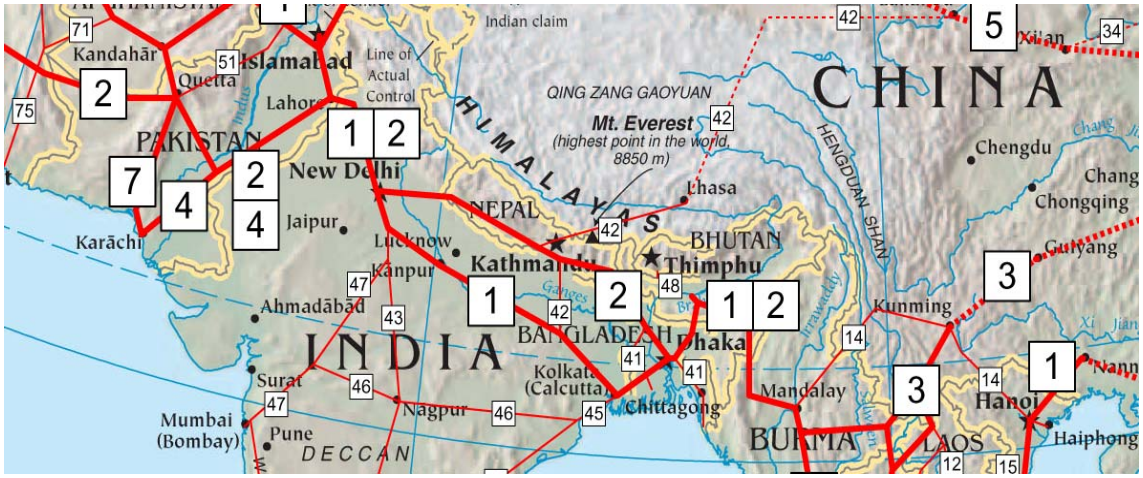
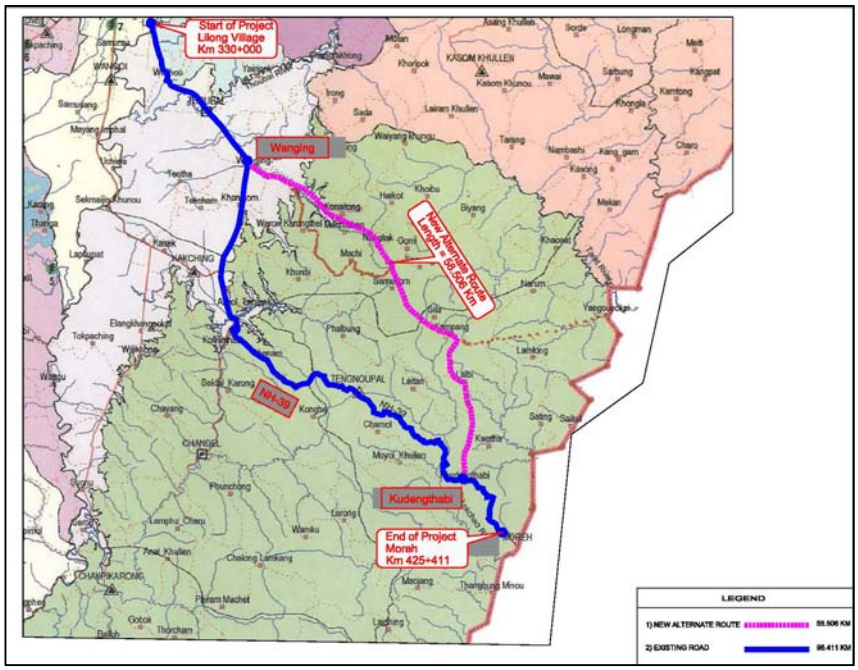
ADB TA No. 8116-IND

INDO MYANMAR ROAD SECTION FROM IMPHAL TO MOREH ON NH-39





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Detailed Project Report

Volume - IV Technical Specifications

SHELADIA ASSOCIATES, INC.

April, 2015

SHELADIA Associates Inc. USA

CONTENTS

TECHNICAL SPECIFICATIONS

1. PREAMBLE

1.1 The Technical Specifications contained herein as Volume IV shall be read in conjunction with the other Documents.

1.1.1 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. These specifications are not intended to cover the minute details. The works shall be executed in accordance with good practices followed for achieving high standards of workmanship, thus ensuring safety and durability of the construction. All codes and standards referred to in these specifications shall be the latest thereof unless otherwise stated.

1.1.2 Inclusive Documents

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

1.1.3 The attention of the contractor is drawn to those clauses of codes which require supporting specification either by the 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.

1.1.4 Measurement and Payment

The methods of measurement and payment shall be as described under various items and in the Bill of Quantities. Where specific definitions are not given the methods described in CPWD, IRC IS and B.I.S. Code will be followed. Should there be any detail of construction or materials which has not been referred to in the specification or in the Bill of Quantities and Drawings but the necessity for which may be implied or inferred there from, or which is usual or essential to the completion of the work in the trades, the same shall be deemed to be included in the rate and prices quoted by the contractor in the Bill of Quantities.

1.1.5 Defective Works

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

1.2 SITE INFORMATION

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

1.2.2 **Main alignment:** The project road section from Imphal to Moreh on NH 39 starts from Lilong village and ends at Moreh town (Myanmar border). As per site visit, length of this section is found to be about 95.411 km. Existing NH 39 (now NH 102) passes through three districts i.e. Imphal, Thoubal and Chandel. The road run through flat terrain up to Pallel (46 km) and remaining road section in hilly terrain (from Pallel to Moreh).

The project road running north to south east between Longitudes 24o48'8.9" N & 24014'16.46"N and lies between Longitude of 93056'18.44"E & 94018'2.23"E within the state of Manipur.

1.2.3 **Alternative alignment:** As part of the project, possible alternative alignments were studied and it is found that there is an alternative alignment existing on western side of the project corridor which starts from Wangjing town and finally merges with the project corridor near Khudengthabi village.

