCC Wall	cum	2	9.060	2.500	0.300	13.59
	(+)RCC Column	cum	4	0.600	0.900	1.600	3.46
						Total	48.90

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/2 (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					3.91
						Total	3.91

PROTECTION WORK

Upstream side

10	Earthwork for excavation						
		cum	1	5.400	2.00	0.50	5.40
						Total	5.40

11	PCC M 15 below Catch Pit						
		cum	1	4.400	1.50	0.30	1.98
						Total	1.98

12	Catch Pit Stone Masonry/PCC M15						
	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

13	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

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:- 01/45/2 (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	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
16	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
17	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
18	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



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/53/0 (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	7.740	12.000	1.020	94.74
	Shear Key	cum	2	7.940	1.530	0.630	15.31
	Return Wall II	cum		6.480	5.150	0.700	0.00
						Total	110.04

2	PCC-M15						
	Box culvert	cum	1	6.740	9.140	0.150	9.24
	Shear Key	cum	2	6.940	1.291	0.150	2.69
	Return Wall II	cum	0	6.080	4.350	0.150	0.00
						Total	11.93

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	6.740	11.000	0.570	42.26
	Box Side Wall	cum	2	11.00	3.350	0.570	42.01
	Base slab of Return wall II	cum	0	5.980	4.150	0.400	0.00
	Return wall I	cum	4	0.300	3.850	0.250	1.16
	Return wall II	cum	0	5.980	0.325	4.020	0.00
	Shear Key	cum	2	6.740	0.38745		5.22
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	90.89

4	Steel						
	@ 80 Kg per cum of concrete	ton					7.27
						Total	7.27

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	6.28	0.600	3.550	53.51
						Total	91.94

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					110.04
	Less for PCC	cum					11.93
	Less for Bottom Slab RCC	cum					42.26
	Less for Shear Key RCC	cum					5.22
	Less for Return Wall-I RCC	cum	4	0.300	0.250	0.300	0.09
	Less for Return Wall-II Base Slab	cum					0.00
	Less for Return Wall-II Stem Wall	cum	4	5.980	0.450	0.470	5.06
	Less for Box above Invert upto EGL	cum	1	6.14	12.000	0.300	22.10
						Total	23.38

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	6.140	11.000	0.500	33.77
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	34.02

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/53/0 (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					2.72
						Total	2.72
10	Bituminous Concrete						
		cum	1	6.14	10.00	0.04	2.46
						Total	2.46
11	Mastic Asphalt						
		sqm	1	6.14	10.00		61.40
						Total	61.40
12	Tack Coat						
		sqm	1	6.14	10.00		61.40
						Total	61.40
13	RCC M-40 Crash Barrier	m	2	6.14			12.28
						Total	12.28
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	6.400	2.00	0.30	3.84
						Total	3.84
16	PCC M 15 below Catch Pit						
		cum	1	5.400	1.50	0.30	2.43
						Total	2.43
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	5.400	0.360		1.94
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	3.02
18	300 mm Boulder Pitching						
		cum	1	4.800	1.50	0.30	2.16
		cum	1	5.666	1.50	0.30	2.55
						Total	4.71
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:- 01/53/0 (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	10.727	0.95	0.150	1.53
	For PCC wall						
		cum	1	6.184	0.35	1.000	2.16
		cum	1	7.569	0.35	1.600	4.24
		cum	1	8.955	0.35	1.600	5.01
	Below PCC Wall						
		cum	1	6.384	0.55	0.100	0.35
		cum	1	7.769	0.55	0.100	0.43
		cum	1	9.155	0.55	0.100	0.50
	On trades						
		cum	1	5.491	0.85	0.100	0.47
		cum	1	6.876	0.85	0.100	0.58
		cum	1	8.262	0.85	0.100	0.70
		cum	1	9.734	1.00	0.100	0.97
						Total	16.96
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	11.327	1.55	1.95	34.24
	Stone Pitching and side wall	cum	1	8.014	3.320		26.60
						Total	60.84
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	10.427	1.003		10.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	12.45
23	300 mm Boulder Pitching						
	Below trades	cum	1	5.491	0.85	0.300	1.40
		cum	1	6.876	0.85	0.300	1.75
		cum	1	8.262	0.85	0.300	2.11
		cum	1	9.734	1.00	0.300	2.92
						Total	8.18
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	6.14	2.558		31.41
						Total	31.41



