



NATIONAL HIGHWAYS AUTHORITY OF INDIA
(MINISTRY OF ROAD TRANSPORT & HIGHWAYS)

**Construction and Widening of CC pavement for Temporary User-Fee Toll
Plaza at km 294/500 of NH-26 at Titarpani in District Sagar, M.P**

VOLUME – II

SECTION 5 : TECHNICAL SPECIFICATIONS

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TECHNICAL SPECIFICATIONS

CONTENTS

Sl. No.	Description
1.	Preamble
2.	PART - I: General Technical Specifications
3.	PART - II: Supplementary Technical Specifications

SECTION 5

1.0 PREAMBLE

- 1.1** The Technical Specifications contained herein shall be read in conjunction with the other Bidding Documents as specified in Volume-1.

1.2 SITE INFORMATION

- 1.2.1** The information given hereunder and provided elsewhere in these documents is given in good faith by the Employer but the Contractor shall satisfy himself regarding all aspects of site conditions and no claim will be entertained on the plea that the information supplied by the Employer is erroneous or insufficient.
- 1.2.2** The area in which the works are located is mostly plain terrain, the approximate longitude and latitude of the region being

1.2.3 General Climatic Conditions

- 1.2.3.1** The variation in daily temperature in this region is as under :
- i) During summer months, from about 41⁰ C minimum to 47⁰ C maximum.
 - ii) During winter months, from about 1⁰ C minimum to 12⁰ C maximum.
- 1.2.3.2** The average annual rainfall in the area is of the order of 600 mm to 950 mm, a good portion of which is concentrated during the months of August and September each year.
- 1.2.3.3** The range of relative humidity varies from a minimum of 15 to a maximum of 95

1.2.4 Seismic Zone

The works are located in Seismic Zone II as defined in IRC : 6-1966.

2.0 GENERAL REQUIREMENTS

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

2.1 PART - I: General Technical Specifications

The General Technical Specifications shall be the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS" (FOURTH REVISION - August 2001, Reprinted - March 2002), issued by the Ministry of Road Transport & Highways, Government of India and published by the Indian Roads Congress (IRC), New Delhi, 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 various Amendments / Modifications / Additions to the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS" referred to in PART - I above and also **Additional Specifications** for particular item of works not already covered in PART-I.

- 1.1.1** 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.

- 1.1.2** 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.
- 1.1.3** The Additional Specifications shall comprise specifications for particular item of works not already covered in PART-I.
- 1.1.4** The Sub-Clauses of the following Sections in the “Specifications for Road and Bridge Works (Fourth Revision - August 2001, Reprinted - March 2002) have been Amended / modified / added upon:

Sr. No.	Section No.	Title	Clause No.
1.	100	General	102, 103, 105, 106, 107, 108, 109, 110, 111, 112, 114, 115, 121, 123, 124
2.	200	Site Clearance	201, 202
3.	300	Earthwork, Erosion control and Drainage	301, 304, 305, 306, 307, 309, 313
4.	400	Sub-bases, Bases (non bituminous) and Shoulders	401, 406, 407, 408, 409
5.	500	Bases and Surface Courses (bituminous)	501, 502, 503, 504, 507, 509, 511, 513, 516
6.	600	Concrete Pavement	601, 602
7.	800	Traffic Signs, Marking and Other Road Appurtenances	801, 802, 803, 804, 805, 806, 808, 809, 810
8.	900	Quality Control for Road Works	901, 903
9.	1000	Materials for Structures	1002, 1006, 1007, 1008, 1009, 1010, 1012, 1013, 1014
10.	1100	Pile Foundations	1101, 1103, 1104, 1107, 1113, 1118, 1119
11.	1400	Stone Masonry	1404, 1405
12.	1500	Formwork	1501, 1502, 1503, 1505, 1506, 1508, 1509, 1510, 1513, 1514
13.	1600	Steel Reinforcement (Untensioned)	1602, 1604, 1605, 1606, 1607
14.	1700	Structural Concrete	1703, 1704, 1705, 1706, 1707, 1709, 1710, 1712, 1713, 1715
15.	1800	Prestressing	1801, 1802, 1804, 1806, 1807, 1808, 1815, 1816
16.	2000	Bearings	2001, 2004, 2005, 2006, 2009, 2011
17.	2100	Open Foundations	2106
18.	2200	Sub-structure	2204, 2210
19.	2500	River Training Work and Protection works	2504
20.	2600	Expansion Joints	2601
21.	2700	Wearing coat and Appurtenances	2702, 2703, 2704, 2706, 2708, 2709
22.	2800	Repair of Structures	2809, 2811, 2812, 2813, 2814, 2815, 2816, 2817, 2818, 2819, 2820, 2821, 2822, 2823, 2824, 2825, 2826, 2827, 2829, 2829, 2830
23.	2900	Pipe Culverts	2904, 2906
24.	3000	Maintenance of Road	3002, 3003, 3004
25.	3100	Reinforced Earth	3101, 3102, 3103, 3104, 3105, 3106, 3107

Scope of Work

The “Works” consist of Construction of Toll Plaza at Km 294/500 of Jhansi-Lakhnadon Section of NH-26 in the State of Madhya Pradesh. The works shall, inter alia, include the following, as specified or as directed:

A. Road works

Site clearance; setting out and lay out; supplying and placing of drainage channels, flumes, guard posts, guard rails and other related items; road markings, road signs; protective works for roads; all aspects of quality assurance of various components of works; rectification of the defects in the completed works during the Defect Liability Period; submission of “As Built” drawings and any other related documents; and other items of works as may be required to be carried out for completing the works in accordance with the drawings and provisions of the Contract to insure safety.

B. Miscellaneous

Execution of any other items of work for the construction and completion of the Works in accordance with the provisions of the Contract including all incidental items as well as preparation and submittal of reports, plans as may be required including construction of Barbed wire fencing, Space Frame Structure, Providing and installing Toll Booths, construction of generator room, erection of High Mast/ Generator and all electrical works related to toll plaza as directed by engineer-in-charge.

During the period of the Contract the right of way and all existing roads shall be kept open for traffic and maintained in a safe and usable condition. Residents along and adjacent to the Works are to be provided with safe and convenient access to their properties all times. Traffic control and traffic diversions shall be used as necessary to protect the works and maintenance will be carried out as directed by the Engineer and provided in the Contract and any other items as required to fulfil all contractual obligations as per the Bid Documents.

PART - I

GENERAL TECHNICAL SPECIFICATIONS

1.0 This part shall comprise the “Specification for Road & Bridge Works” (Fourth Revision - August 2001, Reprinted March 2002), issued by the Ministry of Road Transport and Highways (MORTH), Government of India and Published by the Indian Roads Congress (IRC), Jamnagar House, New Delhi - 110001, all as deemed to be bound into this document.

1.1 Where the term crushed stone is referred to in the Specification for Road & Bridge Works of the MORTH (Clause 1007) for use as aggregate in construction of pavement layers or in construction of cross drainage works it shall mean that the aggregates shall be obtained through the use of crusher / granulator and vibratory screens of suitable capacity as approved by the Engineer.

2.0 Quality Control on Works & Materials

Quality control on materials and execution remains the primary responsibility of the contractor.

Nevertheless, the Engineer will inspect the work from time to time during and after construction and get the quality of the work tested (by him / herself, by his / her Testing & Quality Control Units and / or by any other agency deemed fit by him / her) generally as per the requirements of the Handbook of Quality Control for Construction of Roads & Runways (IRC Special Publication No. 11 & Section-900 of MORTH Specifications).

3.0 Surveying & Measuring Equipments

Equipments for surveying and measurement of the work shall be procured by the Contractor for site use. The same shall also be made available at site for use by the Engineer for any work connected with the Contract without any Charge.

PART - II
SUPPLEMENTARY TECHNICAL SPECIFICATION

**(AMENDMENTS / MODIFICATIONS / ADDITIONS TO EXISTING
CLAUSES OF GENERAL TECHNICAL SPECIFICATIONS - PART - I)**

SECTION 100 GENERAL

Clause 102 DEFINITIONS

The following abbreviations shall be added in this Clause.

MoRT&H	:	Ministry of Road Transport. & Highways, Govt. of India
NHAI	:	National Highways Authority of India
WBM	:	Water Bound Macadam
WMM	:	Wet Mix Macadam
MDD	:	Maximum Dry Density (as per IS: 2720-Part 8)

Clause 103 MATERIALS AND TEST STANDARDS

Add at the end of the clause:

The latest edition of these standards till 30 (thirty) days before the final date of submission of the tender shall be adopted.

Clause 105 SCOPE OF WORK

Clause 105.3

Add the following below the existing clause.

The Contractor shall establish, adhere to, monitor and maintain an adequate quality management system complying with IRC:SP-47-1998 ("Guidelines on Quality Systems for Road Bridges") and IRC:SP-57-2001 ("Guidelines for Quality System for Road Construction"). The quality management system shall be described in a Quality 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 work. The Quality Plan shall cover the following items:

- i. The Contractor's organization and management including:
 - The Definition of the Contract and its documentation;
 - 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 principals and key personnel;
 - Control of liaison and meeting with third parties;
 - Identification of the Contractor's staff responsible for overseeing each major activities;
 - Contractor's control of sub-contracts;
 - Document and data control;
 - Program for submission of method statements;
 - Procedures for 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 personnel 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 storage at which checks are necessary before continuing;
- 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.

Clause 105.4 Delete the words"15 days in advance..... "in the first line of the Clause and replace it with. "Submission of contractor's programme of work, method etc., as covered in this Clause shall be at least 28 days in advance, unless the quality management system for the project as finalized and approved by the Engineer demands an other time schedule for various submissions and approvals in which case the quality management system requirements will prevail".

Clause 106 CONSTRUCTION EQUIPMENT

Add the following below sub para (f):

- g) Adequate standby equipment including spare parts shall be available.
- h) 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

Clause 107.3 Add the following at the end of the paragraph:
 "After careful study of the drawings issued by the Engineer, the Contractor shall, prepare, where necessary all supplementary and working drawings with necessary field / construction information and the like for adequacy of construction methods and procedure etc. and shall submit the same to the Engineer for approval prior to construction progressively according to the work programme accepted by the Engineer. Engineer shall be given not less than 21 days for review of these supplementary / working drawings and as directed, the contractor shall modify the drawings incorporating the comments and requirements of the Engineer.

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 30 days before commencement of construction of culverts."

Clause 108 SITE INFORMATION

Clause 108.4 This Clause shall read as follows:

“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 etc. Materials procured from quarry sites and borrow areas identified by the 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

Clause 109.9 Delete second and third sentences and substitute the following:

“Setting out of the road alignment and measurement of angles shall be done by using Total Station.”

Clause 109.10 Add the following as Clause 109.10:

“The Contractor shall provide necessary surveying equipment, accessories, surveyors and labourers required for setting out and related measurements, including making available these to the Engineer and to his representatives at different stages of the work. The surveying equipment shall be of high standard of manufacture as approved by the Engineer, in good working condition with adequate numbers and shall include inter-alia the following:

- i. 2 nos. of Precision automatic levels with micrometer attachment with tripods and levelling staff reading to 5 mm accuracy by direct observation and to 1 mm accuracy by estimation or better
- ii. 2 nos. of Total Stations with 2 spare batteries and a charger, three tripods plus tangents sufficient for a 4 km range, together with an electronic data recorder, 6 data packs and all necessary software for operation.
- iii. Precision staff as required
- iv. 4 nos. of 3 metre straight edge and measuring wedge fitted with handles wedges 100 mm ht. and 1 mm accuracy.
- v. Field umbrellas as required
- vi. Ranging rods 50 mm dia 3 m long straight with one end each metallic conical and painted alternatively black and white along the length as required.
- vii. Steel tape graduated in metres, centimetre and millimetre as required and as per the following categories:
 - 10 m long
 - 20 m long
 - 50 m long
 - Reference markers and pegs
- viii. 2 sets of string line arrangement with sensor paver
- ix. Towed fifth wheel bump indicator

The Contractor shall maintain the surveying equipment in good condition during the full duration of works and replace the ones which get worn out or otherwise become unworkable.

The surveying equipment and related resources shall be provided under the general obligations of the Contractor requiring no separate payment.”

Clause 110 PUBLIC UTILITIES

Clause 110.3 This clause shall read as under:

“Any utility likely to be affected by the Contractor’s work shall be brought to the notice of the Engineer / Employer and such work shall be undertaken only after getting written clearance from the Engineer.”

CLAUSE 111 PRECAUTIONS FOR SAFEGUARDING THE ENVIRONMENT

Add the following text after the heading to Clause 111:

“In addition to the requirements of Annexure A to Clause 501, the Contractor shall comply with the Environmental requirements in the following clauses“:

Clause 111.1 General

Substitute the Clause with 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 Contractor shall take all measures and precautions to avoid any nuisance or disturbance arising from 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.

Roads used for haulage, 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.”

Clause 111.2 Borrow pits for Embankment Construction

Substitute the Clause with 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 sign boards and the operational areas shall be access-controlled.

In the case of borrow from tank beds, a regrade / improvement of the inlet channels (at least up to 100 m stretch) shall be undertaken in consultation with the concerned state government departments (the Minor Irrigation department of the State PWD) 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 of 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 all applicable states noise emission regulations. All operation areas shall be water sprinkled to contain dust levels to the National Ambient Air Quality Standards.”

Clause 111.3 Quarry Operations

Substitute the Clause with 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.”

Clause 111.5 Pollution from Hot-Mix Plants and Batching Plants

Delete the first sentence of this Clause and substitute with 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.”

Clause 111.8 Add the following at the end of this Clause:

“Water tankers with suitable sprinkling system shall be deployed along the haulage roads and in the work sites. Water shall be sprinkled regularly all along the routes to suppress airborne dusts from truck / dumper movements particularly on unpaved roads. Actual frequency shall be decided by the Engineer to suit site conditions.”

After Clause 111.12, add the following new Clauses 111.13 to 111.23

Clause 111.13 Haulage Roads

“Existing roads used for hauling shall be strengthened and / or widened by the Contractor in accordance with the requirements for normal as well as 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 respective specifications.

The alignment of the haulage roads shall be set 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 the 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.”

Clause 111.14 Water Sources and Water Quality

The Contractor shall provide independent sources of water supply, such as bore wells, for use in the Works and for associated storage, workshop and work force compounds. Prior approval shall be obtained from the relevant State Authorities and all installations shall be in compliance with local regulations. Bore wells installed and used for the project shall be left in good operating condition for the use of NHAI and 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.

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 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 off in accordance with the procedures approved by the local regulatory authority.

Clause 111.15 Equipment and Vehicles used for the Works

Equipment and vehicles deployed for the construction activities shall not be older than 5 years. Equipment used for road and bridge works shall be based on new technology and must not (NOT) generate noise and pollutants 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. Blasting, if any, shall be carried out using small charges.

Clause 111.16 Air Quality

The Contractor shall devise and implement methods of working to minimize dust, gaseous and other air-borne emissions and carry out the Works in such a manner as to minimize adverse impacts on the air quality. Construction camps shall have facilities for LPG fuel. The use of firewood shall not be permitted.

The Contractor shall utilize effective water sprays during delivery, manufacture, processing and handling of materials when dust is likely to be created, and to dampen stored materials during dry and windy weather. Stockpiles of friable materials shall be covered with clean tarpaulins, with applications of sprayed water during dry and windy weather. Stockpiles of materials or debris shall be dampened prior to their movement, except where this is contrary to the Specification.

Any vehicle with as open load-carrying area used for transporting potentially dust producing material shall have properly fitting side and tail boards. Materials having the potential to produce dust shall not be loaded to a level higher than the side and tail boards and shall be covered with clean tarpaulins in good condition. The tarpaulin shall be properly secured and extend at least 300 mm over the edges of the side of the side and tail boards.

The Contractor shall monitor air-quality once every week in all operational areas under the project and take the necessary steps to comply with the specified requirements. Air quality parameters will include SPM, RPM, SO NOx, HC and CO. Operational areas include work sites, haulage roads, hot mix plants, quarries, crushing plants, stock piles, borrow sites spoil disposal sites and any other area is used by the plant and equipment of the Contractor.

Clause 111.17 Noise Control

The Contractor shall consider noise as an environmental pollution constraint 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 requirement. The Contractor shall use all necessary measures and shall maintains all plant and silencing equipment in good conditions so as to minimize the noise emission during construction works.

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

Construction operations shall be limited to daytime hours only, particularly in the settlement areas. Night work shall not be allowed unless permission in writing by the Engineer.

Clause 111.18 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 111.19 Construction Camps

The construction camps shall conform to the State and National building regulations as applicable. The area for the storage of polluted materials shall be stored on impervious floors and shall be surrounded by impervious ditches in order to avoid spilling of polluted material to surrounding areas.

Construction camps shall be properly arranged to avoid noise pollution to the nearby habitants and to avoid contamination of river and canals from wastewater drainage. To prevent such contamination, wastewater generated at the camp sites shall be discharged into soak pits. These shall be of sufficient capacity to contain 120% of estimated volume. These shall be regularly cleaned and maintained to be effective. Human excreta shall be treated through septic tanks prior to discharge and shall conform to directives and guidelines of the State. Water accumulated in tires, empty vessels and containers of all nature will be regularly cleaned to avoid the related health hazards.