The said alternate alignment takes off from the project corridor from Wangjing town at its km 350+000 and follows the existing Major District Road (MDR) up to Heirok town. There from the alternative alignment takes right turn and passes adjacent to the Heirok Military camp on a track for a length of 0.5 kilometers to join the track on hill section. Further the track passes through several villages in hilly terrain and merges with another major district road which connects Tengupoal on NH 39 and Hariyam village where there is a bituminous road observed for its full length.

1.2.3 Seismic Zone

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

2. GENERAL REQUIREMENTS

The Technical Specifications in accordance with which the entire work described hereinafter to 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 Surface Transport & Highways, Government of India and published by the Indian Roads Congress.

2.2 PART-II: Additional Technical Specifications

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

Additional Specifications

The following Appendices have been added to the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS" (Fifth Revision April 2013).

1.	Appendix A-1	Providing PVC Rigid Pipes as Utility Duct
2.	Appendix A-2	Void Former
3.	Appendix A-3	Curing using Liquid Membrane Forming Compound
4.	Appendix A-4	Specification for PVC rigid pipes
5.	Appendix A-5	Specification for compressible pre-moulded asphalt filler board
6.	Appendix A-6	Specification for Guard Post
7.	Appendix A-7	Specification for Passenger Shelter
8.	Appendix A-8	Painting on Structures with Synthetic Enamel Paint for Numbering & Span Details of Bridges / Culverts and Water Proof Cement Paint for Parapet, Railing, Kerb and Crash Barrier
9.	Appendix A-9	Reflective Pavement Markers (Road Studs)
10.	Appendix A-10	Seismic Restrainers
11.	Appendix A-11	Plantation of Flowering Plants and Shrubs

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 PART III Specifications for Building, Subways and miscellaneous Works.

Technical Specifications for Building, Subways, etc. and Miscellaneous works shall be the latest "CPWD Specifications-2009 volume 1 & 2 for Civil Works and General Specifications for Electrical Works Part I – Internal 2005, Part II – External 2007, as published by the Central Public Works Department (CPWD), Govt. of India and deemed to be bound into this document.

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

Amendments to Technical Specifications

PART-I

Clause 106 CONSTRUCTION EQUIPMENT

Add the following sub para (l) after sub para (k)

l) All measuring devices and gauges shall be in good working condition. Measuring devices that can affect product quality shall be calibrated prior to use and at prescribed intervals against certified equipment. Calibration procedures shall be established, maintained and documented and corrective actions taken when results are unsatisfactory. Accuracy and fitness of measuring devices shall be ensured by proper maintenance.

Clause 108 SITE INFORMATION

Clause 108.4 Add as new sub clause

The Contractor shall identify quarries, borrow areas and other sources of materials required for the work. He shall satisfy himself that the required materials are available in adequate quantities and complying with the requirements of specifications. No claims shall be entertained on account of non-availability of materials, and increase in leads.

Clause 110.3 Delete the existing and replace as

The Employer will make payments to the respective service provider / authorities for cutting of trees and shifting of utilities, wherever required. The contractor will 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 departments / service provider organization for expediting and facilitating cutting of trees, shifting of utilities and removal of encroachment etc.

Clause 110.9 Add as Cl.110.9

Payment

Cutting of trees shall be paid as per Bill of Quantities. However the Contractor will assist in co-ordinating with appropriate authorities for shifting of utilities and removal of encroachments etc. and for that no separate payment shall be made.

Clause 112.4 Traffic Safety and Control

Add the following paras in the end of Clause 112.4

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

The Contractor shall submit to the Engineer a detailed proposal covering safety measures proposed to be adopted at site.

Persistent breaches of safety provision by the Contractor and his employees

shall constitute a sufficient cause for action.

The following additional safety provisions shall also be observed by the Contractor:

i) All workmen shall use safety helmets at work site, which should be provided by the Contractor.

ii) All workmen shall wear reflective jackets, while working in the traffic movement zone.

iii) Adequate precautions shall be taken to prevent accidents from electric cables, while digging operation is underway.

iv) Workers employed on bituminous works, stone crushers, concrete batching plants etc. shall be provided with protective goggles, gloves, gumboots etc.

v) Those engaged in welding work shall be provided with welder protective shields.

vi) All scaffolds, ladders and other safety devices shall be maintained in as safe and sound condition.

vii) All display boards shall be retro reflective material and of sizes mentioned in the drawing.

viii) All vehicles will have reverse horns.

ix) In addition, if directions are given by the 'Engineer' to augment the safety measures, the Contractor has to abide by his directions.

x) A safety officer shall be nominated by the Contractor to prepare safety programme and after getting the approval from the Engineer, oversee the safety arrangement at site.

Clause 202.3 Dismantling Pavements and Other Structures

Add the following at the end of 2nd para

"The existing bituminous pavement surface, sub-base courses (Wet Mix Macadam or Water Bound Macadam, stone soling, brick soling etc.) shall be removed by ripping, pavement breaker or any other suitable equipment, or any other suitable means as approved by the Engineer.

Dismantling of existing base, sub-base and surface courses shall be measured by taking cross-sections at normal regular intervals, for the width of the existing carriageway and making 30 cm wide trenches for full width at 200 m intervals before dismantling for depth of pavements and computing the volumes in cum by the method of average cross-sectional areas".

Clause 202.4 Back-filling

After the word "operations" add the words "and wells encountered in the alignment".

Add the following after last sentence "The wells may be capped thereafter if directed by the Engineer. The filling of wells and capping will be paid

separately in the relevant item of earth work, concrete, RCC works, as the case may be."

Clause 301 EXCAVATION FOR ROADWAY AND DRAINS

Clause 305.3.5.1 Add the following at the end of this clause

"To ensure the density of each layer, the contractor shall prepare a layer chart indicating layer number, level, etc. in a format approved by the Engineer".

Clause 305.3.6 Compaction

Second para of this clause shall read as :
"The compaction shall be done with the help of Vibratory Roller of not less than 8-10 T static weight with plain or pad foot drum or pneumatic tyre roller of 15-30 T weight having tyre pressure of at least 7 kg/sq.cm."