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/53/2 (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	7.740	12.000	1.220	113.31
	Shear Key	cum	2	7.940	1.530	0.630	15.31
	Return Wall II	cum		9.000	6.300	1.150	0.00
						Total	128.62

2	PCC-M15						
	Box culvert	cum	1	6.740	9.140	0.150	9.24
	Shear Key	cum	2	6.940	1.291	0.150	2.69
	Return Wall II	cum	0	8.600	5.500	0.150	0.00
						Total	11.93

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	6.740	11.000	0.570	42.26
	Box Side Wall	cum	2	11.00	3.000	0.570	37.62
	Base slab of Return wall II	cum	0	8.500	5.300	0.650	0.00
	Return wall I	cum	4	0.300	3.531	0.250	1.06
	Return wall II	cum	0	8.500	0.450	5.451	0.00
	Shear Key	cum	2	6.740	0.38745		5.22
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	86.41

4	Steel						
	@ 80 Kg per cum of concrete	ton					6.91
						Total	6.91

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 = $4.5/2 =$						5
	No of weep holes in vertical direction per return wall = $2.5/1 =$						3
	Total no of Weep holes per abutment = 5×3						15
	Total no of Weep holes per return wall = 5×3						15
	Total mtrs of weep holes = $15 \times 2 + 15 \times 4$						
						Total	45.00

6	Filter media						
	Behind Abutment	cum	2	10.500	0.600	2.531	31.89
	Behind Return Wall	cum	4	8.800	0.600	5.031	106.25
						Total	138.14

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					128.62
	Less for PCC	cum					11.93
	Less for Bottom Slab RCC	cum					42.26
	Less for Shear Key RCC	cum					5.22
	Less for Return Wall-I RCC	cum	4	0.300	0.250	0.500	0.15
	Less for Return Wall-II Base Slab	cum					0.00
	Less for Return Wall-II Stem Wall	cum	4	8.500	0.650	0.420	9.28
	Less for Box above Invert upto EGL	cum	1	6.14	12.000	0.500	36.84
						Total	22.94

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	6.140	11.000	0.531	35.84
	(+)Haunch	cum	2	11.00	0.01125		0.25
	(+)RCC Wall	cum	2	6.740	2.900	0.300	11.73
	(+)RCC Column	cum	4	0.600	0.900	2.000	4.32
						Total	52.14

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/53/2 (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					4.17
						Total	4.17

PROTECTION WORK

Upstream side

10	Earthwork for excavation						
		cum	1	6.400	2.00	0.50	6.40
						Total	6.40

11	PCC M 15 below Catch Pit						
		cum	1	5.400	1.50	0.30	2.43
						Total	2.43

12	Catch Pit Stone Masonry/PCC M15						
	Side wall length parallal to road	cum	1	5.400	0.360		1.94
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	3.02

13	300 mm Boulder Pitching						
		cum	1	4.800	1.50	0.30	2.16
		cum	1	5.666	1.50	0.30	2.55
						Total	4.71

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:- 01/53/2 (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	10.727	0.95	0.150	1.53
	For PCC wall						
		cum	1	6.184	0.35	1.000	2.16
		cum	1	7.569	0.35	1.600	4.24
		cum	1	8.955	0.35	1.600	5.01
	Below PCC Wall						
		cum	1	6.384	0.55	0.100	0.35
		cum	1	7.769	0.55	0.100	0.43
		cum	1	9.155	0.55	0.100	0.50
	On trades						
		cum	1	5.491	0.85	0.100	0.47
		cum	1	6.876	0.85	0.100	0.58
		cum	1	8.262	0.85	0.100	0.70
		cum	1	9.734	1.00	0.100	0.97
						Total	16.96
16	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	11.327	1.55	1.95	34.24
	Stone Pitching and side wall	cum	1	8.014	3.320		26.60
						Total	60.84
17	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	10.427	1.003		10.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	12.45
18	300 mm Boulder Pitching						
	Below trades	cum	1	5.491	0.85	0.300	1.40
		cum	1	6.876	0.85	0.300	1.75
		cum	1	8.262	0.85	0.300	2.11
		cum	1	9.734	1.00	0.300	2.92
						Total	8.18