Clause 111.20 Control and Disposal of Wastes

The Contractor shall control the disposal of all forms of waste generated by the construction operations and in all associated activities. No uncontrolled deposition or dumping shall be permitted. Wastes to be so controlled shall include, but shall not be limited to, all forms of fuels and engine oils, all types of bitumen, cement, surplus aggregates, gravels, bituminous mixtures etc. The Contractor shall make specific provision for the proper disposal of these and any other waste products, conforming to local regulations and as approved by the Engineer.

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 approved by the Engineer. Wastewater shall be disposed in to septic tanks and soak pits etc. The Contractor shall make arrangements to clean-up 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 300 mm 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 450 mm thick impervious floor apron as per Clause 2503. Each successive 1.0 m layers shall be covered with 500 mm thick soil layer, and the area will be covered with 300 mm thick layer and planted.

Clause 111.21 Transport of Hazardous Materials

Transport of all hazardous materials, in bulk or in sealed containers, shall meet the requirements of the State regulations. Prior to ordering transport of hazardous material in bulk, the Contractor must obtain the approval of the relevant authority as well as of the Engineer. Precautionary measures and conformity with regulations shall be stated in a Method Statement for the approval of the Engineer. Sealed containers of hazardous materials shall be stored in a well ventilated room, well guarded and secured.

Clause 111.22 Emergency Response

The Contractor shall plan and provide remedial measures to be implemented in the event of occurrence of emergencies such as spillages of oil or bitumen or chemicals. The Contractor shall provide the Engineer with a statement of the measures he intends to implement in the event of such an emergency which shall include a statement of how he intends to provide personnel adequately trained to implement such measures.

Clause 111.23 Measurement

Monitoring of Air / Water / Noise and Soil quality shall be paid as per numbers of samples tested.

For Compliance of all other provisions made in this Clause 111, it shall be deemed to be incidental to the work and no separate measurement shall be made. The Contractor shall be deemed to have made allowance for such compliance with these provisions in the preparations of his prices for items of work included in the BoQs and full compensation for such compliance shall be deemed to be covered by them.”

Clause 112 ARRANGEMENT FOR TRAFFIC DURING CONSTRUCTION

Clause 112.1 General

Delete the last sentence and add the following:

“14 days before undertaking work which would involve any obstruction whatsoever to traffic, the Contractor shall submit, for the Engineer’s approval, a Traffic Safety and Management Plan.

The plan shall include:

- i. Details of the arrangements for passing traffic during construction, design of barricades, signs, markings, lights, flags etc conforming and satisfying the requirements of IRC: SP 55-2001;
- ii. Drawings for temporary diversions in accordance with Sub- Clause 112.3 if required;
- iii. Details of arrangements proposed to be in place after the cessation of work.

Special consideration shall be given in the preparation of the Traffic Safety and Management Plan for the safety of pedestrians, traffic works and delineation of the roadway at night.”

Clause 112.2 Replace second sentence as “The treatment of shoulder shall consist of 200 mm thick wet mix macadam base as per Clause 406 covered with 20 mm thick premix carpet and Type B sand seal coat as per Clauses 512 and Clause 513 in a width of at least 2.0 m and the surface shall be maintained throughout the period during which traffic uses the same to the satisfaction of the Engineer.”

Add at the end of second paragraph as follows

“Where it is absolutely necessary that the camber of the existing road is to be corrected before the commencement of the additional carriageway in order to avoid ponding of rain water, the same unidirectional camber has to be provided first.”

Clause 112.3 Passage of Traffic along a Temporary Diversion

Substitute the Clause as under:

Clause 112.3.1 “In stretches where it is not possible to pass traffic on part width of carriageway, a temporary diversion shall be constructed with total 7.0 m roadway with the following provision for road crust:

- i. 300 mm thick subgrade in 7m width with earth of minimum CBR 5% as per Clause 305;
- ii. 200 mm thick granular subbase as per grading I of Table 400-1 of Clause 401;
- iii. 225 mm thick wet mix macadam as per Clause 406;
- iv. 20 mm thick premix carpet covered with Type B seal coat as per Clauses 512 and 513.

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

Clause 112.3.2 “On completion on one side of carriageway, traffic shall be diverted to new carriageway in order to carry out the strengthening work on existing carriageway. Traffic shall be diverted through a temporary diversion to be constructed at the both ends of completed carriageway. Such diversion shall have minimum 20 m length along the length of the road stretch and shall be in full width of median. It shall have the following crust composition if its location does not match with the location of median opening:

- i. 300 mm thick subgrade in 7m width with earth of minimum CBR 5% as per Clause 305;
- ii. 200 mm thick granular subbase as per grading I of Table 400-1 of Clause 401;
- iii. 225 mm thick wet mix macadam as per Clause 406;
- iv. 20 mm thick premix carpet covered with Type B seal coat as per Clauses 512 and 513.

Clause 112.4 Traffic Safety and Control

Last line of fifth para shall be read as under:

“The signs shall be of approved design and of reflectory type.”

Clause 112.6 Measurements for Payment and Rate

Substitute the clause as follows:

- (a) “The provision of treated shoulder including construction of temporary cross drainage structures, if required, as described in Clause 112.2 including their maintenance, dismantling and clearing debris, where necessary, shall be considered as incidental to the works and shall be Contractor’s responsibility.
- (b) The Construction of temporary diversion including temporary cross drainage structures as described in Clauses 112.3.1 shall be measured in running metre and the work as per Clause 112.3.2 will be measured in sq.m. and the unit contract rate shall be inclusive of full compensation for construction (including supply of material, labour, tools etc), maintenance as per Clause 112.5, final dismantling, and disposal.
- (c) The Construction of temporary diversion for diverting traffic from one carriageway to another carriageway as described in Clause 112.3.2 shall be measured in square meter and the unit contract rate shall be inclusive of full compensation for construction (including supply of material, labour, tools etc), maintenance as per Clause 112.5, final dismantling, and disposal.

- (d) All traffic safety and control devices used during the construction as per Clause 112.4 including providing, erecting and maintaining barrier, signs, markings, flags, lights and providing flag man etc. shall be measured and paid in km. month.”

Clause 114 SCOPE OF RATES FOR DIFFERENT ITEMS OF WORK

Clause 114.2 Item (ii) shall read as under:

“A detailed resources based construction programme including resource 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.

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 approval not later than 28 days after the date of receipt of the letter of acceptance.

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

Add the following as item (xvii) of the Clause 114.2:

“Monthly progress reports in a format acceptable to the Engineer shall be submitted by 5th of every month. The reports shall state the progress which has been achieved during the preceding compared with the planned progress; illustrate delays in proportion to the progress planned, analyse the consequences and state planned corrective actions as well as remedial measures proposed.”

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, an element or a part of the structure. 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 structure. Rate and cost for rehabilitation of the structure shall be settled mutually between the Engineer and the Contractor. In case of failure to arrive at an agreed rate and cost; the Engineer’s decision regarding the rate and cost shall be final and binding.”

Clause 115 METHODOLOGY AND SEQUENCE OF WORK

The Clause shall read as follows:

The Contractor shall submit a methods statement within 28 days after the date of letter of acceptance. The methods statement shall be submitted in two parts.

The General part of the methods statement shall describe the Contractor’s proposals regarding preliminary works, common facilities, and items that require consideration at the early stage of the contract. The General part shall be issued along with the first issue of the construction programme (refer to clause 114.2) and shall include information on:

- a) Sources of materials like coarse aggregate and fine aggregate, quantity and quality of materials available in different sources;
- b) Sources of manufactured materials like cement, steel, reinforcement, pre-stressing strands and bearings. Wherever possible the Contractor shall identify at least two sources for each of the items; he shall also submit samples / test certificates of recently manufactured materials for the consideration of the Engineer;
- c) Location of site facilities like batching plant, hot mix plant, aggregate processing plant etc;
- d) Details of facilities / approaches for transportation of men, equipment and materials like concrete for construction of pavements, foundations and substructure in river bed;
- e) Information on procedures to be adopted by the Contractor for prevention and mitigation of negative environmental impact due to construction activities;
- f) Any other information required by the Engineer subsequent to the scrutiny of method statement submitted along with the bid.

The general part of the quality management system shall accompany the methods statement under Clause 105.3.

Special parts of the methods statement shall be submitted to the Engineer by the Contractor for each important item of work like construction of embankments and subgrade, pavements, pile foundations, concreting, pre-stressing, repair and rehabilitation of existing structures, concrete superstructure and for any other item as directed by the Engineer. These statements shall be submitted at least 28 days in advance of the commencement of the activity or item of work, unless otherwise stipulated in the Contract. These statements shall give information on:

- i. Details of personnel both for execution and quality control of the work;
- ii. Equipment deployment with details of number of units, capacity, standby arrangements;
- iii. Sequence of construction, details of temporary or enabling works like, diversions, cofferdams, formwork including specialized formwork for superstructure, details of borrow areas, method of construction of embankment and subgrade, pavements, piles, concreting procedures, details of proprietary processes and products (e.g. details of prestressing systems, proprietary piling systems, bearings, expansion joints etc.) and details of equipment to be deployed. Wherever necessary, technical literature, design calculations and drawings shall be included in the methods statement;
- iv. Testing and acceptance procedures including documentation;
- v. Special part of the quality management system referred in clause 105.3 for the particular item of work shall be submitted along with the methods statement for the concerned activity;
- vi. Engineer shall examine and approve the methods statement or direct the Contractor to resubmit the statement with required modifications. The modified statement shall be submitted within 14 days of receipt of Engineer's comments.

The sole responsibility for the safety and adequacy of the methods adopted by the Contractor shall rest on the Contractor irrespective of any approval given by the Engineer.

The following Clause shall be added:

Clause 115.1 Approval of Proprietary Product / Process / System

“Only proprietary products proven by International usage in comparable projects shall be permitted to be used. Fully authenticated details of licensing and collaboration arrangement shall be submitted by the manufacturer, where relevant.

Within 90 days of award of work the Contractor shall submit the following information for all proprietary products for approval by the Engineer.

- i. Name of manufacturer and name of product / process / system
Complete details of the manufacturer of the product / process / system shall be furnished. Details of projects where similar product / process / system have been successfully used shall be furnished. Authenticated copies of license / collaboration agreement shall be furnished.
- ii. General features of the product / product / process / system
Detailed write up with methods statements shall be furnished for each product / process / system. This shall include complete working drawings & installation drawings, technical specifications covering fabrication, materials, system of corrosion protection etc.
- iii. Details of product development and development testing
- iv. Acceptance test and criteria
Manufacturer shall submit a quality assurance system document. Details of acceptance test and criteria of acceptance shall be furnished in this document.
- v. Installation procedure.
- vi. Maintenance procedure and schedule.
- vii. Warranty proposal.

The Engineer may order any additional tests for the purpose of accepting the product. The facility for such additional tests shall be made available by the manufacturer. The charges for these additional tests shall be borne by the Employer only in case the product satisfies the specifications.”

Clause 121 FIELD LABORATORY

Clause 121.2 Description

Substitute the words “shown in drawings” in first sentence of first para by “per provisions indicated in the Clause and at a location approved by the Engineer”.

Replace “electric supply etc” in the second sentence of first para with words” uninterrupted power supply etc.”

Delete the first sentence of second para and substitute the following:
“The floor space required for the field laboratory shall be not less than 500 sq. m.”

The fourth sentence of second para “The furnishings..... in Table 100-2” shall be read as under:

“A good semi furnished office accommodation shall be provided to the Materials Engineers of the Supervision Team as per the direction of the Engineer.”

Add as third para:

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

Within 14 days of the Letter of Acceptance, the Contractor shall prepare and submit a layout plan and details of the laboratory building and submit the 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 60 days after the receipt of Letter of Acceptance, and the field laboratory with all equipment / instrument shall be to the entire satisfaction of the Engineer. During the 60 days period starting from the Letter of Acceptance, the laboratory tests shall be performed in another laboratory proposed by the Contractor and approved by the Engineer.”

Clause 121.3 Laboratory Equipment

This Clause shall read as under:

“The following items of laboratory equipment procured from reputed manufacturers duly approved by the Engineer shall be provided in the field laboratory. The equipment and instruments shall be new and shall be quality certified by Bureau of Indian Standards (BIS). It shall include but not be limited to the following:

A General	
i.	Balance
a.	10 kg capacity semi-self indicating electronic type, Accuracy 1 gm 1 No
b.	500 gm capacity semi-self indicating electronic type, Accuracy 0.01 gm 2 Nos
c.	Chemical balance (electronic) 100 gm capacity, Accuracy 0.0001 gm 1 No
d.	Triple Beam balance 25 kg capacity, Accuracy 1 gm 1 no.
e.	Pan balance 5 kg capacity, Accuracy 0.5 gm 3 Nos
f.	Platform scale 300 kg capacity 1 No
ii.	Ovens-electrically operated, thermostatically controlled (including thermometer), stainless steel interior
a.	Temperature range ambient to 320°C, Sensitivity 5°C, capacity 300 Litre 1 No.
b.	Temperature range, ambient to 200°C, sensitivity 1°C, capacity 250 Litre. 1 No.
iii.	Sieves: as per IS :460-1962
a.	Test sieve set 450 mm internal dia as per BIS of required sieve sizes complete with lid and pan 2 Set
b.	Test sieve set 200 mm internal dia (brass frame and steel / or brass wire cloth mesh) as per BIS of required sieve sizes complete with lid and pan. 2 Set
iv.	Sieve shaker capable of taking 200 mm dia and 450 mm dia sieves electrically operated with time switch assembly as per BIS 1 No.
v.	200 tonnes compression testing machine electric cum manually operated fitted with three gauges 0-2000 KN. x 10 KN, 0-1000 KN x 5 KN and 0-500 KN x 2 KN 1 No.
vi.	Stop watches 1 / 5 sec. accuracy 3 Nos.
vii.	Glassware comprising beakers, pipettes, dishes, measuring cylinders (50 to 1000cc capacity) glass rods and funnels, glass thermometers range 0° C to 100°C and metallic thermometers range 300° C. 1 Doz. each
viii.	Hot plates 200 mm dia (2000 watt.) 3 Nos
ix.	Enamel trays
a.	600 mm x 450 mm x 50 mm 6 Nos
b.	450 mm x 300 mm x 40 mm 6 Nos
c.	300 mm x 250 mm x 40 mm 4 Nos
d.	Circular plates of 250 mm dia 4 nos
x.	Spatula set 2 sets
xi.	Water testing kit 1 set
xii.	First aid box 1 set
xiii.	Digging tools (pixels, shovels, fork etc) As reqd
xiv.	Miscellaneous tools (sledge hammer, lump hammer, wooden pegs etc) As reqd
xv.	Rain gauge 1 set
xvi.	Maximum and Minimum Thermometer 2 Nos
B For Soils and Aggregates	
i.	Liquid limit and plastic limit
a.	Liquid limit device with Casagrande and grooving tools and as per 1 No

	IS - 2720	
b.	Single point LL device	1 No
c	Moisture content cups of 50 ml and 30 ml capacity	150 No
d.	Ground glass plate with rounded edges 600 mm x 600 mm x 10 mm	2 Nos
ii.	Hydrometer analysis	
a	High speed stirrer	1 No
b.	Hydrometer	3 Nos
c.	Hydrometer jars	12 Nos
iii.	Sampling pipettes fitted with pressure and suction inlets, 10 ml capacity	2 sets
iv.	Laboratories compaction	
a	Compaction apparatus (Proctor) to the requirements of IS-10074-1982, complete with collar, base plate & 2.5kg rammer.	1 No
b	Compaction apparatus (heavy) to the requirements of IS-10074-1982, complete with collar, base plate and 4.5kg rammer.	3 Nos
c.	Vibratory hammer to the requirements of Test 14 - BS	1 set
v.	Sand pouring cylinder (150 mm) with conical funnel and top and base late (with 152 mm dia of sand cone) to the requirements of ASTM D 1556	2 sets
vi.	Sampling tins with lids 100 mm dia x 75 mm ht. 0.5kg capacity and miscellaneous items like moisture, tins with lid etc	30 Nos
vii.	Laboratory C.B.R. testing equipment to the requirements of IS, consisting following:	1 set
a.	floor mounted electro-mechanical load frame 5 tonne capacity with automatic strain control	1 No
b.	CBR moulds complete with collar, base plate etc	18 Nos
c.	Swell stands for holding dial gauge	9 Nos
d.	CBR plunger with penetration dial gauge holder	1 Nos
e.	Surcharge weight with central hole of 2 kg weight	40 Nos
f.	Spacer disc with handle	2 Nos
g.	Perforated brass swell plate with adjustable cap on handle	18 Nos
h.	Soaking tank for accommodating 18 CBR moulds	1 No
i.	High tensile steel calibrated proving rings of 1000 kg. 2500 kg and 5000 kg capacity	1 set
j.	Dial gauge, 25 mm travel, 0.01 mm / division	12 Nos
k.	Tripod stands for holding dial gauge holder	18 Nos
l.	Aluminium Ties	
	50 mm x 30 mm	As reqd
	55 mm x 35 mm	As reqd
	70 mm x 45 mm	As reqd
	70 mm x 50 mm	As reqd
	80 mm x 50 mm	As reqd
ix.	Dynamic Cone Penetrometer equipment	2 Nos
x.	Nuclear gauge for density and moisture content determination to the requirements of AASHTO 238 and 239	1 set
xi.	Speedy moisture tester complete with carrying case and chemicals	2 Nos
xii.	Reagent grade Sodium Sulphate for soundness test of aggregate to the requirements of AASHTO T- 104	30 kgs.
xiii.	Flakiness auger (to BS 812)	1 No
xiv.	Post-hole auger (to BS 812)	3 sets
xv.	Core cutter apparatus with 10cm dia. and diamond cutting edge	2 sets
xvi.	Flakiness and Elongation test gauge	2 sets
xvii.	Standard measures of 30, 15, 3 litre capacity along with tamping rod	2 sets
xviii.	Unconfined compression test apparatus	1 set
xix.	Water still, 3 litre / hr. with fittings and accessories	1 set
xx.	Aggregate Impact Test Apparatus as per IS 2386 (Part IV) 1963	1 No
xxi.	Los Angeles abrasion Test Apparatus as per IS 2386 (Part IV) 1963	1 No