Clause 305.9 Rates

Clause 305.9.1 Insert "including removal of top soil" after the word 'material' appearing in first line of item (v).

Clause 306 SOIL EROSION AND SEDIMENTATION CONTROL

Clause 306.4 Measurement for payment

Add the following at the end of Clause 306.4

"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."

Clause 401.4.2 Spreading and compacting

Add the following sentence at the end of Clause 401.4.2

"Sub-base (for drainage layer only) shall continue over the full extent of the earthworks in cutting (excluding rock) and embankments and the base of the sub-base shall at all times fall towards the drainage system."

Clause 406 WET MIX MACADAM SUB-BASE/BASE

Clause 406.2.1.1 Physical requirements

Add the following at the end of the sub clause:
"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."

Clause 406.4 The Clause shall read as follows:

No vehicular traffic of any kind shall be allowed on the finished wet mix macadam surface till it has dried and wearing course laid.

Mixing

Clause 501.3

The first sentence of Para 1 shall read as under:

Clause 507.2.3 Delete the words “or naturally occurring mineral” and “or a combination of the two” appearing in the first sentence of the clause.

Clause 507.2.4 The first sentence of this clause shall read as “Filler shall consist of finely divided hydrated lime or cement as approved by the Engineer.”

Clause 509 **Bituminous Concrete**

Clause 509.2.1 **Bitumen**

Delete words “indicated in Table 500-18” and insert “grade of 60-70(VG-30)” in 3rd line.

Clause 509.9 **(BC) Rate**

The last sentence is replaced as follows : " No adjustments for payment of variance (up or down) in actual percentage of bitumen used (specified as per the Job Mix Formula) shall be made. Also, no price adjustment shall be allowed on account of such variance. Above parameters are deemed inclusive in the rate quoted by the contractor."

Clause 511 **OPEN-GRADED PREMIX SURFACING**

Clause 511.1.2.1 Delete the words “suitable grade as specified in contract, or as directed by the Engineer” and insert “grade of 60-70 (VG-30)”

PART II

ADDITIONAL TECHNICAL SPECIFICATION

DEFINITIONS

The following abbreviations shall be added

"MORT&H"	:	Ministry of Road Transport & Highways (Previously known as 'MOST', Ministry of Surface Transport)
"NHAI"	:	National Highways Authority of India
"PWRD"	:	Public Works Road Directorate
"BIS"	:	Bureau of Indian Standards
"WBM"	:	Water Bound Macadam
"WMM"	:	Wet Mix Macadam
"CPCB"	:	Central Pollution Control Board
"QA"	:	Quality Assurance
"BOQ"	:	Bill of Quantities
"CECRI"	:	Central Electro Chemical Research Institute

ADDITIONAL TECHNICAL SPECIFICATIONS

Appendix A-1

PROVIDING PVC RIGID PIPES AS UTILITY DUCT

1. Scope

The work shall be consisting of laying and jointing of PVC rigid pipes for utility ducts in accordance with requirements of these specifications.

2. Material

PVC rigid pipes shall conform to IS: 4985-1988 suitable to sustain a working pressure of 4.0 kgf/cm^2.

3. Laying of Pipes

Pipes shall be laid inside the crash barrier / safety barrier of deck slab of culverts, bridges, flyovers, etc. The pipes shall be fixed in position as per drawing and tied firmly with the reinforcement. The pipes shall be fitted and matched so that when laid in work they shall have a smooth uniform invert.

4. Jointing

The pipes shall be joined by collar or otherwise as approved by the Engineer.

5. Closing of Ends

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

6. Measurement for Payments

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

7. Rate

The contract unit rate for the pipes shall include cost of pipes including cost of collars or other jointing material, transportation, handling, storing, laying in position and jointing complete and all incidental costs to complete the work as per specification.

Appendix A-2

VOID FORMER

Void former tubes shall consist of galvanized corrugated light sheet metal tube subject to approval of Engineer having minimum thickness of 0.5 mm with end cones and tie down clips. The diameter and the sheet metal thickness of the void formers shall satisfy the following:

Internal Dia. (d) (mm)	External Dia (d) (mm)	Sheet Metal Thickness-(t) (mm)	Material (m^3/m)	Weight (kg/m)
500	504	0.5	0.198	8.5
600	605	0.5	0.285	10.2
700	706	0.7	0.388	10.5
900	909	0.7	0.644	21.0

Corrugations

The void formers shall be spirally lock seamed and corrugated on patented special machines with three 6-8 mm tube corrugations between the seams. The spacing between seams shall not exceed 120 mm. The radial rigidity of the tube shall be as below:

(t) (mm)	Radial Stiffness I(cm^4/m)
0.5	0.20
0.7	0.35

End Cones

Void formers are to be supplied with end cones mounted in place on the tubes to seal the void formers. The dimensions and installation lengths of the end cones shall be as under:

Internal dia. of void former (mm)	Internal dia. of end cone (mm)	Length of end cone (mm)
500	250	500
600	300	600
700	350	700

900	450	900

"Suitably designed wooden plug can also be used with the approval of Engineer."

Tie Down Clips

In order to minimise horizontal and vertical movement of the void formers during concreting operations the void formers shall be fitted with tie down clips with necessary accessories.

Storage and Installation of Void Formers

The storage and installation of void formers shall be carried out as per manufacturer's literature on the subject and subject to approval of the Engineer.

Standard of Acceptance

The roundness of the void tubes before pouring of concrete shall meet tolerances permitted as per concreting specifications. The stiffness of the tubes must be sufficient enough to resist a change of roundness not more than 2cm. on account of the pressure from concrete.

The tie down clips shall be fixed in such a way that movement does not exceed ± 1 cm vertically and ± 2 cm. horizontally. In case of joints, these shall be strong enough to stop the pipes from moving in relation to each other.