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/54/0 (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	8.840	12.000	1.050	111.38
	Shear Key	cum	2	9.040	1.500	0.600	16.27
	Return Wall II	cum		6.460	5.300	0.750	0.00
						Total	127.66

2	PCC-M15						
	Box culvert	cum	1	7.840	9.200	0.150	10.82
	Shear Key	cum	2	8.040	1.249	0.150	3.01
	Return Wall II	cum	0	6.060	4.500	0.150	0.00
						Total	13.83

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	7.840	11.000	0.600	51.74
	Box Side Wall	cum	2	11.00	4.000	0.620	54.56
	Base slab of Return wall II	cum	0	5.960	4.300	0.450	0.00
	Return wall I	cum	4	0.800	4.520	0.250	3.62
	Return wall II	cum	0	5.960	0.375	4.670	0.00
	Shear Key	cum	2	7.840	0.36000		5.64
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	115.81

4	Steel						
	@ 80 Kg per cum of concrete	ton					9.26
						Total	9.26

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 =3.7/1 =						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	10.500	0.600	3.700	46.62
	Behind Return Wall	cum	4	6.76	0.600	4.220	68.47
						Total	115.09

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					127.66
	Less for PCC	cum					13.83
	Less for Bottom Slab RCC	cum					51.74
	Less for Shear Key RCC	cum					5.64
	Less for Return Wall-I RCC	cum	4	0.800	0.250	0.300	0.24
	Less for Return Wall-II Base Slab	cum					0.00
	Less for Return Wall-II Stem Wall	cum	4	5.960	0.500	0.450	5.36
	Less for Box above Invert upto EGL	cum	1	6.24	12.000	0.300	22.46
						Total	28.37

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	6.240	11.000	0.583	39.98
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	40.23

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/54/0 (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					3.22
						Total	3.22
10	Bituminous Concrete						
		cum	1	6.24	10.00	0.04	2.50
						Total	2.50
11	Mastic Asphalt						
		sqm	1	6.24	10.00		62.40
						Total	62.40
12	Tack Coat						
		sqm	1	6.24	10.00		62.40
						Total	62.40
13	RCC M-40 Crash Barrier	m	2	6.24			12.48
						Total	12.48
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	6.400	2.00	0.30	3.84
						Total	3.84
16	PCC M 15 below Catch Pit						
		cum	1	5.400	1.50	0.30	2.43
						Total	2.43
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	5.400	0.360		1.94
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	3.02
18	300 mm Boulder Pitching						
		cum	1	4.800	1.50	0.30	2.16
		cum	1	5.666	1.50	0.30	2.55
						Total	4.71
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:- 01/54/0 (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	10.727	0.95	0.150	1.53
	For PCC wall						
		cum	1	6.184	0.35	1.000	2.16
		cum	1	7.569	0.35	1.600	4.24
		cum	1	8.955	0.35	1.600	5.01
	Below PCC Wall						
		cum	1	6.384	0.55	0.100	0.35
		cum	1	7.769	0.55	0.100	0.43
		cum	1	9.155	0.55	0.100	0.50
	On trades						
		cum	1	5.491	0.85	0.100	0.47
		cum	1	6.876	0.85	0.100	0.58
		cum	1	8.262	0.85	0.100	0.70
		cum	1	9.734	1.00	0.100	0.97
						Total	16.96
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	11.327	1.55	1.95	34.24
	Stone Pitching and side wall	cum	1	8.014	3.320		26.60
						Total	60.84
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	10.427	1.003		10.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	12.45
23	300 mm Boulder Pitching						
	Below trades	cum	1	5.491	0.85	0.300	1.40
		cum	1	6.876	0.85	0.300	1.75
		cum	1	8.262	0.85	0.300	2.11
		cum	1	9.734	1.00	0.300	2.92
						Total	8.18
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	6.24	2.558		31.92
						Total	31.92



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/54/0 (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	8.840	12.000	1.050	111.38
	Shear Key	cum	2	9.040	1.500	0.600	16.27
	Return Wall II	cum		7.510	5.300	0.750	0.00
						Total	127.66