C	For Bitumen and Bituminous Mixes	
i.	Constant temperature bath for accommodating bitumen test specimen, electrically operated, and thermostatically controlled, stainless steel interior, 50 litre capacity, temperature range ambient to 80° C	2 Nos
ii.	Bitumen Penetrometer automatic type, including adjustable weight arrangement, and needles to the requirements of AASHTO T -49	1 set
iii.	Centrifuge type motorized bitumen extraction apparatus to the requirements of AASHTO T164 with stock of solvent & filter paper	1 set
iv.	Bitumen laboratory mixer planetary action, 2 litre capacity, including required accessories electrically operated and fitted with heating jacket	1 No
v.	Marshall compaction apparatus to the requirements of AASHTO 245 as per ASTM 1559-62 T and complete with electrically operated automatic loading unit, compaction pedestal, heating unit, head breaking assembly, flow meter, load transfer bar, specimen moulds 100 mm dia with base plate. collars, specimen extractor, compaction hammer 4.53kg x 457 mm fall, (excluding constant temperature bath)	1 set
vi.	Dial type thermometer reading 0-200°C range, accuracy 2° C	As reqd
vii.	Digital reading thermometer for measuring temperature in Asphalt mixes	1 No
vii.	Thin Film Oven Test apparatus to the requirements of AASHTO T 179 including accessories	1 No
viii.	Ring and Ball Apparatus as per IS 1205-1978	1 set
ix.	Asphalt Institute Vacuum Viscometer as per IS 1206 (Part-II)-1978	1 set
x	Apparatus for Determination of Ductility test as per IS 1208-1978	1 set
xi	Pen Sky-Martars closed tester for testing flash and fire point as per IS 1209-1978	1 set
xii	Apparatus for Float Test - IS 1210-1978	1 set
xiii	Apparatus for Determination of water content (Dean and Shark Method) IS-1211-1978	1 set
xiv.	Apparatus for Determination of Loss on heating IS-1212-1978	1 set
xv	Apparatus of Determination of specific Gravity IS-1202-1978	1set
D	For Cement, Cement Concrete and Materials	
i.	Vicat needle apparatus for setting time with plungers, as per IS-269-1968	1 set
ii.	Moulds	
a.	150 mm x 300 mm ft Cylinder with capping component along with the capping set and compound as per IS	48 Nos
b.	Cube 150 mm , moulds and 100 mm (each Size) as per IS	36 Nos
c.	Beams 600 mm x 150 mm x 100 mm moulds	18 Nos
iii.	High frequency mortar cube vibrator for cement testing	1 No
iv.	Concrete mixer power driven, 1 Cu. Ft. capacity	1 No
v.	Variable frequency and amplitude vibrating table size 1m x 1m, as per the relevant British Standard	1 No
vi.	Concrete permeability apparatus	1 No
vii.	Flakiness and Elongation index test apparatus	2 sets
viii.	Flexural Beam testing machine with accessories	1 No
ix.	Chloride testing kit for chemical analysis of chloride content	1 No
x.	Flow table as per IS 712-1973	4 Nos
xi.	Vibrating hammer as per BS specification	1 No
xii.	Equipment for slump test (C-143) / compacting factor Apparatus complete	4 Nos
xiii.	Equipment for determination of specific gravity for fine and coarse aggregate as per IS 2386 (Part 3)1963	4 Nos

xiv.	Flexural attachment to compression testing machine	2 Nos
xv.	Needle vibrator	4 Nos
xvi.	Air entrainment meter ASTM C-231	1 No
xvii.	0.5 cft / 1.0 cft cylinder for checking bulk density of aggregate with tamping rod	2 Nos
xviii.	Soundness testing apparatus for cement	1 set
xix.	Chemicals solutions and consumable	As regd
xx.	ION Exchange kit for rapid determination of sulphate content	
xxi.	Water still	1 No

All equipment shall conform to accepted international standards and shall be subject to the approval of the Engineer.

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.”

Clause 121.4 Ownership

This clause shall read as under:
“Land for the laboratory shall be provided by the Contractor.”

Clause 121.5 Maintenance

This clause shall read as under:
“The contractor shall arrange to maintain the field laboratory including sample store yards in a satisfactory manner until the issue of Taking over Certificate for the whole work. Maintenance includes all activities described in Clause 120.4 and maintenance of equipment and running of the same including chemicals and consumables.”

Clause 121.5 Deleted

Clause 121.6 Rates

“The construction, supply, installation, maintenance, and operation including al expenses involved in connection thereto for the field laboratory shall be incidental to the work, and shall not be paid separately.”

CLAUSE 123 PROVIDING AND MAINTAINING WIRELESS COMMUNICATION SYSTEM

Replace this Clause by the following:

Clause 123.1 Scope

The work. covers the provision and maintenance of cellular phone system with necessary accessories.

Clause 123.2 Supply

The Contractor shall arrange to supply, install and commission mobile cellular phones in numbers of Instrument-month indicated in the Bill of Quantities. The system shall consist of the following:

- a) Hand held Mobile Cellular phones of Nokia/Motorola/Siemens or equivalent approved with roaming facility make suitable for use throughout the State of Rajasthan.

- b) SIM cards for each phone for connection to all places in Rajasthan.
- c) Initial subscription fees and security deposit.

The Contractor shall provide the phones within 15 days from the date of commencement of work. He shall submit a guarantee for replacement of any defective phones during the period of the Contract.

Clause 123.3 Approval

The Contractor shall procure the services of authorised service providers within the State of Rajasthan and shall be liable for the licences and approvals necessary for using the cellular phones.

Clause 123.4 Maintenance

The Contractor shall arrange to maintain the entire cellular phone system including the phone sets, SIM cards and other accessories. Maintenance shall also include payment for local and STD calls (as allowed by the SIM Cards) and subscription fees or any other airtime and operating cost. The period of maintenance shall be until the issue of taking over certificate for the complete work. He shall replace any instrument or component which goes out of order at his own cost and provide all necessary spares and attend to all.

Clause 123.5 Measurements for Payment

The measurement for supply and commissioning of cellular phone communication system shall be on the basis of number of instrument-month as indicated in the Bill of Quantities.

If the Contractor fails to commission and hand over the system in good working condition in the stipulated time, an amount of Rs.30,000/- per month or part thereof shall be debited to the Contractor's account.

The measurement for maintenance of the system shall be on instrument months and shall be made on completion of satisfactory maintenance every month.

If the Contractor fails to carry out the required maintenance as directed by the Engineer at any stage of work, an amount of Rs.20,000/- per month or part thereof shall be debited to the Contractor. In addition, the month/months during which the Contractor fails to carry out the required maintenance shall not be measured for payment.

If the Contract Works are not completed within the stipulated period or within granted extended time of completion, the maintenance of the system in accordance with Clause 123.4 shall be carried out by the Contractor at his own cost and as such, no payment shall be made for the same. In case of any failure by the Contractor to do so, an amount of Rs.25,000/- per month or part thereof shall be debited to the Contractor's account.

Clause 123.6 Rates

The Contract unit rate for the supply, commissioning and maintenance of cellular phone system shall cover all the expenses towards the supply of all necessary items and expenses towards operating the system, guarantee for replacement of the phones (which are found defective) during the currency of the Contract and all other incidentals.

No separate maintenance charges shall be paid for carrying out periodic servicing and checking of the system, replacement of components, attending to all necessary repair, payment of air-time charges, subscription fees and taxes, if any, and other incidentals to keep the complete system in satisfactory working condition."

Clause 124 PROVIDING AND MAINTAINING VEHICLES FOR THE ENGINEER

The heading of this Clause shall read as under:

PROVIDING AND MAINTAINING VEHICLES FOR EMPLOYER/ EMPLOYER'S REPRESENTATIVE AND HIS STAFF

Clause 124.1 Scope

This Clause shall read as under:

"The work covers providing and maintaining vehicles/passenger cars for use by the Employer and his representatives as described under the Bill of Quantities".

Clause 124.2 Description

Modify para 1 of this clause to read as under:

"The vehicles for the Employer/Employer's representative shall be of A.C. Passenger cars (Toyota, Qualis, Sumo or equivalent). The vehicles shall not be older than year 2003. The no. of vehicles to be provided by the contractor shall be decided by the Employer/Employer's representatives at various time out of the total provision in the Bill of Quantities and ordered in writing".

The last two sentences of para - 2 of this clause shall be read as under:

" The vehicles shall be provided day and night as required by the Employer. The contractor shall also make available drivers having valid licenses at such times and for such duration as instructed by Employer's Representative".

Clause 124.3 Maintenance

Substitute Rs.500/- by Rs.1 ,000/- in 9th line of para1

Substitute Rs.700/- by Rs.15,00/- in 9th line of para2

Clause 124.4 Withdrawal of Vehicles

The first sentence for this Clause shall read as under:

"The Contractor shall withdraw particular vehicles for the non use by the Employer."

Clause 124.5 Measurement for Payment

The first sentence of this Clause shall read as under:

"The payment for providing and maintaining vehicles shall be on vehicle-month basis for actual number of months the vehicles were provided in god working order."

Add the following to the end of this Clause.

"The unit rate shall allow for the vehicles to travel for up to 5000 km. per month per vehicle. Kilometer in excess of 5000 km. per month shall be paid for on KM. basis, where the aggregate sum of mileage for all the vehicles is more than 5000 km. per month for each vehicle. Running totals shall be adjusted monthly.

SECTION 200 SITE CLEARANCE

Clause 201 CLEARING AND GRUBBING

Clause 201.1 Scope

Replace with following para:

"Clearing and grubbing shall be performed in advance of earthwork and 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 upto 150 mm , which in the opinion of the Engineer is unsuitable for incorporation in the work or can not be auctioned 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 the Engineer. It shall include necessary excavation by borrow discs or any other suitable equipment, back filling of the pits by suitable soil resulting from uprooting of trees and stumps and making the surface in proper grade by suitable equipment and compacted by power roller to the required compaction as per Clause 305.3.4. The work also includes handling, salvaging and disposal of cleared material."

Clause 201.5 Measurements for Payment

The last sentence of first para shall read as "Removal of stumps and roots of trees less than 300 mm in girth left over after trees have been cut by any other agency shall be considered incidental to the work. The removal of stumps and roots of trees above 300 mm girth left over after trees have been cut by any other agency shall be paid in numbers according to their category of girth."

Clause 201.6 Rates

Clause 201.6.1 Delete "as well as stumps left over after cutting of trees carried out by another agency" from the second sentence.

Clause 201.6.4 Add new Clause

"The Contract unit rate for removal of stumps and roots of trees of girth above 300 mm left over after cutting of trees carried out by another agency shall include excavation and back filling to required density, where necessary, and compaction, handling, salvaging, piling and disposing of the cleared materials with all lifts and leads."

Clause 202 DISMANTLING CULVERTS, BRIDGES AND OTHER STRUCTURES / PAVEMENTS

Clause 202.3 Dismantling Pavements and Other Structures

Add at the end of first para as follows:

"Existing bituminous layer in the specified width shall be removed as per Clause 501.8.3.2 if there is no need to remove granular layers."

Clause 202.5 Disposal of Materials

The first para shall be read as:

"All materials obtained from dismantling / milling shall be the property of the Contractor for which rebate shall be admissible according to respective BoQ item. The Contractor

shall be free to use this material in work as indicated below, or may sell / dispose the material as deemed fit by him except existing pavement crust which shall be reused:

The Contractor shall be free to use dismantled / milled material, either as is where is basis or, by suitably modifying the material or, by crushing the material or, by breaking the material and screening the same, provided it meets the specifications and is approved by the Engineer.”

Clause 202.6 Measurements for Payment

This Clause shall be read as:

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

- | | | |
|--------|--|--------------------|
| (i) | Dismantling brick / stone masonry / concrete (plain / reinforced) |cum |
| (ii) | Dismantling pavement structures such as Sub bases / Bases, bituminous courses, concrete wearing course |cum |
| (iii) | Dismantling pipes, guard rails, road kerbs |running metre |
| (iv) | Dismantling guard stones / km stones / sign posts / hectometre stones |each |
| (v) | Dismantling RCC railing |running metre |
| (vi) | Dismantling angle type expansion joint of bridges |running metre |
| (vii) | Dismantling of railing kerb |running metre |
| (viii) | Dismantling of concrete edge strip without damaging existing structure |running metre |
| (ix) | Dismantling of drainage spouts including cleaning entire area, enclosure of metallic bearing |each |
| (x) | Dismantling of stone pitching / boulder apron / brick soling / stone soling |cum |
| (xi) | Dismantling of telephone and electric poles including their foundation |each |

Clause 202.7 Rates

Add at the end of this Clause:

“The contract unit rates for various items of rebate shall be on the full quantities obtained from dismantling taking into account all the operations for reuse of salvaged materials and disposal of the balance material within all lead and lifts.”

SECTION 300 EARTHWORK, EROSION CONTROL AND DRAINAGE

Clause 301 EXCAVATION FOR ROADWAY AND DRAINS

Clause 301.1 Scope

Insert the following between the words “roadway” and “side drains” in the second line:

“road shoulders, verge, medians, channel training at culvert / bridges”.

Clause 301.2.1 Classification

Add para (f) as under:

“Hard Rock (controlled blasting)

Hard rock requiring blasting as described under (c) but where full scale blasting is prohibited for any reason and excavation has to be carried out by less quantity of explosive placed at pre-determined critical locations so that maximum returns can be had.”

Clause 301.3.3 Excavation- General

Delete the last two sentences of fifth para “If trees were..... to the work” .

Clause 301.3.5 Rock Excavation

The first sentence of first para shall read “rock, when encountered in road excavation, shall be removed upto 100 mm below the base of WMM.”

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 providing treated / paved shoulders and medians”

Add at the end of para as follows:

“If there are chances of damage to the existing pavement due to involvement of excessive cutting, the Contractor shall take adequate safety measure to safeguard the crust of existing pavement and may provide dry stone wall caged in GI wire of adequate strength after getting concurrence from the Engineer. This work shall be considered incidental to the Work and no extra payment shall be made.”

Clause 301.3.11 Disposal of excavated materials

Begin the first para with words “Except in areas where the excavated material shall be pushed down to valley within 100 m lead,” before the sentence “All.....”.

Add at the end of first para “If directed the suitable excavated material can be used beyond 1000 m lead with payment on actual haulage as per Clause 301.9.6. In mountainous terrain, excavated material shall be pushed down to the valley to make working space. However, if it is required to push the excavated material beyond 100m lead, the same may be resorted after prior permission of the Engineer but with no extra payment on account of additional lead.”

Clause 301.6 Preparation of Cut Formation

Second para shall be read as under:

“In rocky formation, the rock shall be cut 100 mm below the specified elevation of base of WMM and the surface irregularities shall be corrected. The gap between rock cut and base

of WMM shall be filled with 100 mm thick granular sub base as per grading I of Table 400-1 of Clause 401. The unsuitable material shall be disposed of in accordance with Clause 301.3.11.”

Clause 301.8 Measurement for Payment

First para shall read as follows:

“Excavation for roadway and side drains shall be measured by taking cross section at suitable intervals on completion of clearing and grubbing and before the commencement of earthwork and after its completion and computing volumes in cu.m by the method of average end areas for each class of material encountered.”

Fourth para shall read as follows:

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

- | | | |
|--------|--|-------------|
| (i) | Excavation in all classes of soil in non-mountainous terrain |cum |
| (ii) | Excavation in ordinary rock in non-mountainous terrain |cum |
| (iii) | Excavation in hard rock with blasting |cum |
| (iv) | Excavation in hard rock without blasting |cum |
| (v) | Excavation in hard rock with Controlled blasting |cum |
| (vi) | Excavation in all classes of soil in mountainous terrain |cum |
| (vii) | Excavation in ordinary rock in mountainous terrain |cum |
| (viii) | Preparation of rocky subgrade |sq.m. |
| (ix) | Stripping, storing and reapplication of top soil |cum |
| (x) | Disposal of surplus material beyond initial 1000m lead | |
| | • Beyond initial lead but upto 5 km | |
| | • 5 km- 10 km |cum |
| | • beyond 10 km |cum |
| | |cum.km |

Clause 304 EXCAVATION FOR STRUCTURES

Clause 304.3.2 Excavation

At the end of first para add the following:

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

Clause 304.3.4 Preparation of Foundation

In second and third paras, substitute “concrete M15” in place of “1:3:6 nominal mix”

Clause 304.3.7 Backfilling

Delete the word “Mechanical tamper” in seventh line and substitute it with “Roller / or plate vibrator”.