Rate

The unit rate of Plain Concrete or Reinforced Concrete or Prestressed Concrete voided slab as defined in respective sections shall be deemed to cover the cost of void formers, end cones, tie down clips and other accessories, their storage and installation at site including all operations as per instructions of the manufacturer.

Where the contract unit rate for void former is specially provided as separate item it shall include the cost of supply of void formers, end cones, tie down clips and other accessories, their storage and installation at site including all operations as per instructions of manufacturer. Measurement of the void former shall be made in running meters from one end of the end cone of the void former to the other end of the end cone of the void former.

Appendix A-3

CURING USING LIQUID MEMBRANE FORMING COMPOUND

1. General

Liquid membrane forming compound are sometimes permitted to be used by the engineer for curing concrete for part or whole of the total curing period as specified in sections dealing with concrete construction. These membranes reduce the loss of water from concrete during early hardening period and some type of compounds also help in reducing the temperature-rise of concrete exposed to the radiation from the sun. These specifications cover the type and use of such compounds. However, the use of the same will need specific permission from the engineer, who may require a number of tests to be carried out for establishing the conformity of the product to these specifications and to establish that the curing compound and its method of use does not have any unacceptable effect on the quality of concrete. The cost of the initial acceptance testing and the quality control testing will be borne by the owner, if the method has been specified as a requirement by the engineer. If on the other hand, it is suggested by the contractor as an alternative to wet-curing, the full cost of testing will be borne by him and deemed to be included in his rates for concreting. The cost of curing in any case will be deemed to be part of the concrete rates and will not be paid extra.

All equipment, material etc., needed for curing and protection of concrete shall be at hand and ready for installing before actual concreting begins. Detailed plans, methods and procedures shall be firmly established, shall be settled and got approved in writing from the Engineer-in-charge sufficiently in advance of the actual concreting.

The equipment and method proposed to be utilised shall provide for adequate control and avoid interruption or damage to the work of other agencies.

Only wax-based white pigmented curing compound with water retention of 90 percent shall be used to cure the dry lean concrete. The curing compound shall conform to BS 7542. The curing compound shall be applied uniformly with a mechanical sprayer and with a hood to protect the spray from the wind. The curing compound shall be applied over the entire exposed surface of the DLC, including sides and edges, at the rate of 0.2 liters/ square meter.

The first application, referred to as the curing application, shall be applied immediately after the final rolling of the DLC is completed. As soon as the curing compound has lost its tackiness, the surface shall be covered with wet Hessian for three days. The second application, referred to as the debonding application, shall be applied 24 to 48 hours prior to the PQC placement. The application shall be made on the DLC surface free of debris and damaged surface. If the DLC is damaged, it shall be

corrected prior to application of the second application of the curing compound. No construction traffic except that used for placing the PQC shall be allowed on the DLC surface after the second application of the curing compound. The curing compound shall not be tacky at the time of the PQC placement.

2. Curing Compound

The curing compound shall be conforming to ASTM-C-309-81, Type-2, white pigmented compound. The solids dissolved in vehicle shall be either A (no restrictions) or Class B (resin as defined in ASTM D-883) as approved by the engineer.

White pigmented compound (Type-2) shall consist of finely divided white pigments and vehicle solids, ready mixed for immediate use without alteration.

The compound shall present a uniform white appearance when applied uniformly to a fresh concrete surface at a specified rate of application. It shall be of such consistency that it can be readily applied by spraying to provide uniform coating at temperatures above 4°C. If two coats are to be applied then it should be applied at an interval of approximately one hour. They shall adhere to freshly placed concrete that has stiffened or sufficient resist marking during the application and to damp hardened concrete and shall form a continuous film when applied at a rate of 5 m^2/litre. When dry, the covering shall be continuous flexible and without visible breaks or pin holes and shall remain as unbroken film at least 28 days after application. It shall not react deleteriously with the concrete.

The compound shall meet with the requirement of water retention test as per ASTM designation C-156-80. The loss of water in this test shall be restricted to not more than 0.55 kg/m^2 of exposed surface in 72 hours.

The white pigmented compound (Type 2) when rested as specified in accordance with method E-79 of ASTM shall exhibit a day light reflectance of not less than 60% of that of magnesium oxide.

It shall fulfill the requirement of drying time when tested in accordance with ASTM-C-309-81. The compound applied shall be dry to touch in not more than 4 hours. After 12 hours it shall not be tacky or tack off (peel off) concrete when walked upon nor it shall impart a slippery surface.

The liquid compound should be of a sprayable consistency.

3. Supply and Testing

3.1 Acceptance Testing

Prior to the approval of the brand/trade name of compound and the source of supply and manufacturer acceptance testing shall be carried out to demonstrate the conformance of the compound to Clause 2 above. In addition, testing shall be performed to demonstrate that no adverse/undesirable change in quality of concrete

or concrete surface takes place as a result/by-product of use of the compound. These tests should be designed to check properties such as loss of strength at 28 days of surface layer, or of concrete cube, change in surface texture, change in adhesion to subsequently applied layers like plaster, flooring, tiling etc. The type and number of tests are to be as specified by the engineer.

3.2 Routine Testing

a) The liquid membrane forming curing compound should be brought in the manufacturer's original clear containers. Each container shall be legibly marked with the name of the manufacture, the trade name of the compound, the type of compound and class of vehicle/solids, the nominal percentage of volatile material and batch or lot number. The lot numbers will be assigned to the quantity of compound mixed, sampled and tested as single product. The manufacturer shall exercise the care in filling the container so that all are equally representative of the compound produced.

b) Curing compound to be used on site shall be got tested at least 14 days in advance so that the result of water retention tests, reflectance test, drying etc, are available before it can be permitted for use. All of the filled containers represented by the approved sample shall then be sealed to prevent leakage, substitution or dilution. The engineer-in-charge or authorised representative should mark each container represented by the samples with a suitable identification mark for later identification and correlation and shall be kept in store with double lock arrangements. One key shall be kept with the Contractor and the other with Engineer. Random samples shall be collected from every batch of the compound. Frequency of random sampling shall be done as directed by the Engineer. The contractor shall provide samples and labour for collecting samples free of cost. Testing shall be carried out by agency approved by the engineer and in presence of his representative.