2	PCC-M15						
	Box culvert	cum	1	7.840	9.200	0.150	10.82
	Shear Key	cum	2	8.040	1.249	0.150	3.01
	Return Wall II	cum	0	7.110	4.500	0.150	0.00
						Total	13.83

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	7.840	11.000	0.600	51.74
	Box Side Wall	cum	2	11.00	4.350	0.620	59.33
	Base slab of Return wall II	cum	0	7.010	4.300	0.450	0.00
	Return wall I	cum	4	0.800	4.870	0.250	3.90
	Return wall II	cum	0	7.010	0.375	5.020	0.00
	Shear Key	cum	2	7.840	0.36000		5.64
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	120.87

4	Steel						
	@ 80 Kg per cum of concrete	ton					9.67
						Total	9.67

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 = $4.1/1 =$						5
	No of weep holes in horizontal direction per return wall = $6/2 =$						4
	No of weep holes in vertical direction per return wall = $4.1/1 =$						5
	Total no of Weep holes per abutment = 5 x 5						25
	Total no of Weep holes per return wall = 4 x 5						20
	Total mtrs of weep holes = 25 x 2 + 20 x 4						
						Total	65.00

6	Filter media						
	Behind Abutment	cum	2	10.500	0.600	4.050	51.03
	Behind Return Wall	cum	4	7.81	0.600	4.570	85.66
						Total	136.69

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					127.66
	Less for PCC	cum					13.83
	Less for Bottom Slab RCC	cum					51.74
	Less for Shear Key RCC	cum					5.64
	Less for Return Wall-I RCC	cum	4	0.800	0.250	0.300	0.24
	Less for Return Wall-II Base Slab	cum					0.00
	Less for Return Wall-II Stem Wall	cum	4	7.010	0.500	0.450	6.31
	Less for Box above Invert upto EGL	cum	1	6.24	12.000	0.300	22.46
						Total	27.42

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	6.240	11.000	0.520	35.69
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	35.94

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/54/0 (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					2.88
						Total	2.88
10	Bituminous Concrete						
		cum	1	6.24	10.00	0.04	2.50
						Total	2.50
11	Mastic Asphalt						
		sqm	1	6.24	10.00		62.40
						Total	62.40
12	Tack Coat						
		sqm	1	6.24	10.00		62.40
						Total	62.40
13	RCC M-40 Crash Barrier	m	2	6.24			12.48
						Total	12.48
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	6.400	2.00	0.30	3.84
						Total	3.84
16	PCC M 15 below Catch Pit						
		cum	1	5.400	1.50	0.30	2.43
						Total	2.43
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	5.400	0.360		1.94
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	3.02
18	300 mm Boulder Pitching						
		cum	1	4.800	1.50	0.30	2.16
		cum	1	5.666	1.50	0.30	2.55
						Total	4.71
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:- 01/54/0 (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	10.727	0.95	0.150	1.53
	For PCC wall						
		cum	1	6.184	0.35	1.000	2.16
		cum	1	7.569	0.35	1.600	4.24
		cum	1	8.955	0.35	1.600	5.01
	Below PCC Wall						
		cum	1	6.384	0.55	0.100	0.35
		cum	1	7.769	0.55	0.100	0.43
		cum	1	9.155	0.55	0.100	0.50
	On trades						
		cum	1	5.491	0.85	0.100	0.47
		cum	1	6.876	0.85	0.100	0.58
		cum	1	8.262	0.85	0.100	0.70
		cum	1	9.734	1.00	0.100	0.97
						Total	16.96
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	11.327	1.55	1.95	34.24
	Stone Pitching and side wall	cum	1	8.014	3.320		26.60
						Total	60.84
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	10.427	1.003		10.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	12.45
23	300 mm Boulder Pitching						
	Below trades	cum	1	5.491	0.85	0.300	1.40
		cum	1	6.876	0.85	0.300	1.75
		cum	1	8.262	0.85	0.300	2.11
		cum	1	9.734	1.00	0.300	2.92
						Total	8.18
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	6.24	2.558		31.92
						Total	31.92



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/55/0 (W =10 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	10.400	11.000	1.130	129.27
	Shear Key	cum	2	10.600	1.420	0.520	15.65
	Return Wall II	cum		7.350	6.300	0.950	0.00
						Total	144.93