Clause 304.4 Measurement for Payment

In the second sentence of first para after the words”.... Cutting of slopes,” insert the words “protection / support of existing structures,”.

Clause 305 EMBANKMENT CONSTRUCTION

Clause 305.2 Materials and General Requirements

Clause 305.2.1 Physical Requirements

Clause 305.2.1.2 Add the following after the second para:

“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 soils. The location and the extent of these soils with medium to high swelling potential shall be defined as instructed by the Engineer.”

Clause 305.2.1.4 Delete second sentence “However, the Engineer.....requirements of these specifications”.

Clause 305.2.2.2 Borrow materials

First para of this Clause shall be read as under:

“No borrow area shall be made available by the Employer for this work. The arrangement for the source of supply of the material for embankment meeting the prescribed specifications as well as compliance to the different environmental requirements in respect of excavation and borrow areas as stipulated, from time to time, by the Ministry of Environment and Forest, Government of India and the local bodies, as applicable shall be the sole responsibility of the Contractor.”

After seventh para substitute the Table 300-2 as under:

Compaction Requirements of Embankment and Subgrade

Sr. 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 98
2	Embankment	
	a) upto 6m height	Not less than 95
	b) exceeding 6m height	Not less than 97
3	Expansive clays	Such material is not allowed
4	Median and verge (below agriculture soil)	Not less than 95

Para 8 given below the Table 300-2 shall read as under:

“The Contractor shall at least 21 working days before commencement of construction of embankment and the subgrade, submit the following to the Engineer for approval:

- 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;
- Graphs of Density versus moisture content through which values of maximum dry density and optimum content determined and given in (i) above;
- Dry density-moisture content-CBR relationships based on heavy compactive efforts conforming to IS:2770 (Part 8) for each fill material proposed to be used in the subgrade.

The compaction shall be carried out on approved dry density-moisture relationship.”

Clause 305.3 Construction Operations

Clause 305.3.4 Compacting ground supporting embankment / subgrade

In first para delete the words “where necessary”.

In second para replace “97%” by “98%” wherever it appears.

Add the following sentence at the end of second para:

“Backfilling layers in pits, trenches and below the original ground shall 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 0.5 m to 1.0 m. Samples of natural ground collected at each location, and tested in accordance with IS:2720 (Part 8). The relative density (i.e. percentage of the field dry density to the laboratory maximum dry density) is assessed for each sample, and the greatest relative density obtained is selected as the ‘natural ground density’. If the natural ground density is less than 85% then these are to be compacted after necessary watering so as to achieve not less than 85% of relative compaction.”

Clause 305.3.5.1 Replace the first sentence as follows:

“The embankment and subgrade material shall be spread in layers of uniform thickness, provided demonstrated successfully and approved by the Engineer, not exceeding 250 mm compacted thickness over the entire width of embankment by mechanical means, finished by a motor grader and compacted as per clause 305.3.6.”

Clause 305.3.5.2 In third para delete the words “or IS:2720 (Part 8) as the case may be” in sixth line.

Clause 305.3.6 Compaction

The second para shall read as under:

“Vibratory roller of not less than 8-10 tonne static weight with plain or pad foot drum or pneumatic tyre roller of 15-20 tonne weight having tyre pressure of at least 7 kg / sq cm shall be used for compaction.”

Insert the following sentence before the last sentence of fifth para:

“The co-relation between sand replacement densities and nuclear gauge densities shall be used on trails with minimum 30 coherent density measurements.”

Clause 305.4.1 Earthwork for widening existing road embankment

First sentence of second para shall read as “Where the width of the widened portions is insufficient to permit the use of conventional rollers, compaction shall be carried out with the help of small vibratory roller or any other equipment approved by the Engineer.”

Clause 305.4.3 Earthwork over existing road surface

Substitute the Clause 305.4.3 (i) by the following:

“If the existing road surface lies within 1.0 m of the new subgrade level, the bituminous course of existing road crust shall be removed in its full depth so as to provide ample bond and sound internal drainage.”

Clause 305.4.4 Embankment and Sub-grade around structures

First sentence of fifth para shall read as “Where it may be impracticable to use conventional rollers, compaction shall be carried out with the help of small vibratory roller or any other equipment approved by the Engineer.”

Clause 305.8 Measurement for Payment

First para shall read as follows:

“Earth embankment / subgrade construction shall be measured by taking cross section at suitable intervals on completion of clearing and grubbing and before the commencement of earthwork and after its completion and computing volumes in cu.m by the method of average end areas.”

Clause 305.9 Rates

Clause 305.9.1 Add “including removal of top soil” after word “materials” appearing in first line of item (v)

Clause 306 SOIL EROSION AND SEDIMENTATION CONTROL

Clause 306.4 Measurement 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.”

Clause 306.5 Rates

This Clause shall be deleted.

Clause 307 TURFING WITH SODS

Clause 307.3.5 Watering and maintenance

First sentence of first para shall be replaced by “The sods shall be watered by the Contractor initially for 28 days on daily basis and thereafter at suitable interval so that grass shall maintain in good shape and health till final acceptance.”

Clause 309 SURFACE / SUB-SURFACE DRAINS

Clause 309.2 Surface Drains

Add the following after end of the fourth para:

“In urban section, inspection chambers as shown in drawings shall be constructed at the start, junctions and at the point of change in grade. In case of covered drain where it meets a slab or box culvert en-route, meeting arrangement shall be designed so as to avoid any water leakage.

Filling in median shall be levelled so as to drain out the water through median drain without causing any siltation in drain or erosion in median fill.

Catch pits shall be provided at the meeting point of - (a) two different types of drains, (b) culvert and drain and (c) bridge and drain.”

Clause 309.4 Measurement for Payment

This Clause shall read as follows:

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

- (a) Excavation in unlined ditch drain as per Clause 301
- (b) Open cross chute drain as shown in running metre

	drawing with PCC M 20, levelling concrete M15	
(c)	Paved open / covered drain	
	Levelling concrete M 15 grade	cu.m
	Coursed rubble masonry in cement mortar 1:3	cu.m
	PCC / RCC M 20 grade (excluding reinforcement)	cu.m
	HYSD Reinforcement	tonne
	RCC Grating	nos
	Precast RCC slab in M 20 grade	cu.m
(d)	Pipe drain	
	NP4 RCC pipe 600 mm dia, M20 grade	running metre
	RCC slab and M15 grade pipe encasing	
	NP4 RCC pipe 900 mm dia, M20 grade	running metre
	RCC slab and M15 grade pipe encasing	
(e)	Inspection chambers including MS grating, drainage pipes	nos
(f)	Catchpits	nos

Clause 309.5 Rates

This Clause shall read as under:

“The Contract unit rate for surface drains shall be payment in full for all items such as excavation, dressing the sides and bottom; providing lining, turfing, pitching, masonry, concrete providing, laying and jointing pipes; providing, laying and compacting backfill and bed of granular material; providing and fixing cover including full compensation for all materials, labour, tools, equipment and other incidentals to complete the work as shown on drawing with all leads and lifts. The levelling and sloping of road side land, provision of inlets, gratings, outlet pipes, bedding etc. wherever required shall be incidental to construction of drain.”

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

Clause 401 GRANULAR SUB BASE

Clause 401.1 Scope

Add the following at the end of this Clause:

“A site trial shall be performed in accordance with Clause 901.16.”

Clause 401.2 Materials

Clause 401.2.1 First para of this Clause shall read as under:

“The material to be used for the work shall be a mix consisting of crushed stone aggregate, natural sand, gravel in the required proportion depending upon the grading of each fraction so as to result in the mix grading confirming to Grading I or Grading II given in Table 400-1. The mix shall be prepared mechanically under control conditions. Use of moorum for GSB, either alone or in combination with other type of material, shall NOT be allowed. The material shall be free from organic or other deleterious constituents.”

Substitute second para by the following:

“Where the layer is intended to serve as a drainage layer in addition to being a part of the structural pavement the material must satisfy drainage criteria and for such requirement material passing sieve 2.36 mm and down shall be as per Table 400-1 A. In addition, the portion of 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).”

Table 400-1A

IS Sieve Designation	Percent by weight passing the IS sieve
	Grading -I
2.36 mm	10-15
0.85 mm	4-10
0.425 mm	Less than 3

Clause 401.2.2 Physical Requirements

Add at the end of this Clause as under:

“The Contractor shall, at least 21 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 commence only upon the Engineer’s approval of the material.”

Clause 401.4.1 Preparation of subgrade

Add after the first paragraph

“The existing pavement, where it is to be overlaid by a granular base and embankment as per Clause 305.4.3 shall be scarified as per clause 501.8.3.2 or as directed by the Engineer. Where the existing pavement contains multiple bituminous layers the scarification shall be to the underside of the lowest bituminous layer. General areas within the Works where multiple bituminous layers exist will be advised by the Engineer.

After scarification and removal of the bitumen surface from the existing pavement to be overlaid to the satisfaction of the Engineer, the existing pavement shall be lightly sprinkled with water if necessary and rolled with three passes of an 80-100kN smooth wheeled roller. The existing pavement shall then be proof rolled with an 8 tonne single drum vibrating roller in the presence of the Engineer who shall determine the suitability of the existing pavement for overlay.

Alter proof rolling, the surface of the existing pavement shall be lightly “tyred” as directed by the Engineer where the overlay includes a sub-base layer but the compacted depth of the sub-base layer is less than 75 mm. In other cases “tyring” is not necessary.”

Clause 406 WET MIX MACADAM SUB-BASE / BASE

Clause 406.2.1.1 Physical Requirements

Add at the end of first para as under:

“The fraction of materials passing through 4.75 mm sieve shall be crusher run screening only. The river sand or quarry sand shall not be permitted either as such or mixed with crusher-run-screening in the Wet Mix Macadam. Use of moorum in any form is disallowed. Contractor shall obtain Engineer’s approval for the Job Mix Formula (JMF) for WMM mix before laying. If the source of materials changes, each time separate JMF approval shall be required.”

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

“The constituents of the aggregates shall be produced by integrated crushing and screening plant (impact or cone type crusher of capacity 200 ton / hr) and, unless otherwise instructed by the Engineer, crushing shall be carried out in at least two stages.”

Add the following at the end of the last para:

“Soundness test shall be carried out in accordance with IS: 2386 (Para 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: 383-1970.”

Clause 406.3.3 Preparation of Mix

The first para shall be read as follows:

“Wet mix macadam shall be prepared in an approved Wet Mix Macadam mixing plant of 200 ton / hr capacity having provision for controlled addition of water and forced / positive mixing arrangement.”

Clause 406.3.4 Spreading of Mix

Replace the second para as follows:

“The mix shall be spread by a WMM paver finisher preferably in full width of the pavement including hard shoulder. The provision of string line arrangement duly supported on steel pegs installed at 5 metre centre to centre shall be made by the Contractor during laying of WMM layer with sensor fitted paver finisher to obtain guiding signals for maintaining levels, lines, grades etc. The laying in two operations to cover full width with Paver Finisher shall be allowed only if segregation of WMM along longitudinal joint does not take place. For portions where paver finisher can not be used, motor grader may be permitted subject to approval of the Engineer.”

Clause 406.3.5 Compaction

Delete second sentence of first para.

Clause 406.4 Opening to Traffic

The Clause shall be read as follows:

“No vehicular traffic of any kind shall be allowed on the finished WMM surface.”

Clause 407 SHOULDERS, ISLANDS AND MEDIAN

Clause 407.2 Materials

Add after “granular material / ” in second line “dismantled bituminous / granular material”

Replace third para shall read as under:

“Paved shoulder shall be constructed on same specification as of main carriageway. Where hard shoulder is not provided raised footpath shall be constructed.”

Clause 407.4.2 Median and Islands

This Clause shall be read as under:

“Median and islands shall be constructed in a manner similar to shoulder upto kerb level except top 325 mm. Earth filling in median and islands shall be 25 mm below kerb top. Agriculture soil in top 300 mm shall be filled as median filling. Median and islands shall be raised as shown in drawings by using concrete kerb or kerb cum channel as the case may be and suitably finished and painted in yellow and black bands as shown in drawing. The confined area of median and island below 300 mm shall be filled with granular material or dismantled bituminous / granular material and compacted by smooth wheel 8-10 ton roller. In case space does not permit use of smooth wheel roller, small roller or plate compacter may be used subject to approval of the Engineer. Top surface of median and islands shall be turfed with grass or planted with shrubs in rural section.

In urban section, no agriculture soil shall be filled and median shall be finished flushed with kerb top with chequered tiles. Before laying concrete blocks granular surface shall be levelled, watered and compacted as per shoulder specification given in Table 300-2. To facilitate the drainage in concentric widening, holes of minimum 150 mm dia shall be punctured in existing road at least 70 cm deep before filling the median with granular material. Frequency of hole shall be decided by the Engineer and it shall be considered incidental to work and no additional payment shall be admissible.”

Clause 407.4.2 Deleted

Clause 408 CEMENT CONCRETE KERB AND KERB WITH CHANNEL

Clause 408.3 Type of Construction

This Clause shall be read as under:

“The cement concrete kerb shall be cast in situ laid with kerb casting machinery.”

Clause 408.5 Construction Operations

Clause 408.5.1 This clause shall read as under:

“If kerb is to rest on new carriageway, the same shall be laid on extended width of WMM course of the pavement. However, if kerb is to rest on existing pavement, the same shall be laid on firm foundation of minimum 100 mm thickness of cement concrete of M15 grade cast-in-situ. The foundation depth in cement concrete shall be adjusted depending upon the elevation difference between existing and finished pavements subject to the condition of minimum. The foundation width in any of the above cases shall have a projection of 50 mm beyond the kerb stone towards the median. Before laying the foundation for kerbs, the base shall be levelled and slightly watered to make it damp.”

Clause 408.5.2 Substitute second line “In the portions.....facilitate drainage openings” by “In the portions where separator or footpath and / or the slope of the carriageway is towards median, there shall be a gap of 600 mm in every 10 m length of the kerb to facilitate drainage opening.”

Clause 408.5.4 Add at the end; “RCC or MS grating shall be inserted in the kerb as shown in drawing to facilitate the entry of water in covered drain.”

Clause 408.6 Measurements for Payment

Second para shall read as under:

“Foundation of kerb where separately provided other than extended pavement shall be measured in cu.m and paid as separate item in BOQ.”

Clause 409 FOOTPATHS AND SEPARATORS

Clause 409.1 Scope

Delete third sentence “The scope of the work..... or as directed.”

Clause 409.2 Materials

Part (a) shall read as under:

“Cast-in-situ reinforced cement concrete of Grade M20 as per Section 1700 of the Specifications wherever covered drain shall be constructed below.”

In part (b) delete the word “tile” wherever appears.

Part (c) shall be deleted.

Clause 409.3 Construction Operations

Clause 409.3.1 The para shall read as under:

“Base and walls of covered drain below footpath and separator shall be first constructed. Connection with inlets and outlets through inspection chambers or drainage pipes or gratings or catch basins shall be established as provisions in drawings or as directed by the Engineer.”

Clause 409.3.3 Add at the end of this Clause “Over walls of covered drain cast-in-situ or precast RCC slab as directed by the Engineer shall be placed.”

Clause 409.4 Measurement for Payment

This Clause shall be read as under:

“Except in case where slab over covered drain is treated as footpath, footpath and separator shall be measured in square meter inside of kerb.”

Clause 409.5 Rates

Substitute second sentence with “Cost of providing cement concrete (plain / RCC) in covered drain shall be paid in respective items of BoQ.”

SECTION 500 BASE AND SURFACE COURSES (BITUMINOUS)

Clause 501 GENERAL REQUIREMENTS FOR BITUMINOUS PAVEMENT LAYERS

Clause 501.2 Materials

Clause 501.2.2 Delete “crushed gravel or other hard material” from second line of first para.

Third para is deleted.

Clause 501.3 Mixing

In third and fourth lines of first para, replace the word “adequate capacity” with “Hot mix plant of batch type with minimum capacity of 120 ton per hour”.

Clause 501.5.3 Spreading

Replace first para as under:

“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 lines is compulsory to provide signal to electronic sensing device fitted with a paver finisher.”

Clause 501.6 Compaction

Substitute the sentence in second para beginning with “the intermediate rolling.....” with “Intermediate rolling shall be done with a pneumatic roller of 150-200 KN weight having tyre pressure of at least 0.7 Mpa.

Add new seventh para as under:

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

Clause 501.8.2.4 Profile corrective course and its application

This Clause shall read as under:

“Profile corrective course shall be laid in bituminous macadam if it is laid over existing bituminous surface. If existing bituminous surface is removed as per profile requirement and as per Clause 305.4.3, no profile corrective course shall be laid as the same shall be covered in granular course.

Where the maximum thickness of profile corrective course will be not more than 50 mm, the profile corrective course shall be constructed as an integral part of the overlay course. In other cases it shall be constructed as separate layer within tolerance as per Clause 902.3.”