4. Method of Application

The compound shall be sprayed using mechanical sprayer of approved design to ensure uniform and continuous membrane on the concrete surface. The coverage shall be at the rate specified by the manufacturer or at the rate of $4m^2$ per litre or as specified by the manufacturer and approved by the engineer. Field trials shall be conducted to decide effective coverage rate, which depends upon surface finish. The engineer after verification of the field and based on the actual experience shall order the rate of application as needed for achieving the proper curing. With a view to ensure thorough and complete coverage, approximately one half of the compound for a given area should be applied by moving the spray gun back and forth in one direction and the remaining half at right angles to this direction. In case the application is still not found uniform, the contractor shall have to apply the second coat as and when directed

by the Engineer. If a second coat is to be applied, it should be applied approximately after an interval of one hour. The curing compound shall generally be applied as soon as the bleeding water or shine disappears, leaving dull appearance.

If surface treatment by roughing, hand brushing etc., is required (e.g. as in case of road pavements) the curing compound should be applied immediately after the same. Equipment for spraying curing compound shall be of pressure tank type (5 to 7 kg/cm^2) with provision of continuous agitation. A curing jumbo with multiple travelling spray fans shall be provided for effective spray. Spraying on concrete lining shall be done in such a way that the green concrete is not disturbed or damaged or any foot impression left. Necessary schemes or spraying by mechanised means shall be got approved by the Engineer-in-charge. However, in emergency for very small areas/ patches) it can be applied with wire or bristled brush.

Appendix A-4

SPECIFICATION FOR PVC RIGID PIPES

1. Scope

The item includes supplying of PVC pipes with fittings of specified diameter including laying, fixing, cutting, jointing, etc., for service duct or drain water pipe line.

2. Materials

The pipes and fittings shall conform to series IV of IS 4985-1978. PVC pipes and fittings shall be free from cracks, flows and defects.

3. Construction Methodology

Before laying pipe line, it shall be first examined for damages and cracks. No cracked or damaged pipe and fittings shall be used in the work and they shall be removed from the site by the contractor at his own cost.

All the pipes and fittings shall be thoroughly cleaned with brush and washed if necessary to remove any accumulated stone, soil or dirt inside and outside surface.

The pipes shall be carefully laid straight to the correct alignment as indicated in the drawing. All pipes shall be used in standard length as far as possible. Cut length may be used only where it is necessary to make up exact length.

The pipe line shall be fixed in position as shown in the drawing or as directed by the Engineer.

The joining of pipes and fittings generally shall be done with approved make of cement solvent including making surface rough. The pipe shall be cut to desired length. Care shall be taken that profile or cut surfaces shall not be changed and the fibrous material shall be removed with scraper or knife.

6. Measurement and Rate

The payment shall be made on running meter basis of pipe fixed in position. Unit rates includes,

i. Supplying of PVC pipes and fittings of specified diameter

ii. Laying and cutting the pipe wherever necessary and wastage

iii. Fixing the pipe line with GI clamps not less than 2mm thick and GI nails length not less than 40mm or with PVC clamps, screws, wooden gutties etc.

iv. Making the solution joint

v. All necessary materials, labour and use of tools required to complete the job

The measurement shall be taken along the longitudinal axis center to center which includes fittings, making joint etc.

Appendix A-5

SPECIFICATION FOR COMPRESSIBLE PRE-MOULDED ASPHALT FILLER BOARD

The pre-moulded filler board shall be 20mm thick with a tolerance of +1.5mm and of a firm compressible material and complying with the requirement of IS: 1838.

2 mm dia wire shall be sewn on one face of the filler board. The wire shall be at least 300 mm long and shall be tied to reinforcement wherever possible. The other face shall be glued to the face of the deck slab with approved adhesive.

Measurement will be in square metre. The rate shall include cost of all labour, material including the bitumen capping.

Appendix A-6

SPECIFICATION FOR GUARD POST

1. General

The work covers the construction, supply, priming, painting & fixing of guard posts at locations as directed by the Engineer.

Guard posts shall generally be located at all horizontal curves (<1000m radius) where metal beam crash barrier has not been provided.

1.1 The posts shall be of concrete grade M25 and shall conform to IS 10262-1982. Guidelines for concrete mix design. The precast member shall be properly checked against spalling, bruises, cracks etc. after 28 days curing to the satisfaction of the Engineer.

The posts shall be fixed at-places as decided by the Engineer with the bottom 470 mm below proposed hard shoulder finished surface. The fixation shall be such that it shall not get tilted or dislocated under normal condition.

After erection, guard posts shall be painted with one coat-primer and two coats of colour paint (white & black). All colours shall be of ready mix oil bound and shall be approved by the Engineer. There shall be three white and three black bands alternately placed.

1.2 Measurement for payment of posts

The measurement shall be in number.

1.3 Rate

The contract unit rate for guard posts shall be paid in full compensation for furnishing of all labour, materials, tools, equipment for construction, fixing, painting at site and all other incidental costs necessary to complete the work to these specifications.

Appendix A-7

SPECIFICATION FOR PASSENGER SHELTER

1. Scope

The work consists of providing passenger shelter including seating arrangement and raised footpath of length 13.75 m on each side of the structure as per drawing.

2. Description

2.1 Passenger Shelter

It will be a permanent structure supported on R.C. columns at the corners and having sloped reinforced concrete slab with protrusions on all sides. Panel walls on three sides shall be built with brick jail of 125mm thick set in cement mortar 1:4 (1 part cement : 4 parts sand). It shall have seating arrangement with 50mm thick R.C. slab with raised back with atleast 1.5% reinforcement. The mix of concrete for seating slab and back shall be nominal one with 1:2:4 (1 part cement : 2 parts sand : 4 parts stone chips) and it will be finished with neat cement punning not less than 3mm thickness. The flooring shall be with 25mm thick I.P.S. flooring (1:2:4) over 100mm thick M-10 grade concrete. All walls, ceiling and roof top shall be finished with cement mortar (1:4). The exposed surfaces of the structure shall be painted with two coats of cement based paint of make and brand approved by the Engineer.