2	PCC-M15						
	Box culvert	cum	1	9.400	8.360	0.150	11.79
	Shear Key	cum	2	9.600	1.135	0.150	3.27
	Return Wall II	cum	0	6.950	5.500	0.150	0.00
						Total	15.06

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	9.400	10.000	0.680	63.92
	Box Side Wall	cum	2	10.00	5.000	0.700	70.00
	Base slab of Return wall II	cum	0	6.850	5.300	0.650	0.00
	Return wall I	cum	4	1.500	5.580	0.300	10.04
	Return wall II	cum	0	6.850	0.450	5.610	0.00
	Shear Key	cum	2	9.400	0.29120		5.47
	Haunch	cum	2	10.000	0.01125		0.23
						Total=	149.66

4	Steel						
	@ 80 Kg per cum of concrete	ton					11.97
						Total	11.97

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 = $9.4/2 =$						5
	No of weep holes in vertical direction per abutment = $4.7/1 =$						5
	No of weep holes in horizontal direction per return wall = $7.5/2 =$						5
	No of weep holes in vertical direction per return wall = $4.7/1 =$						5
	Total no of Weep holes per abutment = 5 x 5						25
	Total no of Weep holes per return wall = 5 x 5						25
	Total mtrs of weep holes = 25 x 2 + 25 x 4						
						Total	75.00

6	Filter media						
	Behind Abutment	cum	2	9.400	0.600	4.700	53.02
	Behind Return Wall	cum	4	8.35	5.280		105.81
						Total	158.83

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					144.93
	Less for PCC	cum					15.06
	Less for Bottom Slab RCC	cum					63.92
	Less for Shear Key RCC	cum					5.47
	Less for Return Wall-I RCC	cum	4	1.500	0.300	0.300	0.54
	Less for Return Wall-II Base Slab	cum					0.00
	Less for Return Wall-II Stem Wall	cum	4	6.850	0.650	0.330	5.88
	Less for Box above Invert upto EGL	cum	1	6.40	11.000	0.300	21.12
						Total	32.94

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	6.400	10.000	0.636	40.72
	(+)Haunch	cum	2	10.00	0.01125		0.23
						Total	40.95

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/55/0 (W =10 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					3.28
						Total	3.28
10	Bituminous Concrete						
		cum	1	6.40	9.00	0.04	2.30
						Total	2.30
11	Mastic Asphalt						
		sqm	1	6.40	9.00		57.60
						Total	57.60
12	Tack Coat						
		sqm	1	6.40	9.00		57.60
						Total	57.60
13	RCC M-40 Crash Barrier	m	2	6.40			12.80
						Total	12.80
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	6.400	2.00	0.30	3.84
						Total	3.84
16	PCC M 15 below Catch Pit						
		cum	1	5.400	1.50	0.30	2.43
						Total	2.43
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	5.400	0.360		1.94
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	3.02
18	300 mm Boulder Pitching						
		cum	1	4.800	1.50	0.30	2.16
		cum	1	5.666	1.50	0.30	2.55
						Total	4.71
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:- 01/55/0 (W =10 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	10.727	0.95	0.150	1.53
	For PCC wall						
		cum	1	6.184	0.35	1.000	2.16
		cum	1	7.569	0.35	1.600	4.24
		cum	1	8.955	0.35	1.600	5.01
	Below PCC Wall						
		cum	1	6.384	0.55	0.100	0.35
		cum	1	7.769	0.55	0.100	0.43
		cum	1	9.155	0.55	0.100	0.50
	On trades						
		cum	1	5.491	0.85	0.100	0.47
		cum	1	6.876	0.85	0.100	0.58
		cum	1	8.262	0.85	0.100	0.70
		cum	1	9.734	1.00	0.100	0.97
						Total	16.96
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	11.327	1.55	1.95	34.24
	Stone Pitching and side wall	cum	1	8.014	3.320		26.60
						Total	60.84
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	10.427	1.003		10.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	12.45
23	300 mm Boulder Pitching						
	Below trades	cum	1	5.491	0.85	0.300	1.40
		cum	1	6.876	0.85	0.300	1.75
		cum	1	8.262	0.85	0.300	2.11
		cum	1	9.734	1.00	0.300	2.92
						Total	8.18
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	6.40	2.558		32.74
						Total	32.74