Clause 501.8.3.4.1 Laying on granular base

This Clause is deleted

Clause 502 PRIME COAT OVER GRANULAR BASE

Clause 502.2.3 Choice of Primer

This Clause shall read as under:

“The prime coat used for prime coat shall be slow setting type bitumen emulsion complying with IS:8887 and CSS-I Grade conforming to ASTM D 2397 / AASHTO M 140, and shall be refinery produced.”

Clause 503 TACK COAT

Clause 503.2 Materials

This Clause shall read as under:

“The binder used for tack coat shall be rapid setting type bitumen emulsion complying with IS:8887 and CRS-I Grade conforming to ASTM D 2397 / AASHTO M 140, and shall be refinery produced.”

Clause 504 BITUMINOUS MACADAM

Clause 504.2.1 Bitumen

This Clause shall read as under:

“The binder shall be paving bitumen of Penetration Grade S 65 complying with IS:73.”

Add the following sentence at the end of this clause:

“The wax content in bitumen shall not exceed 4.5%”.

Clause 504.2.2 Aggregates

Delete the words “crushed gravel or other hard material” from the first sentence of first para.

Substitute third para with the following:

“The constituents of the aggregates shall be produced by integrated crushing and screening plant (impact or cone type crusher of capacity 200 ton / hr) and, unless otherwise instructed by the Engineer, crushing shall be carried out in at least two stages.”

Clause 504.2.5 Proportioning of materials

Add below Table 500-4 of Clause 504.2.5 as under:

“Grading-I shall be used for compacted thickness of a layer of 75 mm and above while Grading-2 shall be used for compacted thickness of a layer of less than 75 mm thickness. The Contractor shall give job mix formula for the mix design indicating mix properties. The laying of mix shall be done after approval of the Engineer.”

Clause 504.3.5 Spreading

The following sentence shall be added to this clause:

“The paver finisher shall be capable of laying full width as per drawing without forming any cold longitudinal joint.”

Clause 504.8 Rate

Add the words “except for the items of tack coat and prime coat (if any)” after the words “required operations” in second line.

The item (viii) of Clause 501.8.8.2 shall be substituted as under:

“The rate shall include any variation in the bitumen content in excess of minimum content given in Table 500-4 and no adjustment on this account shall be admissible.”

Clause 507 DENSE GRADED BITUMINOUS MACADAM

Clause 507.2.1 Bitumen

Delete words “indicated in Table 500-10” and insert “grade of S 65 in third and fourth lines.

Add the following sentence at the end of the Clause:

“The wax content in bitumen shall not exceed 4.5%”.

Clause 507.2.2 Coarse Aggregates

Delete the words “crushed gravel or other hard material” from the first sentence of first para.

Substitute second para with the following:

“The constituents of the aggregates shall be produced by integrated crushing and screening plant (impact or cone type crusher of capacity 200 ton / hr) and, unless otherwise instructed by the Engineer, crushing shall be carried out in at least two stages.”

Clause 507.2.5 Aggregate Grading and Binder Content

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

Grading	1	2
Layer Thickness	75 mm to 100 mm	50 mm to 75 mm
Bitumen Content % by mass of total mix ²	Min 4.5	Min 4.5
Bitumen Grade (pen)	S65	S65

The note-1 below Table 500-10 shall read as:

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

Clause 507.3 Mixture Design**Clause 507.3.1 Requirements for the Mixture**

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

Water sensitivity (ASTM D1075): Retained stability (Ratio of Marshall stability for 24 h immersion and 30 min immersion in water at 60° C)	not less than 75%
Stability to flow ratio	205 to 410
Filler – Bitumen ratio	0.6 to 1.2

Clause 507.4.8 Spreading

Following sentence shall be added to this clause:

“Temperature of mix at the time of laying shall be in the range of 120° C - 140° C.”

Clause 507.9 Rate

Add the words “except for items of prime coat and tack coat” after the words “required operations” in second line of first para.

Clause 509 BITUMINOUS CONCRETE**Clause 509.2.1 Bitumen**

This Clause shall read as under:

“The bitumen shall be refinery produced crumbed rubber modified bitumen CRMB 60 meter the requirements of clause 521”.

Clause 509.2.2 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 crusher of capacity 200 ton / hr) and, unless otherwise instructed by the Engineer, crushing shall be carried out in at least two stages.”

Clause 509.2.5 Aggregate Grading and Binder Content

This Clause shall read as under:

“When tested in accordance with IS:2386 Part I (wet grading method), the combined grading of the coarse and fine aggregates and added filler shall fall within the limits shown in Table 500-18 for grading irrespective of thickness of bituminous concrete course.”

The note-1 below Table 500-18 shall read as:

“The grading of the aggregates mix as used in work shall be a smooth curve within and approximately parallel to the envelope in Table 500-18.”

Clause 509.3 Mixture Design**Clause 509.3.1 Requirements for the mixture**

Add the following requirements to the list of Table 500-19:

Water sensitivity (ASTM D1075): Retained stability (Ratio of Marshall stability for 24 h immersion and 30 min immersion in water at 60° C)	not less than 75%
Swell Test (Asphalt Institute MS-2, No. 2)	Max 1.5%
Percent voids in mineral aggregate (VMA)	14-16

Clause 509.4.7 Spreading

Following sentence shall be added to this clause:

“Temperature of mix at the time of laying shall be in the range of 120° C - 140° C.”

Clause 509.9 Rate

Add the words “except for item of tack coat” after the words “required operations”.

Clause 511 OPEN-GRADED PREMIX SURFACING**Clause 511.1.2.1 Binder**

This Clause shall read as under:

“The bitumen shall be paving bitumen penetration grade S-65 or S-90 complying with IS:73. The wax content in bitumen shall not exceed 4.5%”.

Clause 511.1.3.5 Spreading and rolling

Replace the first sentence of first para as under:

“The premixed material shall be spread by sensor or manual paver or if approved by the Engineer by motor grader to the desired thickness, grades and cross-fall making due allowance for any extra quantity required to fill up depressions.”

Clause 511.1.3.6 Seal coat

This Clause shall read as under:

“A Type B seal coat conforming to Clause 513 shall be applied to the surface immediately after laying and compacting the premix material.”

Clause 511.1.8 Rate

Add the following at the end of para:

“Rate shall be inclusive of Type B seal coat and no extra payment shall be admissible in this regard.”

Clause 513 SEAL COAT

Clause 513.3.4 Construction of Type-B seal coat

This clause shall be read as under:
“Hot mix plant of appropriate capacity and type for the mixing of sand and bitumen as approved by the Engineer shall be used. The plant shall have separate dryer arrangements for heating sand.”

Clause 513.8 Rate

This Clause is deleted.

Clause 516 SLURRY SEAL

Clause 516.1 Scope

This Clause shall read as under;
“The work shall consist of mixing emulsified bitumen, well-graded fine aggregates (with mineral filler) and water, spreading the mixture and rolling on a pavement surfacing as 3 mm thick surface treatment. The work shall also include the removal of all loose bituminous materials and refilling the same treating as pothole repair and filling wide gaps more than 12 mm wide as per Clause 3004.2.

Clause 516.2 Materials

Clause 516.2.1 Emulsified bitumen

Delete last two sentences beginning with “If approved by the Engineer.....”.

Clause 516.4.2 Surface Preparation

Delete first para.

Clause 516.4.3 Tack Coat

Amend the paragraph as under:
“Tack coat of rapid setting emulsion diluted with water as per the Engineer’s direction shall be applied on the road surface, prior to slurry seal at the rate of 0.15 to 0.30 litres / sq.m. for each of the two sprays.”

Clause 516.9 Rate

Add the following in the end of para:
“Provision of tack coat, pot hole repair and filling wide gaps shall be incidental to work and no extra payment shall be admissible.”

SECTION 600 CONCRETE PAVEMENT

Clause 601 DRY LEAN CEMENT CONCRETE SUB-BASE

Clause 601.4 Subgrade

The second sentence shall read as under:
“The lean cement concrete sub-base shall be laid on drainage layer as per drawings. The drainage layer shall be as per grading Class III of Table 300-3. The material shall be crushed stone aggregate. The CBR of drainage layer shall be more than 30.”

Clause 601.5 Construction

Clause 601.5.4 Placing

Add the following in the beginning of this Clause:

“One day before placing of the dry lean cement concrete sub-base, the surface of the Granular Sub-base course shall be given a fine spray of water and rolled with a smooth wheeled roller after a lapse of 2-3 hours after watering. The Engineer may instruct another line spray of water to be applied just before placing of the dry lean cement concrete sub-base.”

Clause 601.5.7 Curing

Method (a) shall be adopted. Method (b) shall be deleted and add the following:

“Wet curing shall be done after the curing compound is not sticky to reduce the temperature of the concrete and avoid temperature induced curing of slabs.”

Clause 602 CEMENT CONCRETE PAVEMENT

Clause 602.1 Scope

Add the following at the end of this Clause:

“Site trials shall be performed in accordance with Clause 601.16.”

Clause 602.2 Materials

Clause 602.2.2 Cement

Replace the first para of this Clause with:

“It is the responsibility of the Contractor to test and propose the type of cement which will result in a concrete complying in all respects with the specifications. Cement to be used shall be obtained in bulk. Bulk cement shall be stored in accordance with Clause 1014. The cement shall be subject to acceptance test prior to use.”

Clause 602.2.4.2 Coarse Aggregate

Add the following para at the end of the Clause:

“The stone polishing value as measured by BS:812 (Part 114), shall not be less than 55.”

Clause 602.2.4.3 Fine Aggregate

Add the following para at the end of the Clause:

“The fine aggregates shall be natural sand conforming to the grading Zone-II as per IS:383.”

Clause 602.2.4.4 Add new Clause

“The grading limits for all aggregates shall be as per IS:383 for 20 mm nominal size aggregates and as given here under:

IS Sieve Designation	Percentage Passing
40 mm	100
20 mm	95-100
4.75 mm	30-50
600 μ	10-35
150 μ	0-6

Clause 602.2.5 Water

This Clause shall read as under:

“Water used for mixing and curing shall conform to Clause 1010 of Section 1000.”

Clause 602.2.7 Premoulded Joint Filler

Replace this Clause as under:

“Joint filler board for expansion joints shall be of the same thickness as the specified joint width within a tolerance of ± 1.5 mm and shall comply with the requirements of IS:1838 or BS specifications No. 2630. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint. Holes to accommodate dowel bars shall be accurately bored or punched to give a sliding tilt on the dowel bars.”

Clause 602.2.8 Joint Sealing Compound

Replace this Clause with:

“The Joint sealing compound shall be hot applied elastomeric type, complying with AASHTO M-282 for joints in asphalt pavements or joints between asphalt and concrete pavements, and cold applied polyurethane or polysulphide type complying with BS:5212-1990 for joints in concrete pavements.

The joint sealant shall be resistant to age hardening and shall have flexibility to accommodate movements of minimum 25% of the joint width as shown in the drawings without risk of breaking of the sealant or adherence failure. The dimensions shall be so proportioned; that the adherence to the groove walls is fully intact within the movement limits.

Suitable primers as recommended by the manufacturers of each type of joint sealant shall be used.”

Clause 602.3 Proportioning of Concrete

Clause 602.3.3 Concrete Strength

Clause 602.3.3.1 The last sentence of this para shall read as under:

“The water content shall be the minimum required to provide the workability for full compaction of the concrete to the required density as determined by the trial mixes or other means approved by the Engineer and the maximum free water-cement ratio shall be 0.45.”

Add the following at the end of this Clause:

“The concrete for the rigid pavement shall be of M40 grade with a 28 days compressive strength of not less than 40 Mpa and a flexural strength not less than 4.0 Mpa.”

Clause 602.3.5 Design Mix

Add at the end of first para, the following parameters shall be used for design mix:

- | | | |
|-------|--|--------------------|
| (i) | Characteristics flexural strength at 28 days |4.0 Mpa |
| (ii) | Target mean strength at 28 days |5.0 Mpa |
| (iii) | Water cement ratio |0.45 maximum |
| (iv) | Slump as per IS:1199 |30 $\pm$ 15 mm |

Clause 602.6 Joints

Clause 602.6.4 Longitudinal Joint

Add new Clause 602.6.4.3 after the Clause 602.6.4.2:

Clause 602.6.4.3 Joints at the junction of rigid and flexible pavements

“Joints shall be provided at the junctions of rigid and flexible pavements as shown in drawings. Where due to unavoidable reasons, the joints can not be constructed dowel bars shall be provided in the rigid pavement and other measures as directed by the Engineer shall be introduced.”

Clause 602.9 Construction

Clause 602.9.3.2 Batching Plant and equipment

Add at the end of this Clause:

“The batching plant shall have suitable devices for adjusting the slump of the mix and shall have facility for the computer printouts of every batch produced.”

Clause 602.9.9 Curing

Add the following at the end of this Clause.

“Immediately after sawing the joints the concrete in the grooves shall be covered by curing membrane.”

Clause 602.10 Trial Length

Clause 602.10.2 Add new para to Clause 602.10.2 as follows:

“All trials shall be carried out using the same paving width and slab thickness as used in the permanent works.”

Clause 602.10.5.3 Density

Replace the entire Clause with:

“(v) In-situ density shall be assessed as described in Clause 903.5.2.2 from at least 3 cores drilled when the concrete is not less than 7 days old. Should any of the cores show honey-combing in the concrete, the trial length shall be rejected and further use of the spreading and compacting unit shall not be permitted until further trials have shown that modification can be made which will result in adequate compaction.”

Clause 602.11 Preparation and Sealing of Joint Grooves.

Clause 602.11.3 Sealing with Sealant.

Clause 602.11.3.1 Replace first sentence with:

“Prior to application of the sealant the primer recommended by the manufacturer shall be applied.”

Clause 602.11.3.3 Replace the entire Clause with:

“Sealant complying with Clause 602.2.8 shall be used. Cold applied sealant shall be mixed and applied within the time limit specified by the manufacturer. Primers shall be applied neatly with an appropriate brush or as recommended by the manufacturer.

Clause 602.13 Opening to Traffic

Replace the entire Clause with:

“No vehicular traffic (including the Contractor’s vehicles) shall be allowed on the finished surface until a field flexural strength of minimum 4.0 Mpa has been achieved. It is the responsibility of the Contractor to produce a sufficient number of series of test specimens to verify the field flexural strength.

Prior to opening to traffic the joints shall be sealed and areas adjacent to the pavement shall be completed to a degree that will ensure traffic safety. Opening to traffic shall not constitute a final acceptance of the pavement.”

SECTION 800 TRAFFIC SIGNS, MARKINGS & OTHER ROAD APPURTENANCES

CLAUSE 801 TRAFFIC SIGNS

Clause 801.1 General

Clause 801.1.2 This Clause shall read as follows:

“The signs shall be reflectorised. They shall be retro-reflectorised type and made of encapsulated lens type reflective sheeting vide Clause 801.3, fixed over aluminium sheeting as per these specifications.”

Clause 801.2.6 This clause shall read as under

“The aluminium sheet used for signs shall be 2.0 mm thick.”

Clause 801.3 Traffic Signs Having Retro-reflective Sheetings

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.”

Delete last sentence of this clause.

Clause 801.3.3 Engineering Grade Sheetting

Delete this clause.

Clause 801.3.11 Warranty and Durability

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.”

Clause 801.4.1 Structural posts supporting the frame shall be made of tubular section, square box sections or M.S. angles embedded in concrete grade M-15 as shown in the drawings properly secured with base plate/anchor bolts.

Clause 801.4.2 Add following at the end of this Clause:

“The back side of signboard 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 801.5 Measurement for Payment

This clause shall read as:

“The measurement of cautionary, mandatory information, route marker, chevron and direction & place identification sign shall be in numbers.” The road signs for toll plaza shall be measured as per the details mentioned in respective BOQ items.

CLAUSE 802 OVERHEAD SIGNS

Clause 802.1 General

Add at the end of the Clause:

“The locations of overhead signs (Gantry type) shall be decided by the Engineer.”

Clause 802.3 Lateral Clearance

Clause 802.3.1 Delete last three sentences beginning with “where practicable....” and ending with “.....at inter-changes”.

Clause 802.5 Materials for Overhead Sign and Support Structure

Clause 802.5.3 Replace “1.5 mm” with “2.0 mm” in fifth line.

Clause 802.7 Installation

Clause 802.7.1 Add at the end of the Clause as under:

“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 backside of sign 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.”

Clause 802.8 Measurements for Payment

Clause 802.8.1 This Clause shall read as under:

“Galvanised steel overhead sign structure including aluminum sheeting of required size will be measured for payment by the specific unit complete in place as indicated in BoQ.”

Clause 802.9 Rate

Clause 802.9.1 This Clause shall read as under:

“The Contract unit rate for galvanised steel sign shall include cost of making structural steel, installation of aluminum retro-reflective sheeting and full compensation for furnishing all labour, materials, equipment for erection, fabrication and installation and all other incidental costs necessary to complete the work to the specifications. All other items like excavation for foundation, concrete and reinforcement in foundation, painting of structural steel & sign back etc., shall be considered incidental and no separate payment shall be made.”

Clause 802.9.2 Delete this Clause.