2.2 Raised Footpath

Raised footpath shall be constructed with one layer of brick flat soling laid over one layer of brick on end soling placed on 100mm thick M-10 concrete. Brick on end soling shall be laid in herring bone pattern with joints filled with powdered earth or sand. The joints of top layer of soling shall be filled up with cement mortar (1:3).

All works shall be done as per Technical Specifications sections 1300, 1700 & 1900 and drawings.

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-8

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 depends upon the numbers and letters. The background area and letters/numbers shall be painted with one prime coat (under coat) and two coats (top coat) of synthetic enamel paint.

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-9

REFLECTIVE PAVEMENT MARKERS (ROAD STUDS)

1 General

Reflective pavement marker (RPM) or road stud is a device, which is bonded to or anchored within the road surface for lane marking & delineation for nighttime visibility. It reflects incident light in directions close to the direction from which it came.

2 Definition

Description of terms specific to this standard.

Coefficient of luminous intensity (CIL) or specific intensity-

The ratio of luminous intensity of the retro reflector in the direction of observation to illuminance at the retro reflector on a plane perpendicular to the direction of the incident light expressed in terms of millicadelas per incident lux (mcd/ lx).

Horizontal entrance angle-

The angle in the horizontal plane between the direction of incident light & the normal to the leading edge of the marker.

Observation angle-

The angle at the reflector between the illumination axis & the observation axis.

Retro-reflection-

Reflection in which the radiation is returned in direction close to the direction from which it came, this property being maintained over wide variations of the direction of incident radiation.

Head-

That part of the road stud, which is above the road surface when the road stud is fixed in position in the road.

Upper Surface-

That part of the external surface of the road stud, which is visible when the road stud is fixed in position in the road.

Anchorage-

That part of a road stud, which is below the road surface when the road stud is fixed in position in the road.

3 Material

Plastic body of RPM/road stud shall be moulded from ASA (Acrylic Strene Acrylonitrite) or HIPS (High- Impact Polystyrene) or ABS or any other suitable material approved by the Engineer in charge. The marker shall support a load of 13635 kg tested in accordance with ASTM D4280.

Reflective panels shall consist of number of lenses containing single or duel prismatic cube capable of providing total internal reflection of the light entering the lens face. Lenses shall be moulded of methyl methecrylate conforming to ASTM D788 or equivalent.

4 Design

The slope or retro reflecting surface shall preferably be 35 ± 5 degree to base.

The area of each retro reflecting surface shall not be less than 13.0 sqcm.

5 Optical performance

5.1 Unidirectional

Each reflector or combination of reflectors on each face of the stud shall have a CIL not less than that given in table below.

Minimum CIL value for stud

Entrance angle	Observation angle	CIL in mcd/ lx
		White
0^o U 5^o L&R	0.3^o	220
0^oU 10^o L&R	0.5^o	120

Note: The entrance angle of 0o U corresponds to the normal aspects of the reflectors when the reflecting road stud is installed in horizontal road surface.

5.2 Tests

Co-efficient of luminance intensity can be measured by procedure described in ASTM E809 “Practice For Measuring Photometric Characteristics” or as recommended in BS: 873 Part IV – 1973.

Under test conditions, a stud shall not considered to fail the photometric requirements if the measured CIL at any one position of measurement is less than the values specified in table provided that

(i) The value is not less than 80% of the specified minimum

(ii) The average of the left & right measurements for the specific angle is greater than the specified minimum

6 Fixing of reflective markers

6.1 Requirements

The enveloping profile of the head of the stud shall be smooth & the studs shall not present any sharp edges to traffic.

The reflecting portions of the stud shall be free from crevices or ledges where dirt might accumulate.

All road studs shall be legibly marked with the name, trademark or other means of identification of the manufacturer.

Marker height shall not exceed 20mm.

Marker width shall not exceed 130mm & shall not be less than 100mm.

The base of the marker shall be flat within 1.3mm. If the bottom of the marker is configured, the outer most faces of the configuration shall not deviate more than 1.3mm from a flat surface.

6.2 Placement

The reflective marker shall be fixed to the road surface using the adhesives & the procedures recommended by the manufacturer. No nails shall be used to affix the marker, as nails are hazardous for the roads.

Regardless of the type of adhesive used, the markers shall not be fixed if the pavement is not surface dry & on new asphalt concrete surfacing until the surfacing has been open to traffic for a period of not less than 14 days.

The portions of the highway surface, to which the marker is to be bonded by the adhesive, shall be free of dirt, curing compound, grease, oil, moisture, loose or unsound layers, paint & any other material which would adversely affect the bond of adhesives.

Use a wire brush, if necessary to loosen & remove dirt, then brush or blow clean.

The adhesive shall be placed uniformly on the cleaned pavement surface or on the bottom of the marker in a quantity sufficient to result in complete coverage of the area of contact of the marker with no voids present and a slight excess after the marker has been lightly pressed in place.

For epoxy installations, excess adhesive around the edge of the marker excess adhesive on the pavement and adhesive on the exposed surfaces of the markers shall be immediately removed. Soft rags moistened with mineral spirits or kerosene may be used if necessary to remove adhesive from exposed faces of pavement markers.

7 Warranty & Durability

The contractor shall obtain from the manufacturer a two-year in-field test/ evaluation report for performance as per the table mentioned above and submit to the Engineer. In addition, a two-year warranty for satisfactory in-field performance of the finished road marker shall also be given by the contractor who carries out the work of fixing of reflective road markers. In case the markers are displaced, damaged, get worn out or lose their reflectivity compared to stipulated standards, the contractor would be required to replace all such markers within 15 days off the intimation from the Engineer at his own cost and with no extra remuneration to be paid for such work.

8 Measurement for payment

The measurement of reflective road markers shall be in numbers of markers supplied and fixed.