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/55/0 (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	10.400	12.000	1.130	141.02
	Shear Key	cum	2	10.600	1.420	0.520	15.65
	Return Wall II	cum		8.400	6.300	0.950	0.00
						Total	156.68

2	PCC-M15						
	Box culvert	cum	1	9.400	9.360	0.150	13.20
	Shear Key	cum	2	9.600	1.135	0.150	3.27
	Return Wall II	cum	0	8.000	5.500	0.150	0.00
						Total	16.47

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	9.400	11.000	0.680	70.31
	Box Side Wall	cum	2	11.00	5.350	0.700	82.39
	Base slab of Return wall II	cum	0	7.900	5.300	0.650	0.00
	Return wall I	cum	4	1.500	5.930	0.300	10.67
	Return wall II	cum	0	7.900	0.450	5.960	0.00
	Shear Key	cum	2	9.400	0.29120		5.47
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	169.10

4	Steel						
	@ 80 Kg per cum of concrete	ton					13.53
						Total	13.53

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 =5.1/1 =					6	
	No of weep holes in horizontal direction per return wall =7.5/2 =					5	
	No of weep holes in vertical direction per return wall =5.1/1 =					6	
	Total no of Weep holes per abutment = 5 x 6					30	
	Total no of Weep holes per return wall = 5 x 6					30	
	Total mtrs of weep holes = 30 x 2 + 30 x 4					Total	90.00

6	Filter media						
	Behind Abutment	cum	2	10.400	0.600	5.050	63.02
	Behind Return Wall	cum	4	9.400	5.630		127.01
						Total	190.04

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					156.68
	Less for PCC	cum					16.47
	Less for Bottom Slab RCC	cum					70.31
	Less for Shear Key RCC	cum					5.47
	Less for Return Wall-I RCC	cum	4	1.500	0.300	0.300	0.54
	Less for Return Wall-II Base Slab	cum					0.00
	Less for Return Wall-II Stem Wall	cum	4	7.900	0.650	0.330	6.78
	Less for Box above Invert upto EGL	cum	1	6.40	12.000	0.300	23.04
						Total	34.07

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	6.400	11.000	0.580	40.83
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	41.08

ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/55/0 (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					3.29
						Total	3.29
10	Bituminous Concrete						
		cum	1	6.40	10.00	0.04	2.56
						Total	2.56
11	Mastic Asphalt						
		sqm	1	6.40	10.00		64.00
						Total	64.00
12	Tack Coat						
		sqm	1	6.40	10.00		64.00
						Total	64.00
13	RCC M-40 Crash Barrier	m	2	6.40			12.80
						Total	12.80
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	6.400	2.00	0.30	3.84
						Total	3.84
16	PCC M 15 below Catch Pit						
		cum	1	5.400	1.50	0.30	2.43
						Total	2.43
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	5.400	0.360		1.94
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	3.02
18	300 mm Boulder Pitching						
		cum	1	4.800	1.50	0.30	2.16
		cum	1	5.666	1.50	0.30	2.55
						Total	4.71
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:- 01/55/0 (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	10.727	0.95	0.150	1.53
	For PCC wall						
		cum	1	6.184	0.35	1.000	2.16
		cum	1	7.569	0.35	1.600	4.24
		cum	1	8.955	0.35	1.600	5.01
	Below PCC Wall						
		cum	1	6.384	0.55	0.100	0.35
		cum	1	7.769	0.55	0.100	0.43
		cum	1	9.155	0.55	0.100	0.50
	On trades						
		cum	1	5.491	0.85	0.100	0.47
		cum	1	6.876	0.85	0.100	0.58
		cum	1	8.262	0.85	0.100	0.70
		cum	1	9.734	1.00	0.100	0.97
						Total	16.96
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	11.327	1.55	1.95	34.24
	Stone Pitching and side wall	cum	1	8.014	3.320		26.60
						Total	60.84
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	10.427	1.003		10.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	12.45
23	300 mm Boulder Pitching						
	Below trades	cum	1	5.491	0.85	0.300	1.40
		cum	1	6.876	0.85	0.300	1.75
		cum	1	8.262	0.85	0.300	2.11
		cum	1	9.734	1.00	0.300	2.92
						Total	8.18
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	6.40	2.558		32.74
						Total	32.74



COST COMPARISON WITH CEMENT TREATED PAVEMENT vs
Conventional METHOD



For above table we can conclude that CTSB - Granular course method is cheaper than other three methods. Below table show the figures.