CLAUSE 803 ROAD MARKINGS

Clause 803.2 Materials

This clause shall read as under:

“Road markings shall be hot applied thermoplastic compound and the material 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 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.”

Clause 803.3 Ordinary Road Marking Paint

This Clause shall be deleted.

Clause 803.5 Reflectorized Paint

This Clause shall be deleted.

Clause 803.6 Application

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

Clause 803.6.6 Tolerances

i. General

Road traffic markings shall be constructed to accuracy within the tolerances given below:

- The width of lines and other markings shall not deviate from the specified width by more than 5%.
- The position of lines, letters, figures arrows and other markings shall not deviate from the true position specified by more than 20 mm.
- The alignment of any edge of a longitudinal line shall not deviate from the true alignment by more than 10 mm in 15 m.
- The length of segments of broken longitudinal lines shall not deviate from the specified length by more than 150 mm.

In broken lines, the length of segments and the gap between segments shall be as indicated on the drawings. If these lengths are altered by the Engineer, the ratio of the lengths of the painted sections shall remain the same.

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

ii. Faulty Workmanship or Materials

If any material 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 split paint will not show up again later.”

CLAUSE 804 CLAUSE 805 ROAD DELINEATORS

Clause 805.2 This clause shall read as follows:

- a) Triangular Object Marker shall be 300 mm side with three red reflectors, made out of 2 mm thick aluminum sheet, face to be fully covered by high intensity grade white retro reflective sheeting of encapsulated lens type as per clause 801. The background border symbols shall be made by screen printing of desired colour as per sign details. The sign plate shall be fixed with 6 mm dia. aluminum rivets on MS angle iron frame. The angle iron frame shall be made with angle of size 35 mm x 35 mm x 3 mm. The sign shall be fixed with nut-bolts and welding on MS angle ISA 40 mm x 40 mm x 5 mm and 500 mm high.
- b) Rectangular hazard marker 900 mm x 300 mm made out of 2 mm 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 6 mm dia aluminum rivets on MS angle iron frame. The angle iron frame shall be made with angle of size 35 mm x 35 mm x 3 mm. The sign shall be fixed with nut-bolts and welding on MS angle ISA 40 mm x 40 mm x 5 mm and 150 mm high.
- c) Roadway Indicators shall be 1000 mm high made with 100 mm rectangular aluminum die cast 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 40 mm width, so that total width of reflector shall be 120 mm. A wire mesh cover of 150 mm height shall be provided on top.
- d) All components of signs & supports shall be thoroughly descaled, cleaned, primed and painted with two coats of epoxy paint. The sign back side 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 805.4 Rate

Add at the end of the Clause “The cost of foundation as shown in the drawings including necessary excavation, drilling and concreting if any shall be incidental to the work and no extra payment shall be made.”

CLAUSE 806 BOUNDARY STONES

Clause 806.1 General

Add at the end of first para “The boundary stones shall be of concrete as shown in drawing.”

Clause 806.3 Rate

Add at the end of the Clause “The cost of foundation as shown in the drawings including necessary excavation and concreting shall be incidental to the work and no extra payment shall be made.”

CLAUSE 808 TUBULAR STEEL RAILING

Clause 808.1 General

This clause shall read as follow.

“The work comprises of supplying, fixing and erecting pedestrian guard railing in MS bars and angle iron system as shown in the drawings with posts, supports and accessories subject to approval of the Engineer.”

Clause 808.2 This Clause shall read as follows:

- a) End posts made out of ISA 50 mm x 50 mm x 5 mm and base plate of MS flat 100 mm x 5 mm placed at every 1.5 m center to center.
- b) MS frame made out of ISA 50 mm x 50 mm x 5 mm of size 1.5m x 0.98m.
- c) 20 mm dia MS bars to form vertical stiffeners at a spacing of 125 mm center to center.
- d) Entry gates if any shall be made with material of end posts.
- e) All posts, stiffeners and accessories shall be painted with two coats of enamel paints confirming to relevant IS Specifications.

Clause 808.4 This Clause shall read as follows:

“The railing shall be measured in running metre from end to end excluding space left for entry gates if any along the face of the railing.”

Clause 807.6 Rate

This Clause shall read as follows:

“The contract unit rate for railing shall be payment in full compensation for furnishing all labour, materials, tools, equipment, excavation for foundation, concreting for foundation, assembly / fabrication, installation at site and painting in two coats and all other incidental costs necessary to complete the work to these specifications.”

CLAUSE 809 CONCRETE CRASH BARRIER

Clause 809.5 Measurements for Payment

This Clause shall read as follows:

“The concrete crash barrier shall be measured in cubic meter of concrete placed in position and accepted length of barrier in place. The steel reinforcement shall be measured in tonne.”

Clause 809.6 Rates

Add at the end of the Clause:

“and paid as per respective BoQ items.”

CLAUSE 810 METAL BEAM CRASH BARRIER

Clause 810.2 Materials

The clause 810.2 is modified as under:

“The design, materials to be used and the location of metal beam crash barrier shall conform to relevant drawings or as otherwise directed by the Engineer.”

Clause 810.2.1 This clause shall read as:

Metal beam is a “W” profiled corrugated beam as specified in the drawing, made out of cold roll forming from steel strip of 3 mm thick using high strength steel of ST 42 grade with hot dip galvanised 550 gms per sq.m..

The beam after forming shall have formed width of 312 mm and thickness of 83 mm and shall have punched holes for fixing as specified in the 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 ST 42 grade with hot dip galvanised 550 gms per sq.m..

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 gms per sq.m.

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

The mechanical properties of the base metal for Beam shall conform to the following requirements:

- i) Yield point, minimum 345 Mpa
- ii) Tensile strength, minimum 483 Mpa and
- iii) Elongation, in 50 mm, minimum 12%

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

Clause 810.2.3 Add at the end of this Clause

“The size of the concrete foundation block for embeddings guard posts and grade of concrete shall be as shown in the drawing.”

Clause 810.4 Installation of Posts

The Clauses 810.4.1, 810.4.2, 810.4.3 and 810.4.4 are replaced as below:

“Guard posts may be embedded in earth or concrete. In cases of high embankments where metal crash barrier shall be provided in conjunction with kerb channel, guard post shall be embedded in the concrete footing of size and grade as indicated in the drawings.

In cases of rocky strata, hole shall be drilled to the depth of concrete footing as shown in the drawings. After erecting guard post, the same shall be backfilled with concrete of same grade as indicated in the drawings.

In all other cases, holes shall dug to the depth indicated in the drawing for anchoring in ground. All post holes that are dug shall be of such size as will permit proper setting of the posts and allow sufficient room for backfilling and taping. Holes shall be backfilled with selected earth or stable materials in layers not exceeding 100 mm thickness and each layer shall be thoroughly tamped and rammed.”

Clause 810.5.3 Add at the end of first para “The guard rail reflector shall be bolted replacing splice washer at every 10th posts interval.”

Clause 810.7 Measurements for Payment

Clause 810.7.1 The second sentence “Terminals / Anchors of various types shall be paid by numbers” is deleted.

Clause 810.7.2 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 and the delineator to replace washer as specified in drawing. The cost of these elements shall be deemed to be included in the rate quoted by the contractor.”

Clause 810.7.3 Add the words “or concreting” after the word “backfilling” in the second line.

Clause 810.8 Rate

Add “and drawings” at the end of last sentence of the Clause.

SECTION 900 QUALITY CONTROL FOR ROAD WORKS

Clause 901 GENERAL

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 equipment as per Clause 121 and adequate personnel in order to carry out all required tests and quality control works as per specifications and / or as per Clause 121 and / or as directed by the Engineer. The list of laboratory equipment and the facilities to be provided shall be as per Clause 121 and shall be got approved from the Engineer in advance.”

Clause 901.1 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 may 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

Clause 903.3 Tests on Sub-bases and Bases (excluding bitumen bound bases)

Clause 903.3.1 Acceptance Criteria

In Table 900-3, replace the following against Serial Nos 1 and 4:

Sr. No.	Type of Construction	Test	Frequency (minimum)
1	Granular	(iv) Density of compacted layer	One test per 1000 m ²
2	Wet Mix	(v) Density of compacted layer	One test per 1000 m ²

Clause 903.4 Tests on Bituminous Construction

Clause 903.4.1 Add at the end of this Clause:

“The density test shall be carried out by 150 mm diameter core cutter machine on dense bituminous macadam and bituminous concrete as per the frequency specified. The 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.”

In Table 900-4, Serial No.6 for Dense bituminous macadam and bituminous concrete, modify the frequency (minimum) values for item No. (vii), (ix) and (xvii) as under:
Add new Clause 903.4.3 after the Clause 903.4.2

“Bituminous concrete wearing course shall be tested immediately after laying / finishing for riding quality by measuring roughness of the finished layer by duly calibrated Towed Fifth Wheel Bump Integrator.”

Sr. No.	Type of Construction	Test	Frequency (minimum)
	Dense bituminous macadam / semi dense bituminous macadam / bituminous concrete	(vii) Sand equivalent test	Three tests on aggregates for each 400 ton of mix subject to two tests per plant per day
		(ix) Polished stone value	Initially one set of three representative specimens for each source supply. Subsequently when warranted by changes in the quality of aggregates
		(xvii) Density of compacted layer	One test per 500m ² subject to the condition that 10% of density tests shall be done within 300 mm from the edges

Add the following note at the end of Table 900-4:

Note:

- (a) The laboratory and field test 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.
- (b) 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 specifications and obtain the approval of the Engineer.
- (c) Daily, weekly and monthly reports on the testing done, results obtained thereof must be prepared indicating the location of sampling and testing, deviations from the acceptance norms for materials and works and actions taken in respect of removal of defective works must be prepared by the Contractor and authenticated by the Supervision Personnel that these tests were done in their presence and that the testing has been carried out as per the prescribed methodology.
- (d) The result of tests shall be compared with the prescribed acceptable values. The payment of all such works executed shall be based on the test results. In case test results for density test and riding quality test fall below the required values in accordance with specifications, the deductions as specified below shall be worked out and applied, limiting to “Nil” payment for the executed bituminous works. Separate deduction shall be made for each attribute that is density test and riding quality test.

Density (compaction) Test: Basis of Deduction

Core Density	Deduction in the payable rate
Less up to 1% of requirement	@ 5%
Less above 1% and upto 2% of requirement	@ 15 %
Less above 2% and upto 3% of requirement	@30 %
Less above 3% of requirement	@ 100% such works shall be rejected and NIL payment shall be made.

The minimum deduction in the payable rate shall be made for an area not less than 500 sq.m. for each failure of density (compaction) test.

Riding Quality Test: Roughness measured longitudinally

The finished bituminous concrete (BC) shall be tested for riding quality (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 2001 mm / km for finished BC layer.

Completed layer of BC having roughness in excess of the value 2000 mm / km shall be paid in accordance with the Deduction Formulae as specified below:

Measured Roughness	Deduction in the payable rate
Upto 5% more than the requirement	NIL
More than 5% and upto 30% more than the requirement	@(10%±1% for every 1% in excess of 5% of prescribed limit.)
More than 30% and upto 40% more than the requirement	@50%
Above 40% of more than the requirement	@100% (i.e. Nil payment)

The area for which deduction in the payable rate shall apply, shall be determined by the Engineer based on analysis of roughness results. However, regardless of any other consideration the minimum deduction applicable shall not be less than one lane for one km of surface area i.e. 3500 sq.m.”

Clause 903.5 Quality Control Tests for Concrete Road Construction

Clause 903.5.2 Pavement Concrete

Clause 903.5.2.1 Sampling and testing of beam and cube specimen

Replace first para with:

“For each day’s work, at least six pairs of beams for flexural strength and six pairs of cubes for compressive strength shall be cast from the concrete delivered to the paving plant as long as the total daily production is less than 300 cu.m. For daily production over 300 cu.m, two additional cubes shall be cast of each 100 cu.m (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 of the specimens shall be 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.”

Replace second para with:

“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 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 $\pm$ 5 mm, and shall be tested for compressive strength. The concrete will be acceptable if:

- (a) 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 as per Clause 602.10.5.4.
- (b) None of the cores show consideration honeycombing”

Delete sixth, seventh and eight paras and add the following at the end of para beginning with “Beams shall be.....”:

“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 eleventh para beginning with “The flexural strengths.....”.

In twelfth para replace “2.33” with “1.65” in last line.

Delete thirteenth and fourteenth paras.

Clause 903.5.2.4 Summary of control tests

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

“On each day’s work, at least six pairs of beams and six pairs of cubes for total daily production less than 300 cu.m . Two additional beams and two additional cubes for each 1000 cu.m in excess of 300 cu.m.”

SECTION 1000 MATERIALS FOR STRUCTURES

Clause 1002 SOURCES OF MATERIALS

This Clause shall read as follows:

“The Contractor shall identify the source of materials like coarse aggregate and sand notify the Engineer regarding the proposed sources prior to delivery.

Samples of materials from the source, shall be tested, in the presence of Engineer’s representative, for conformity to specifications. It shall also be ensured that the variation in test results of different samples is within acceptable limits. If the product from the approved source proves unacceptable at any time, the Contractor shall provide acceptable material from new sources other than the previous source at his own expenses conforming to specifications.

The manufactured items like cement, steel, reinforcement, prestressing strands, the Contractor shall intimate the Engineer details of the source (plant where the material is manufactured), testing facilities available with the manufacturer and arrangements for transport and storage of material at site. If directed by the Engineer, the Contractor shall furnish samples and test results of recently manufactured material. The Engineer, at his discretion, may require the Contractor to test the materials in an independent laboratory approved by the Engineer, and furnish test certificates. The cost of these tests shall be borne by the Contractor. The sampling and test procedures shall be as laid down in Indian standards or where these are not available as per the directions of the Engineer. Only materials from the sources approved by the Engineer shall be brought to the Site. If the

material from the approved sources proves unacceptable at any time, the Contractor shall provide new sources of acceptable material conforming to specifications from other sources at his own expense.

Clause 1006 CEMENT

Add the following at the end of list of types of cements:

- f. Portland Blast Furnace Cement (site blending of blast furnace shall not be permitted) IS:455
- g. Low heat Portland Cement IS:12600

Add the following at the end of this Clause:

“Manufacturer’s test certificate shall be submitted to the Engineer by the Contractor for every consignment of cement. The certificate shall cover all tests for chemical requirements, physical requirements and chloride content.

Independent tests of samples drawn from the consignment shall be carried out at the site laboratory or in an independent laboratory approved by the Engineer, immediately after delivery. The following properties shall be tested:

- i. Setting time
- ii. Compressive strength

The Cost of test shall be borne by the Contractor. In case, the cement is stored beyond 90 days from the date of delivery at site, the following test shall be carried out at the site laboratory before the cement is used:

- i. Setting time
- ii. Compressive strength

Lot size for independent testing of cement at site shall be the quantity received at site on any day subject to a maximum of 500 tonnes.”

Clause 1007 COARSE AGGREGATES

Delete from the first sentence “crushed gravel.....inert material” appearing in fourth and fifth lines of first para.

Add the following at the end of second para.

“Costs of all tests shall be borne by the Contractor.”

Delete fourth para and add the following:

“The maximum value of elongation index and flakiness index for plain, reinforced and Prestressed concrete should not exceed 15% each, taken separately, and not to exceed 25% taken together. The flakiness and elongation Index should be measured using methods as per IS: 2386. The coarse aggregates shall satisfy the requirements of grading as given in Table 1000-1.”

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

Clause 1008 SAND / FINE AGGREGATES

Delete from third line the words “crushed gravel” and from the fourth line “gravel” in second para.

Add the following at the end of this Clause:

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

Clause 1009 STEEL

Clause 1009.2 Steel for Prestressing

Add (e) to the list of codes to which acceptable prestressing steel shall conform:

- (e) Stress relieved low relaxation seven-ply strand for prestressed concrete - IS: 14268

Clause 1009.3 Reinforcement / Untensioned steel

In the Table 1000.3, replace “IS : 1786 High Yield Strength Deformed Bars (HYSD)” with “IS:1786 Thermo Mechanically Treated (TMT) deformed bars”. Any other reference to HYSD bars in the specifications shall be read as TMT bars.

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 30 m and below, the permissible limits of chlorides may be increased upto 500 mg / lit.”

Clause 1012 CONCRETE ADMIXTURES

Clause 1012.1 Add the following at the end of second para:

“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.”

The third para 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:

A. General

- (a) Chemical name of the active component in the admixture;
- (b) Values of dry material content, ash content and relative density of admixture, which can be used for uniformity tests;
- (c) Chloride iron content expressed as a percentage of weight of cement;
- (d) pH value and colour;
- (e) Normal side effects e.g. whether the admixture leads to air entrapment at recommended dosage and if so to what extent;
- (f) Side effects when overdosed;
- (g) If two or more admixtures have to be used in one mix, their compatibility;
- (h) Increase in risk of corrosion to reinforcements and embodiments due to the use of admixture;
- (i) Latest date of test and name of test laboratory;

B. Storing

- a) Shelf life;
- b) Maximum & minimum allowable temperature;
- c) Other instructions (e.g. requirements of stirring);

C. Dosage

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

Add the following at the end of the Clause.