9 Rate

The contract unit rate for reflective road markers shall be payment in full compensation for furnishing all labour, material, tools, equipment including all incidental costs necessary for carrying out the work at site conforming to the specifications complete as per approved drawings or as directed by the Engineer.

Appendix A-10

SEISMIC RESTRAINERS

Fabrication

Seismic restrainers shall consist of elastomeric bearings which shall be fixed on to the structure with a system consisting of backing plates, mild steel plates, stainless steel plates by suitable arrangement of bolts, lugs etc. A pair of 15 mm thick mild steel plates shall be vulcanized on either side of the elastomeric bearings. Typical details of the Seismic restrainer assemblies are shown in miscellaneous drawings. The Seismic restrainer assembly shall be manufactured as per contractor design for the lateral load capacities mentioned in the respective BOQ item in conformity with the typical arrangement shown in the drawings. The design and drawings for the seismic restrainer assembly shall be prepared by the Contractor and got approved from the Engineer before starting the manufacture of seismic restrainer assembly. Design, fabrication, testing and installation of elastomeric bearings and structural components of the seismic restrainers shall be as per IRC: 83 (Part-II), and Technical Specification section 1900 and 2000.

Measurement for Payment

Seismic restrainer assemblies shall be measured in numbers according to their capacities.

Rate

The contract unit rate for a seismic restrainer assembly shall include cost of design, supplying and fixing of seismic restrainer assembly consisting of elastomeric bearing, backing plates, mild steel plates, stainless steel plates, bolts, lugs etc. all complete as specified on the drawings or as directed by the Engineer. The rate shall include cost of all tests prescribed in the specifications and shown on the approved drawings.

The quantity of cement concrete and steel reinforcement for seismic restrainers and shear keys shall be paid for separately as per relevant BOQ items.

Appendix A-11

PLANTATION OF FLOWERING PLANTS AND SHRUBS

1 Scope

The work shall consist of:

i) Planting of flowering saplings at designated locations.

2 Materials

2.1 Dump Manure

Dump manure shall be of well decayed (at least six months) organic or vegetable matter, obtained in the dry state from the municipal dump or other similar sources approved by the Engineer. The manure shall be free from earth, stone, brickbats or other extraneous matter.

2.2 Farmyard Manure

Farmyard Manure shall be well decayed (should be at least 6 months covered in dump), free from grits and any other unwanted materials.

2.3 Good Earth

The soil shall be agricultural soil of sandy-loam texture, free from kankar, moorum, shingle, stone, brickbats, building rubbish and any other foreign matter. The earth shall be free from clods or lumps of sizes bigger than 75mm in any direction. It shall have pH value ranging between 6.0 to 8.5.

2.4 Oil Cake (Neem/Castor/Groundnut)

The cake shall be freeform bush, dust, grit and any other foreign matter.

2.5 Sapling of flowering Plants

The sapling shall be of height, as approved by the Engineer leafy type and draught resistant variety native to the area and be of good quality of up to 1m height or caliper dia of 25mm as directed by the Engineer.

2.6 Sapling of Shrubs

The saplings shall be of draught resistant variety normally grown for hedges in the area, approved by the Engineer.

3. Construction Operations

3.1 Planting Flowering Plants and Refilling Earth after Mixing with Oil Cake, Manure and Watering

Holes of circular shape of 100mm dia and 150mm in depth in ordinary soil shall be excavated and the excavated soil, broken to clods of sizes not exceeding 75mm in any direction, shall be stacked outside the hole. Stones, brickbats, unsuitable earth and

other rubbish, all roots, and weeds etc. other undesirable growth met with during excavation shall be separated out and unserviceable material removed from the site as directed. Useful material, if any, shall be stacked properly and separately. Good earth in quantities required to replace such discarded stuff shall be brought and stacked at site by the Contractor, depth not more than 50cm from ground level. The pit shall be treated for termite by raking the soil up to 50mm and treated with 5% Aldrin or Chloradang dust in soil.

The plants hole shall be manured with powdered neem/caster oil cake along with farm yard manure/dump manure screened through 16mm sieve and these shall be uniformly mixed with the excavated top soil after the manure has been broken down to powder (size of particles not to exceed 6mm in any direction) in equal proportion. A sapling of plant shall be placed at the centre of the hole and then the mixture shall be filled into the hole upto the level of adjoining ground and then profusely watered to enable the soil to subside. The refilled soil shall then be dressed evenly with its surface about 50 to 75mm below the adjoining ground level or as directed by the Engineer.

The planting shall be completed soon after completion of the flyover.

3.2 Turfing, with Fine Grassing

The work shall include the work of ploughing, dressing including breaking of clods, removal of rubbish, dressing and supplying of doob roots at 10cm apart, including supplying and spreading of farm yard manure at the rate of 0.60 cum per 100 sqm.

The work shall cover the maintenance of turfing as per para 4.

3.3 Planting of Shrubs

The Shrubs saplings shall be planted in rows. Bed for the saplings shall be prepared with necessary manuring, and the live saplings shall be planted in lines parallel to the median edge to the directions of the Engineer. Spacing between saplings in a row shall be such that a thick hedge can be grown, and this shall generally be not farther away than 300mm.

The planting shall be completed soon after completion of the flyover.

3.4 Grassing of Median Area

The included area of the flyover between the shrubs shall be seeded and mulched to develop grass cover in accordance with Clause 308.

4 Maintenance

The saplings of flowering plants and shrubs planted shall be watered and maintained by the Contractor till issue of final taking over certificate. Maintenance shall also include watering, weeding out of undesirable plants and replacement of dead plant, manuring and trimming of the hedges.

5 Measurement for Payment

The area to be provided with plants and shrubs will be measured in sq.m.

The area for turfing shall also be measured in sqm.

6 Rates

The contract unit rate for planting of flowering plants and shrubs and turfing shall include the cost of all labour and material involved in all the operations described above including cost of saplings and maintenance as mentioned above, the cost of supplying and stacking the requisite quantity of manure and oil cake and other incidentals.