Method	Civil Cost in Cr.	Civil Cost / km	% variation
Conventional Method	260.28	8.68	0
CT BASE & SUBBASE	227.35	7.58	-12.67%
CTSB -Granular coarse	230.02	7.67	-11.63 %
SAMI-CTB-CTSB	231.15	7.71	-11.17%

Reason For Using Conventional Method

Imphal Jiribam road is one of the most important road of the Manipur state and carries high volume of traffic. The cement treated pavement needs a curing period of 28 Days. In this busy road, it is quite difficult to manage such curing period while maintaining the traffic. The diversion of traffic would be major challenging task. This may cause quality issue. Though cement treated pavement is a cheaper alternative with respect to construction cost; considering quality and traffic management factors, the vehicle operating cost and traffic management would be high. Also the quality of work may get affected.

Considering the above facts, Conventional pavement has been adopted for this road.



Road name- IMPHAL-JIRIBAM ROAD SECTION OF NH-53 (OLD NH-37)

PKG-V

(FROM DESIGN CH KM 101+280 TO KM 131+280)

GENERAL ABSTRACT OF COST

Length of Road (KM)

: 30.000

DESCRIPTION OF WORKS		Conventional		CT BASE & SUBBASE		CTSB -Granular coarse		SAMI-CTB-CTSB	
A.	ROAD WORKS	TOTAL COST (IN Cr.)	COST PER KM. OF TOTAL ROAD LENGTH (IN Cr.)	TOTAL COST (IN Cr.)	COST PER KM. OF TOTAL ROAD LENGTH	TOTAL COST (IN Cr.)	COST PER KM. OF TOTAL ROAD LENGTH	TOTAL COST (IN Cr.)	COST PER KM. OF TOTAL ROAD LENGTH
1	Site Clearance and Dismantling	2.17	0.07	2.17	0.07	2.17	0.07	2.17	0.07
2	Earth work ,Subgrade and Erosion control	70.09	2.34	70.09	2.34	70.09	2.34	70.09	2.34
3	Sub-Base & Base	57.54	1.92	51.46	1.72	43.33	1.44	44.57	1.49
4	Bituminous Courses	45.30	1.51	23.03	0.77	33.62	1.12	33.62	1.12
5	Junction Improvement	0.14	0.00	0.05	0.00	0.07	0.00	0.05	0.00
6	Traffic signs, Road marking & other road appurtenances	3.75	0.13	3.75	0.13	3.75	0.13	3.75	0.13
7	Passenger Shelter	0.12	0.00	0.12	0.00	0.12	0.00	0.12	0.00
8	Busbay	0.83	0.03	0.40	0.01	0.52	0.02	0.39	0.01
	Drainage and Protective Works								
9	Longitudinal Drains	11.35	0.38	11.35	0.38	11.35	0.38	11.35	0.38
11	Retaining wall	4.52	0.15	4.52	0.15	4.52	0.15	4.52	0.15
12	Breast wall	17.82	0.59	17.82	0.59	17.82	0.59	17.82	0.59
B.	BRIDGES & CULVERTS								
13	Culvert	31.97	1.07	31.97	1.07	31.97	1.07	31.97	1.07
14	Minor Bridge	3.11	0.10	3.11	0.10	3.11	0.10	3.11	0.10
C.	Utility Shifting								
	Utility Shifting(Electrical+PHE)	0.91	0.03	0.91	0.03	0.91	0.03	0.91	0.03
D.	COST OF CIVIL WORKS IN LAKHS (AS PER SOR 2018)	252.73	8.42	220.75	7.36	223.35	7.45	224.44	7.48
E.	Escalation @ 3% WPI (3% of A+B Only)	7.55		6.60		6.67		6.71	
F.	Total Civil Cost (D+E)	260.28	8.68	227.35	7.58	230.02	7.67	231.15	7.71