“After selecting a few acceptable brands & types of admixture based on the manufacturer’s data / technical literature, independent acceptance tests shall be carried out for the same using the approved combinations of cement / sand / aggregates intended for use in the Project. After establishing the basic acceptability using strength criteria (compression & tensile strengths) a number of trial mixes be designed using different proportions of admixtures / cement / water etc. to establish the data bank on the behaviour 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.

Retrials shall be conducted with change in source / type of cement.

Workmanship

The dosage shall be finalized on the basis of field trial and special mechanical devices shall 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 shall be available for consultation / trouble shooting of problems associated with their product. The conditions of storage shelf life etc., as specified by the manufacturer shall be strictly observed. The manufacturer’s Quality Assurance Plan during process of production shall be obtained and filed for reference / record.

Clause 1013 REINFORCED CONCRETE PIPES

Delete the Clause and add the following:

“Reinforced concrete pipes for highway structures shall be of the class specified by the designer for the particular application. In absence of such specification, the class shall be NP 4 type conforming to requirements of IS: 458.”

Clause 1014 STORAGE OF MATERIALS

Clause 1014.3 Aggregates

Add the following to this Clause:

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

Clause 1015 TESTS AND STANDARDS OF ACCEPTANCE

Add the following as third para to this Clause:

“Independent testing of prestressing 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.”

SECTION 1400 STONE MASONRY

Clause 1404 TYPE OF MASONRY

Replace the Clause with:

“The type of masonry used for side drains and other structures shall be coursed rubble masonry (first sort).”

Clause 1405 CONSTRUCTION OPERATIONS

Clause 1405.2 Laying

Clause 1405.2.1 Substitute second sentence with “The exposed faces shall be plain moulded in case of side drain, and gauged out in case of headwalls and parapets.”

Clause 1405.6 Pointing

Replace first sentence with “Pointing shall be carried out using cement mortar of 1:3 by volume of cement and sand.”

SECTION 1500 FORMWORK

Clause 1501 DESCRIPTION

This 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, the Contractor has to arrange additional formwork, to meet the requirements of the construction programme, it shall be done by the Contractor without any extra cost.”

Clause 1502 MATERIALS

This Clause shall read as under:

“All materials shall comply with the requirements of IRC:87-1984.

Materials and components used for formwork shall be examined for damages 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 shall 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

Clause 1503.2 The following shall be added to this 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-stratum. The loading from the form work shall be distributed to the soil or the permanent works below (e.g. pile cap) in such a manner that any total or differential settlements are 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 1505

Substitute the following Clause in place of the existing clause:

“Formed & Unformed Surface Finishes

The surface finishes for formed and unformed surfaces are classified and defined as below: Surface irregularities for the various classes of finishes are termed either ‘abrupt’ or ‘gradual’. Fins or offsets caused by displaced or misplaced form sheeting, lining or form sections, by loose knots in form lumber or by otherwise defective form lumber are considered abrupt irregularities. All other cases are described as gradual irregularities. Gradual irregularities will be measured with a template consisting of a straight edge for plain surfaces or its equivalent for curved surfaces. The length of template for testing gradual irregularities on formed surfaces shall be 1.5 m in length. The permissible gradual irregularities being measured over this length of the template shall form the base for the type of finishes.

- (i.) Finishes F1, F2 and F3 shall describe formed surfaces
- (ii.) Finishes UI, U2 and U3 shall describe unformed surfaces.

Class F1 Finish

The class F1 finish shall apply to all formed surfaces for which class F2 or F3 is not specified. It shall generally be formed by steel frame mounted with steel sheet. It shall be so constructed that there shall be no loss of material from the concrete during placement and compaction. After hardening, the concrete shall be in the required positions and shall have the shape and dimensions called for in the drawings. Any abrupt irregularities shall not exceed 10 mm. All fins and drifts in excess of the above limits shall be made good by chipping and grinding if required by the Engineer. Small blemishes caused by entrapped air or water may be expected but the surface shall be free from voids, honeycombing or other large blemishes. Class F1 finish shall be generally specified for all surfaces buried in ground or not visible during service or for surfaces that are to receive further rendering treatment such as plastering etc. Unless otherwise specified in the item of BoQ the surface finish shall be understood to be Class F1.

Class F2 Finish

Class F2 finish shall be obtained by use of properly designed forms with steel sheet lining. The abrupt irregularities shall not exceed 5 mm and gradual irregularities shall be less than 8 mm. Small blemishes caused by entrapped air or water may be permitted but the surface shall be free from honeycombing, voids and large blemishes. Surface irregularities in excess of those stipulated shall be removed by chipping or rubbing with abrasive stone.

Class F3 Finish

Class F3 finish shall be formed by specialty designed close jointed rigid forms having lining or high quality form plywood. The surface irregularities shall be limited to nil for abrupt irregularities and 3 mm for gradual irregularities. Class F3 finish may be obtained from class F2 finish by carefully removing all abrupt irregularities including fins and projections by rubbing / grinding. If steel forms are used they shall have steel sheet backing faced with plywood.

In addition, finish F3 shall include filling air holes with mortar and treatment of the entire surface with sack rubbed finish. It shall also include clean up of loose and adhering debris. For a sack rubbed finish, the surface shall be prepared within two days after removal of the forms. The surface shall be wetted and allowed to dry slightly before mortar is applied by sack rubbing. The mortar used shall consist of one part cement to one and one half parts by volume of fine (I.S. No. 16 mesh) sand. Only sufficient mixing water to give the mortar a workable consistency shall be used. The mortar shall then be rubbed over the surface with a fine burlap or linen cloth so as to fill all the surface voids. The mortar in the voids shall be allowed to stiffen and solidify after which the whole surface shall be wiped clean with clean burlap such that all air holes etc., are filled and the entire surface presents a uniform appearance without air holes, irregularities etc.

Class U1 finish

This is the screeded finish used on surfaces over which other finishes such as wearing coats etc., are to be placed. It is also the first step in the formation of U2 and U3 finishes. The finishing operation consists of levelling and screeding the concrete to produce an even and uniform surface so that the gradual irregularities are not greater than 5 mm. Surplus concrete should be removed immediately after consolidation by striking it off with a sawing motion of a straight edge or template across a wooden or metal strip that has been set as a guide. Unless the drawings specify a horizontal surface or show the slope required the tops of narrow surfaces, such as stair treads, walls, curbs and parapets shall be sloped approximately 10 mm per 300 mm width. Surfaces to be covered with concrete topping, terrazzo and similar surfaces shall be smooth screeded and levelled to produce even surfaces, irregularities not exceeding 5 mm.

Class U2 Finish

This is a floated finish used on all outdoor unformed surfaces not prominently exposed to view such as tops of piers etc. The floating may be done by hand or power driven equipment. It should not however be started until some stiffening has taken place in the surface concrete and the moisture film or 'shine' has disappeared. The floating should work the concrete no more than is necessary to produce a surface that is free from screed marks. All joints and edges shall be finished with edging tools. It shall include the repair of gradual irregularities exceeding 5 mm. All abrupt irregularities shall also be repaired unless a roughened texture is specified.

Class U3 Finish

This is a trowel finish used on all surfaces exposed to view at close quarters such as tops of parapets and kerbs etc. Steel trowelling shall not be started until after the moisture film and 'shine' have completely disappeared from the floated surface and the concrete has hardened enough to prevent an excess of fine material and water from being worked to the surface. Excessive trowelling, especially if started too soon, tends to produce crazing and lack of durability. Too long a delay will result in a surface too hard for proper finishing. Steel trowelling shall be performed with a firm pressure that will flatten and smooth the sandy surface free of blemishes, ripples and trowel marks. It shall include the repair of all abrupt irregularities and the repair of gradual irregularities exceeding 5 mm. It shall also include finishing the joints and the edges of concrete with edging tools.

Clause 1506 PRECAUTIONS

Add the following at end of this Clause:

- (vii.) "Adequate support against sideways and lateral loads due to construction, operations and wind shall be provided.
- (viii.) In case cantilevers are supported directly from the ground, the supports for cantilevers shall be removed simultaneously with main supports only after approval for the same from the Engineer.
- (ix.) Forms shall be rigid and of adequate section to reduce deflections. Forms shall have sufficient rigidity to resist horizontal pressure caused by flowing concrete resulting from use of super plasticizers. The formwork shall resist the lateral pressure caused due to fast rate of placement by concrete pumps."

Clause 1508 REMOVAL OF FORMWORK

Add the following as fifth para.

"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 1509 RE-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 shall be rejected and removed from the 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 uses 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 SPECIALIZED FORMWORK

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

The first sentence of second para of this Clause shall read as follows:

“Slip-forming is not permitted.”

Replace the word “plywood” by ‘marine plywood’ in the fourth para of this Clause.

Clause 1513 RATE

Add the following at the end of the first para:

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

Add the new Clause 1514 as under:

Clause 1514 TOLERANCES

“All works shall be carried out true to the lines, levels and grades shown on the drawings and within the tolerances specified below. The forms shall be so designed and erected that the following tolerances are not exceeded unless more stringent and specific specifications have been required by the design and specified in the drawings / instructions. The contractor shall establish, erect and maintain in an undisturbed condition until final completion and acceptance of the project, control points and bench marks necessary and adequate to establish these tolerances.

Elements	Limits
For all elements, departure from established alignment	10 mm
Departure from established grades	10 mm
Variation from plumb or specified batter in lines and surfaces of piers, walls and abutments	10 mm in 3.0 m if exposed, 20 mm in 3.0 m if backfilled
Variation from level or indicated grade in slabs, beams, horizontal and railing offsets	10 mm in 3.0 m if exposed, 20 mm in 3.0 m if backfilled
Variation in cross sectional dimensions of columns, piers, slabs, wall beams and similar parts	+5 mm , -5 mm

Elements	Limits
Variation in slab thickness	+5 mm , - 5 mm
Footings	
Plan dimensions	+15 mm , - 15 mm
Misplacement or eccentricity	2% of footing width in the direction of displacement and not exceeding 30 mm
Reduction in thickness	5% of specified thickness unless specified to be more stringent
Variation in size and locations of slab or wall openings	10 mm

The alignment Tolerances shall be as under

Tolerance in direction where 'd' is the dimension of members

Member with a depth of upto 200 mm	$\pm d / 40$
More than 200 mm	5 mm

SECTION 1600 STEEL REINFORCEMENT (UNTENSIONED)

Clause 1602 GENERAL

The second para shall read as under:

“Reinforcement shall be thermo mechanically treated (TMT) deformed bars of grade S 415 conforming to IS:1786. Only uncoated steel shall be used as reinforcement.”

Clause 1604 BENDING OF REINFORCEMENT

The first para shall 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 Contractor 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 shall be coherent and systematic. A separate bar bending schedule shall be prepared for auxiliary bars like spacers, chairs etc.

Clause 1605 PLACING OF REINFORCEMENT

Para (c) (i) shall read as follows:

“Cover blocks shall be made of concrete of cement mortar with 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 Clause 1605 (f):

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	< 0.01xd
2000< d	< 20

Clause 1606 BAR SPLICES

Clause 1606.1 The first sentence shall read as follows:

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

Add the following as second para:

“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.”

Clause 1606.2 WELDING

Clause 1606.2.1 Add the following at the end of the para:

“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.”

Clause 1607 TESTING AND ACCEPTANCE

Add the following as the last para:

“Manufacturer’s test certificate regarding compliance with Indian standards for each lot of steel shall be obtained and submitted to the Engineer. If required by the Engineer, the Contractor shall carry out confirmatory tests in the presence of a person approved by the Engineer. Cost of these tests shall be borne by the Contractor. The sampling and testing procedure shall be as laid down in I.S. 1786-1985. However, if any test piece selected from a lot fails, no re-testing shall be done and the lot rejected.”

SECTION 1700 STRUCTURAL CONCRETE

Clause 1703 GRADES OF CONCRETE

Add the following at the end of this Clause:

“The concrete mixes leaner than M15 shall be called as nominal mix concrete.

Nominal mix concrete is that concrete for which, concrete is not to be designed by tests and in which the proportions of materials are in accordance with the drawing and the specification Clause mentioned below:

- i) All the materials for this concrete shall conform to section 1000.
- ii) Minimum cement content and maximum water cement ratio for above said nominal mix concrete shall conform to Clause 1703.2 Table 1700-3(A) unless otherwise specified in the drawings.
- iii) Mixing of above said nominal mix concrete shall conform to Clause 1708.
- iv) Transporting, Placing and Compaction of above said nominal mix concrete shall conform to Clause 1709.”

Clause 1704 PROPORTIONING OF CONCRETE

Add the following at the end of the Clause:

“In proportioning concrete, the quantity of both cement and aggregates shall be determined by weight. Where the weight of cement is determined by accepting the manufacture’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 also be made in the weight of aggregates to allow for the variation in weight of aggregate due to variation in their moisture content.”

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 1704.6 Add the following at end of this Clause:

“Materials for pumped concrete:

Materials for pumped concrete shall be batched consistently and uniformly. Maximum size of aggregate shall not exceed one-third of the internal diameter of the pipe.

Grading of aggregate shall be continuous and shall have sufficient ultra fine materials

(materials finer than 0.25 mm). Proportion of fine aggregates passing through 0.25 mm shall be between 15% and 30% and that passing through 0.125 mm sieve shall not be less than 5% of the total volume of aggregate. Admixtures to increase workability can be added. When pumping long distances and in hot weather set-retarding admixtures can be used. Fluid mixes can be pumped satisfactorily after adding plasticisers and super plasticisers. Suitability of concrete shall be verified by trial mixes and by performing pumping test.”

Clause 1705 ADMIXTURES

This Clause shall read as under:

“Duly tested admixtures / 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 adversely 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 modify as given below:

	Components	Maximum Nominal size of coarse aggregate (mm)
(i)	RCC well curb	20
(ii)	RCC / PCC well steining, PCC below foundations and approach slab, annular filling around foundations	40
(iii)	Well cap or pile cap, solid wall type abutments, pier, median walls, splayed wing walls and their foundations	40
(iv)	RCC works in T-beam and slab / solid slab / voided slab and box girder super structure, 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 counterfort type abutments, columns, cantilever return walls etc.	20
(v)	All PSC works	20
(vi)	Any other item	As specified by the Engineer

Clause 1707 EQUIPMENT

The first para shall read as under:

“Under 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 40 cum / hr. The plant shall be approved by the Engineer.”

Part (a) of third para of this Clause shall read as follows:

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

Measurement of cement in each batch	±	1% of the quantity of cement
Measurement of water in each batch	±	1% of the quantity of water
Measurement of aggregate	±	2% of the quantity of aggregate in each batch
Measurement of admixture	±	1% of the quantity admixture in each batch

Add the following para at the end of this Clause:

“Batching, mixing, transportation and placing of concrete

Once the concreting of a section is started, it has to be completed as a continuous operation. Before starting an important placement, the Contractor shall submit to the Engineer an equipment list to ensure that sufficient equipment is available for batching, mixing, transporting and placing concrete and once the concreting of a section is started, it can be completed as a continuous operation within a reasonable time.”

Clause 1709 TRANSPORTING, PLACING AND COMPACTION OF CONCRETE

Add the following para at the end of the Clause:

“**For placing concrete with pumps** : Pipe lines from the pump to the placing area shall be laid out with a minimum of bends. For large concrete placements standby pumps shall be available. Suitable valves (air release valves, shutoff valves etc.) shall be provided as per the Site needs. The pumping of concrete shall be preceded by a priming mix to lubricate the pump and pipelines. A rich mix of creamy consistency shall be required for lubricating the pipelines; continuous pumping shall be done to the extent possible. After concrete has been placed the lines, all related equipment shall be cleaned immediately. A plug sponge ball shall be inserted in the end near the pump and shall be forced through the line by either water or air pressure. Pipes for pumping should not be made from materials, which can harm concrete; aluminium alloy pipelines shall not be used.”

Clause 1710 CONSTRUCTION JOINT

In the first para of Appendix 1700 / 1, add “the coarse aggregate shall be made visible to a depth of 5 mm to 10 mm” after the words “the surface shall be roughened”.

In the third para of Appendix 1700 / 1 under heading “Preparation of the Surface of the Joint” add the following at the end of para:

“Bush hammering shall not be permitted since it loosens the coarse aggregates and results in extensive micro cracks.”

In Appendix 1700 / 1 under heading “Concreting of Joints” add the following at the end of third para:

“At vertical construction joints, a fine mesh on the liner surface of the stopping board shall be placed to facilitate the removal of laitance, if directed by the Engineer.”

Clause 1712 ADVERSE WEATHER CONDITION

Clause 1712.1 Hot Weather Conditions

Add the following at the end of first para:

“Where the Contractor proposes to use ice 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 1713 PROTECTION AND CURING

Clause 1713.1 Water Curing

Add the following at the end of first para:

“Wherever possible, use of water sprinklers or perforated pipes shall be used for curing of concrete for all major bridges, RoBs and grade separators. Such arrangement must be maintained for a minimum period of 14 days after concreting.

Approved concrete curing compounds shall be preferred where water curing can not be done reliably.”

Clause 1715 TOLERANCES

Clause 1715.1 Sectional Dimensions

Add the following as the second sentence of the 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 1715.2 Deviations from Position etc.