Amendments to Technical Specifications

PART-I

Clause 106 CONSTRUCTION EQUIPMENT

Add the following sub para (l) after sub para (k)

l) All measuring devices and gauges shall be in good working condition. Measuring devices that can affect product quality shall be calibrated prior to use and at prescribed intervals against certified equipment. Calibration procedures shall be established, maintained and documented and corrective actions taken when results are unsatisfactory. Accuracy and fitness of measuring devices shall be ensured by proper maintenance.

Clause 108 SITE INFORMATION

Clause 108.4 Add as new sub clause

The Contractor shall identify quarries, borrow areas and other sources of materials required for the work. He shall satisfy himself that the required materials are available in adequate quantities and complying with the requirements of specifications. No claims shall be entertained on account of non-availability of materials, and increase in leads.

Clause 110.3 Delete the existing and replace as

The Employer will make payments to the respective service provider / authorities for cutting of trees and shifting of utilities, wherever required. The contractor will 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 departments / service provider organization for expediting and facilitating cutting of trees, shifting of utilities and removal of encroachment etc.

Clause 110.9 Add as Cl.110.9

Payment

Cutting of trees shall be paid as per Bill of Quantities. However the Contractor will assist in co-ordinating with appropriate authorities for shifting of utilities and removal of encroachments etc. and for that no separate payment shall be made.

Clause 112.4 Traffic Safety and Control

Add the following paras in the end of Clause 112.4

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

The Contractor shall submit to the Engineer a detailed proposal covering safety measures proposed to be adopted at site.

Persistent breaches of safety provision by the Contractor and his employees

shall constitute a sufficient cause for action.

The following additional safety provisions shall also be observed by the Contractor:

i) All workmen shall use safety helmets at work site, which should be provided by the Contractor.

ii) All workmen shall wear reflective jackets, while working in the traffic movement zone.

iii) Adequate precautions shall be taken to prevent accidents from electric cables, while digging operation is underway.

iv) Workers employed on bituminous works, stone crushers, concrete batching plants etc. shall be provided with protective goggles, gloves, gumboots etc.

v) Those engaged in welding work shall be provided with welder protective shields.

vi) All scaffolds, ladders and other safety devices shall be maintained in as safe and sound condition.

vii) All display boards shall be retro reflective material and of sizes mentioned in the drawing.

viii) All vehicles will have reverse horns.

ix) In addition, if directions are given by the 'Engineer' to augment the safety measures, the Contractor has to abide by his directions.

x) A safety officer shall be nominated by the Contractor to prepare safety programme and after getting the approval from the Engineer, oversee the safety arrangement at site.

Clause 202.3 Dismantling Pavements and Other Structures

Add the following at the end of 2nd para

"The existing bituminous pavement surface, sub-base courses (Wet Mix Macadam or Water Bound Macadam, stone soling, brick soling etc.) shall be removed by ripping, pavement breaker or any other suitable equipment, or any other suitable means as approved by the Engineer.

Dismantling of existing base, sub-base and surface courses shall be measured by taking cross-sections at normal regular intervals, for the width of the existing carriageway and making 30 cm wide trenches for full width at 200 m intervals before dismantling for depth of pavements and computing the volumes in cum by the method of average cross-sectional areas".

Clause 202.4 Back-filling

After the word "operations" add the words "and wells encountered in the alignment".

Add the following after last sentence "The wells may be capped thereafter if directed by the Engineer. The filling of wells and capping will be paid

separately in the relevant item of earth work, concrete, RCC works, as the case may be."

Clause 301 EXCAVATION FOR ROADWAY AND DRAINS

Clause 305.3.5.1 Add the following at the end of this clause

"To ensure the density of each layer, the contractor shall prepare a layer chart indicating layer number, level, etc. in a format approved by the Engineer".

Clause 305.3.6 Compaction

Second para of this clause shall read as :

"The compaction shall be done with the help of Vibratory Roller of not less than 8-10 T static weight with plain or pad foot drum or pneumatic tyre roller of 15-30 T weight having tyre pressure of at least 7 kg/sq.cm."

Clause 305.9 Rates

Clause 305.9.1 Insert "including removal of top soil" after the word 'material' appearing in first line of item (v).

Clause 306 SOIL EROSION AND SEDIMENTATION CONTROL

Clause 306.4 Measurement for payment

Add the following at the end ofClause 306.4

"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."

Clause 401.4.2 Spreading and compacting

Add the following sentence at the end of Clause 401.4.2

"Sub-base (for drainage layer only) shall continue over the full extent of the earthworks in cutting (excluding rock) and embankments and the base of the sub-base shall at all times fall towards the drainage system."

Clause 406 WET MIX MACADAM SUB-BASE/BASE

Clause 406.2.1.1 Physical requirements

Add the following at the end of the sub clause:

"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."

Clause 406.4 The Clause shall read as follows:

No vehicular traffic of any kind shall be allowed on the finished wet mix macadam surface till it has dried and wearing course laid.

Clause 501.3 Mixing

The first sentence of Para 1 shall read as under:

Clause 507.2.3 Delete the words “or naturally occurring mineral” and “or a combination of the two” appearing in the first sentence of the clause.

Clause 507.2.4 The first sentence of this clause shall read as “Filler shall consist of finely divided hydrated lime or cement as approved by the Engineer.”

Clause 509 Bituminous Concrete

Clause 509.2.1 Bitumen

Delete words “indicated in Table 500-18” and insert “grade of 60-70(VG-30)” in 3rd line.

Clause 509.9 (BC) Rate

The last sentence is replaced as follows : " No adjustments for payment of variance (up or down) in actual percentage of bitumen used (specified as per the Job Mix Formula) shall be made. Also, no price adjustment shall be allowed on account of such variance. Above parameters are deemed inclusive in the rate quoted by the contractor."

Clause 511 OPEN-GRADED PREMIX SURFACING

Clause 511.1.2.1 Delete the words “suitable grade as specified in contract, or as directed by the Engineer” and insert “grade of 60-70 (VG-30)”