Deviation from specified position in plan

- | | | |
|----|--|----------------------------------|
| a) | Variation in levels at top | + 10 mm |
| b) | Variation of reduced levels of bearing areas | + 5 mm |
| c) | Variation in plumb over full height of piers | + 10 mm |
| d) | Surface irregularities measured with 3 m straight edge | |
| | i) all surfaces except bearing areas | + 5 mm |
| | ii) bearing areas | + 3 mm |
| e) | Variation in length of superstructure - overall and | |
| | length between bearings | + 10 mm |
| | | or + 0.1 % of the |
| | | span length, whichever is lesser |

SECTION 2600 EXPANSION JOINTS

Clause 2601 DESCRIPTION

Add the following para at the end of this Clause:

“The expansion joints may require to be installed both on new structures and on existing structures as shown on the drawings or as directed by the Engineer”

The provision of expansion joints shall be in accordance with the revised interim specification for expansion joints given in MOST circular no. RW / NH-34059 / 1 / 96-S&R dated 30th Nov. 2002 and corrigendum of same no. dated 25th Jan. 2001.

The expansion joints shall be procured only from those manufacturers / suppliers of expansion joints who are empanelled with MoRT&H.

SECTION 2700 WEARING COAT AND APPURTENANCES

Clause 2702 WEARING COAT

Clause 2702.1.1 Replace under item i) “6 mm” with “12 mm”.

Clause 2703 RAILINGS

Clause 2703.3 Cast-in-Situ Concrete Railings

Last sentence of third para shall be replaced by the following:

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

Add new clauses 2703.5 and 2703.6.

Clause 2703.5 Concrete crash barrier bridges

The Concrete Crash Barrier or Parapet shall be given two coats of Cement Paint of approved brand and shade.

Clause 2703.5.1 General

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

Clause 2703.5.2 Materials

All materials shall conform to Section 1000 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 barriers on deck slab, approach slab etc. shall be M40.

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.

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 Parapet shall be given two coats of Cement Paint or aqua based paint as directed by the Engineer of approved brand and shade.

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.

Clause 2703.5.5 The Contract crash barriers shall be given two coats of cement paint of approved brand and shade.

Clause 2703.5.6 Measurements for Payment

All barriers will be measured in cubic meters of concrete completed for the barriers including approach and departure ends. The steel reinforcement shall be measured in tones. The steel rails on the top of crash barrier shall be measured and paid separately. The sealing of opening in crash barrier at expansion joints with polysulphide rubber joint sealant and bituminous fibre board as per Clause 2703.6 shall be incidental to work. The painting on barrier shall be measured in square meter.

Clause 2703.5.7 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.

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 ± 3 @ 25°C
Operating temperature	-	-20°C to + 80°C

Shrinkage	-	Less than 1 %
Permanent dynamic movement capability	-	± 25%

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

Measurements for Payments

Cost for providing Potysulphide 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 2704 APPROACH SLAB

Substitute entire Clause as under:

“Provision of approach slab shall be in accordance with “Guide lines regarding approach slab for bridges given in MOST circular no. RW / NH-34015 / 2 / 86-S&R dated 22nd June 1994.”

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 drain moisture from the back filling. Weep holes shall be provided with 100 mm dia AC. pipe 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 1 m in either direction or as shown in the drawing with the lowest at about 150 mm above the low water level or ground level whichever is higher or as directed by the Engineer.”

Clause 2708 MEASUREMENT FOR PAYMENT

Add the following after (v)

“Painting crash barrier and parapet shall be measured in square metre and paid for separately”

Clause 2709 RATE

The second paragraph shall 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 second para:

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

SECTION 2800 REPAIR OF STRUCTURES

Clause 2809 DISMANTLING OF CONCRETE WEARING COAT

This clause shall be renamed as follows:

Dismantling of Existing Wearing Coat, Expansion Joints and Drainage Spouts

Clause 2809.1 Add the following at the end of this Clause:

“The existing wearing coat, concrete as well as bituminous overlay, shall be removed for the entire length including approach slab for bridges.

Clause 2809.2 This Clause shall read as follows:

“The removal operations shall be carried out mechanically using pavement breakers and compressors. Removal shall be done carefully to avoid damage to any part of the existing structure. In delicate locations for example around spouts, removal shall be done by manual methods. After removal, the concrete deck surface shall be closely inspected for identifying any distress such as cracks, pockets of loose or honeycombed concrete etc. The deck surface shall be thoroughly cleaned with special efforts to remove any loose material. Expansion joints and spouts shall be removed carefully so that deck concrete is not damaged.”

Clause 2809.3 Add the following at the end of the Clause:

“Dismantled material shall not be stacked on the deck nor shall it be thrown below the bridge. It shall be neatly piled at points designated by the Engineer with all lifts and leads up to 5000m. Materials, which can be used or auctioned, shall be stored in neat piles at locations designated by Engineer with all lifts and leads up to 1000m.”

New Clauses 2811 to 2819 shall be added after Clause 2810 as given below and existing Clauses 2811, 2812 and 2813 shall be renumbered as 2820, 2821 and 2822.

Clause 2811 DISMANTLING OF EXISTING RAILING, KERBS, FOOTPATH SLABS, PART or COMPLETE DECK SLABS, APPROACH SLABS AND DAMAGED CONCRETE IN WING WALLS / RETURNS, PIERS AND ABUTMENTS, RCC / BRICK MASONRY, ENCLOSURES OF BEARINGS

Railing, kerbs, footpath slabs, approach slabs, part or complete deck slabs and damaged concrete in wing walls / returns, piers and abutments, RCC / brick masonry exclusive of bearings of the existing structures shall be dismantled as shown in drawing or as directed by the Engineer.

The work shall be executed in accordance with the clause 202. All damaged concrete in wing walls, returns, piers and abutment shall be thoroughly inspected to identify the extent of dismantling. The decision of Engineer shall be final. Care shall be taken to avoid damage to any part of the existing structure. Dismantling work for railing and kerbs shall be done carefully such that the existing reinforcement, which will project into the new work, is not damaged or lost. Reinforcement shall be cleaned thoroughly.

Dismantled material shall not be stacked on the deck nor shall it be thrown below the bridge. It shall be neatly piled at points designated by the Engineer with all lifts and lead upto 1000 m. Materials, which can be used or auctioned, shall be stored in neat piles at locations designated by Engineer with all lifts and lead upto 1000m.

Water shall be sprayed to reduce dust while dismantling work is in progress. Dismantling work shall not be carried out at night, during storms or heavy rain.

Goggles and gas masks shall be worn at the time of dismantling. Leather gloves shall be worn by the workers. Screens made of GI sheets shall be placed wherever necessary to prevent the flying pieces from injuring the workers.

Damage caused to any component of the bridge structure during removal operations shall be restored by the Contractor at his cost. The service lines, if any, shall be disconnected / diverted before dismantling work commences.

Clause 2812 DISMANTLING OF EXISTING DAMAGED BRICK / COURSED RUBBLE MASONRY IN WING WALLS / RETURNS, PARAPETS ETC.

Damaged brick / course rubble masonry in wing walls / returns and all brick / coursed rubble masonry parapets shall be dismantled as shown in drawings or as directed by the Engineer.

The work shall be executed in accordance with the clause 202. Damaged brick / coursed rubble masonry in wing walls, returns shall be thoroughly inspected to identify the extent of dismantling. The decision of Engineer regarding extent of dismantling shall be final. Care shall be taken to avoid damage to any part of the existing structure.

Dismantled material shall not be stacked on the deck nor shall it be thrown below the bridge. It shall be neatly piled at points designated by the Engineer with all lifts and lead upto 1000m. Materials, which can be used or auctioned, shall be stored in neat piles at locations designated by Engineer with all lifts and lead upto 1000m.

Leather gloves shall be worn by the workers. Screens made of GI sheets shall be placed wherever necessary to prevent the flying pieces from injuring the workers.

Damage caused to any component of the bridge structure during removal operations shall be restored by the Contractor at his own cost.

Clause 2813

**DISMANTLING OF EXISTING SPLAYED WING WALL FOR CONSTRUCTION OF ADJACENT 2- LANE BRIDGE - a) BRICK / COURSED RUBBLE MASONRY
b) CONCRETE**

Existing brick / coursed rubble masonry / concrete wing wall shall be dismantled for construction of adjacent 2-lane bridge as shown in drawings or as directed by the Engineer.

The work shall be executed in accordance with the clause 202. Only portions which interfere with the construction of wing walls / return / median wall of adjacent 2-lane bridge shall be dismantled. The decision of Engineer regarding extent of dismantling shall be final.

During dismantling all precautions shall be taken to prevent failure of retained earth of the approaches.

Dismantled material shall not be stacked on the deck nor shall it be thrown below the bridge. It shall be neatly piled at points designated by the Engineer with all lifts and lead upto 1000 m. Materials, which can be used or auctioned, shall be stored in neat piles at locations designated by Engineer with all lifts and lead upto 1000 m.

Goggles and gas masks shall be worn at the time of dismantling. Leather gloves shall be worn by the workers. Screens made of GI sheets shall be placed wherever necessary to prevent the flying pieces from injuring the workers.

Damage caused to any component of the bridge structure during removal operations shall be restored by the Contractor at his own cost.

Clause 2814

FIXING DOWEL BARS IN DECK SLAB AND GROUTING WITH NON-SHRINK FREE FLOW CEMENT GROUT

20 mm dia holes, 150 mm deep, shall be drilled in existing slab at locations shown in the drawings.

Holes shall be drilled vertically using rotary drill machines. Care shall be taken that the holes are drilled vertical and the deck concrete is not damaged. It shall be ensured that buried reinforcement of the deck is not damaged due to drilling by avoiding locations above reinforcement. Rebar detector shall be used for this purpose. 16 / 12 mm dia dowel bars shall be inserted in the hole and kept in undisturbed position with appropriate fixture. The annular space shall be filled by non-shrink free flow cement grout.

Measurement for Payment

Measurement shall be made for number of dowel bars to be fixed in deck slab. The reinforcement steel shall be measured separately.

Rate

Contract unit rate for each dowel bar fixed in deck slab shall cover cost of all material, labour, tools, plant and equipment required for drilling of holes in deck slab, non shrink cement grout etc. excluding cost of reinforcement steel.

Clause 2815 RAILINGS / PARAPETS

Cast-in-situ railings / parapets shall be constructed in accordance with the requirements of structural concrete Section 1700. The reinforcement shall conform to Section 1600. The framework shall conform to Section 1500. The work in general shall conform to the Clause 2703.

The reinforcement of the railings / parapets shall be welded with the existing reinforcement of the deck slab and with the dowel bars as shown in the drawings or as directed by the Engineer.

In case there are no dowel bars fresh dowel bars shall be fixed into deck slab as per Clause 2814.

Clause 2816 REPAIR TO CORRODED REINFORCEMENT

Repair of corroded reinforcement (where corrosion has reduced the diameter of the bar by more than 20%) shall be done by providing new reinforcement, which is either welded or firmly secured with the old reinforcement.

Material

Steel which is to be used as additional reinforcement where the diameter of existing main longitudinal reinforcement has been reduced to 80% of the original, then additional reinforcement of equivalent diameter free from rust shall be firmly secured with the old reinforcement, preferably by welding, if existing reinforcement

Clause 2817 PROVIDING AND FIXING DRAINAGE SPOUT INCLUDING SEALING WITH NON-SHRINK FREE FLOW CEMENT GROUT

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

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

The work shall be executed in accordance with the Clause 2705 except to the extent modified below:

The work shall be done after the wearing coat 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 2818 REPAIR TO LEACHED, HONEY-COMBED AND SPALLED CONCRETE

Leached, honeycombed, spalled concrete (area of damage less than 0.5 sq m) shall be repaired with average 50 mm 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.

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 paying particular attention to packing behind and in between the reinforcement. 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.

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

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 micrometer. The manufacture shall certify the above requirements about solid content and grain size. In order to keep control over the quality, the manufacture 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
- Mix no. 10 Silica sand- 300 parts by weight

The sand which is to be used for constituting the PMC repair mortar shall 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 shall follow the limits provide below:

Quartz sand Mix No. 10

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
150microns	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 and the requirements of soundness as given in Clause 3.2.1 and Clause 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 condition 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 and 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 for 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, laping 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 and 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 and brand of cement as well as weather conditions if necessary, to achieve the desired consistency records the amounts of cement required and 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. Under mortar or mortar, which has partially set shall not be re-mixed and used.

Mechanical Strength of Mortar

Anti-corrosive polymer modified mortar shall have the following:

	7day	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

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 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 $\square$	90-100
300 $\square$	40-60
150 $\square$	0-10
75 $\square$	0-3

Mechanical Strength of Bonding Slurry

Bond strength in wet condition 3-4 N / mm² and in dry condition 7-8 N / mm².

Bonding slurry shall confirm to following properties:

- ASTM-C1 059-86 (Latex agents for bonding fresh to old concrete)
- ASTM-C1 042-86(Bond strength of latex system with cement)
- Pot life 1 hour for 5 kg bonding slurry mix.

Clause 2819

INSPECTION AND 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 / resettlement of missing parts of metallic bearings, requiring jacking up of super structure is excluded from the scope of work. Replacement of existing bearings with new bearings is also excluded from the scope of work.

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

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

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

In respect of metallic bearings, fresh graphite grease as approved by the Engineer shall be applied to the surfaces, which are sliding, rotating or moving due to movement in bearings. The materials, specially, graphite grease, required for oiling and greasing of metallic bearings, wherever required, shall be as per approval of the Engineer. Grease used shall be such that it retains its properties for long life and shall not affect the bearing parts.

All other surfaces of the metallic bearings shall be cleaned of all nuts, 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 of the Employer.

Clause 2820 The existing clause 2811 of the Specifications shall be renumbered as 2820.

Clause 2821 The existing clause 2812 of the Specifications shall be renumbered as 2821.

Add the following as items (i) to (p).

i)	Dismantling of parapets, footpaths, solid slab superstructures or part of slab and approach slabs, etc. RCC and masonry items shall be measured under separate heads.	Cum
j)	Steel handrail, kerbs, railings	running metre
k)	Dismantling of existing damaged brick masonry	Cum
l)	Dismantling of course rubble masonry wings walls, piers, abutments and their foundations	Cum
m)	Provision of dowel bars	Nos
n)	Drainage spouts	Nos
o)	Repairs to concrete with PMC mortar with average thickness of 50 mm of mortar applied.	Sq.m.
p)	Inspection, cleaning and greasing of bearings	Nos

Clause 2822 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 the 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, tools and plants, safety measurers and all other incidental expenses necessary for completion of work as per specifications for the respective items.
- v) 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.

SECTION 2900 PIPE CULVERTS

Clause 2904 BEDDING FOR PIPE

Delete the word “rammed” in sixth line of para (i) and substitute it with “rolled / or plate vibrated”.

Clause 2906 JOINTING

Delete the first and second sentences of first para of this Clause and substitute:
“The pipes shall be jointed by collar. The collars shall be of RCC 150 to 200 mm wide and having the same strength as the pipes to be jointed.”

SECTION 3000 MAINTENANCE OF ROAD

Clause 3002 RESTORATION OF RAIN CUTS

Clause 3002.4 Measurement for Payment

This Clause shall be deleted.

Clause 3002.5 Rate

This Clause shall be read as under:
“The contract unit rate for maintenance of road shall be inclusive of this item of work.”

Clause 3003 MAINTENANCE OF EARTHEN SHOULDER

Clause 3003.3 Construction Procedure

Replace “94” with “98” in sixth line of second para.

Clause 3003.4 Measurement for Payment

This Clause shall be deleted.

Clause 3003.5 Rate

This Clause shall be read as under:
“The contract unit rate for maintenance of road shall be inclusive of this item of work.”

Clause 3004 BITUMINOUS WORKS IN CONNECTION WITH MAINTENANCE AND REPAIRS

Clause 3004.1 General

Delete fourth para and add the following at the end of the Clause:
“Material used in the maintenance operation shall be as specified in the BoQ or in the respective specifications.”

Clause 3004.2.1 Scope

Add at the end of this Clause as under:
“The minimum area and depth for a pothole shall be 25 sq.cm and 1 cm respectively. The areas to be patched / repaired shall be located by the Engineer. Pot hole or patching area shall be cut / trimmed either with jack hammer or hand tools like chisels, pick-axes etc., such that the areas are in the shape of rectangles or squares.”

Clause 3004.2.2 Materials

This Clause shall read as under:
“All materials used for pot-hole and patch repair of other than bituminous surface and for underlying layers shall be of the same type as of original construction. Bituminous Macadam as per Clause 504 shall be used for repair of bituminous surface.”

Clause 3004.2.4 Backfilling Operation

This Clause shall read as under:

“Bituminous macadam shall be prepared in accordance with the Clause 504. The bituminous mix shall be placed in layers of thickness of not more than 100 mm (loose) and shall be compacted in layers with smooth wheel roller to the compaction standards defined in Section 900. While placing the final layer, the mix shall be spread slightly above the adjoining surfaces so that after rolling, the surface shall be flush with the adjoining surface.”

Clause 3004.2.5 Measurement for Payment

Add the following at the end:

“Prime coat and tack coat if any shall be considered incidental to work and no extra payment shall be admissible.”