

## 1 SCOPE OF WORK

The work to be performed under these specification form a part of the ADB assisted Jammu & Kashmir Urban Sector Development Investment Program (JKUSDIP) and is limited to the works for construction of Flyover / Express-way Corridor from Jehangir Chowk to Rambagh –Natipura in Srinagar City.

### 1.1 Site Description

The proposed sub-project stretch is starting from Jehangir chowk. It passes through congested commercial establishments on both side of road which includes shops, malls, industrial establishments, school, religious places, parks, offices (Government and private) and residences. Road side land marks are places like Eqra Masjid, Dr. Sir Mohammad Iqbal Park, Bakshi Stadium, Rambagh Bridge over flood channel. End of sub-project stretch is at Rambagh after Natipura Y-junction on Air Port Road. It covers approximately 2.5 Km. distance with additional limbs/ramps at different location.

Main features of sub-project stretch are as given below:

- Four Lanes Divided Carriageway Elevated Road from Jehangir Chowk to Rambagh Bridge.
- Two lanes, two separate major bridges for each direction traffic over flood channel at Rambagh each on either side of exiting bridge.
- Two lanes elevated road from Rambagh bridge to Rambagh (Beyond Y-Intersection at Natipura Chowk) on airport road.
- At Jehangir Chowk an upward ramp for traffic from Jehangir chowk to Rambagh and a downward ramp for traffic from Rambagh to Jehangir chowk.
- Integrating existing Flyover with Proposed Elevated Expressway at Jehangir Chowk for left turning traffic from Dal Gate to Rambagh.
- At Bakshi Stadium Chowk a left turn Upward Ramp from Jawahar Nagar road to Rambagh and Downward Ramp for traffic coming from Rambagh.
- To and fro connection to the elevated highway for traffic on Natipura road by providing down ward ramp on LHS from Natipura Y-juction and upward ramp on RHS starting from Natipura Y-juction.
- Widening and strengthening of at grade straight connection between Ameera Kadal Bridge and Airport road.
- Widening and strengthening of two lanes at grade road on both sides of proposed elevated road on whole stretch of project.
- Provision/improvement of minimum 1.5m wide drain-cum-footpath on both sides.
- Providing at grade bigger size rotary for smooth traffic movement underneath the exiting flyover at Jehangir chowk. Provision of dividers and small rotaries at different locations of project stretch for smooth flow of traffic.
- Provision of electrification and lighting arrangement for whole project stretch.

### 1.2 Summary of Works to be done under the work Package

The scope of the work under the proposed package JKUSDIP Srinagar/UT/01 includes following works:

Reinforced Earth retaining walls, RCC Crash barrier with hand rail, RCC deck slab with PSC Girders (pre-cast and cast-in-situ)/ PSC deck slab/ RCC deck slab Superstructures, Expansion joint, Bridge bearing, RCC Seismic restrainer, RCC Substructure, Pile foundation, Link road/ Service Road, Rotary, Road divider, Safety Kerb, Drain-cum-footpath, Bus Bays, Diversion Roads if found necessary during construction period, Diversion of Storm Water Nallah, Lightening arrangement of sub project stretch etc. All utilities shifting (Electrical line, Telephone line, water supply etc.) falling in the alignment of the sub – project and service road will be executed through the respective Line Departments. Contractor, if asked by ERA will deposit required amount with line department and will coordinate with them for getting the utilities shifted. **PIU, ERA** will assist the contractor to keep liaison with various Line Departments and local administration to expedite the smooth implementation of the project.

The work of constructing the Flyover and Express-way Corridor under this contract shall include, but not limited to, the following activities:

- i) Preliminary works like setting and maintenance of permanent bench marks, reference points, central line of the carriageway etc. It shall also include making adjustment in the layout if required as per site conditions and as directed by the Engineer. The lay out shall be got approved from the Engineer before starting actual work. Existing levels of the areas under the scope of work shall also be recorded. Use of total station in survey work shall be ensured.
- ii) Clearing of site for construction of the work and all activities connected therewith before commencement of work to the satisfaction of the **Engineer**.
- iii) Protection and maintenance of existing services shall be done by Contractor complying with requirements of Line / Statutory Authorities. It shall be deemed to be part of contract and no extra payment shall be made for the same.
- iv) Providing adequate arrangement for barricading as per typical design, requirements of Local / Statutory Authorities at all required locations viz. to cover the entire construction site including all T & P & materials. This shall include reflective signs, markings, flags, flashing lights, steel posts with GI cover sheets and flagman.
- v) Provision for all safety measures for traffic, pedestrian, workmen, machinery etc. including construction and maintenance of temporary diversion as considered necessary by the **Engineer**. The cost of all such works shall be deemed to be included in the rates quoted by the Contractor for all the items in the Bill of Quantities and no extra amount shall be paid for these works.
- vi) Dismantling of existing old work and bituminous work, kerb stone, brick work, RCC slabs, footpath, old SW/RCC pipes, CC drains etc. including disposal of malba complete & dispose the same as per directions of the **Engineer**.
- vii) Assist in identification of services like sewer lines, water supply lines, electric and telephone poles & cables, underground utilities etc. by excavating required number of pits, well in advance of actual execution and liaisoning with the employer and respective line departments for shifting and / or protecting of same as & when necessary.
- viii) Repair / re-construction / making good damaged roads, service lines, storm water drains, water supply lines, electric cables, telephone cables etc. and other structures / properties affected by any action / inaction and activities of the Contractor.
- ix) It is also made clear that intending tenderer should visit the sites of work and physically assess the activities that are involved for completing the work, including the quantum of work besides the information supplied in the tender document.
- x) Quality Assurance and Quality control manual of MORT&H, BIS and IRC shall be strictly followed.
- xi) Clearing of site to the satisfaction of the **Engineer** after completion of entire work and handing over the same to the Department.

### 1.3 Surveys and Executive Design

The Detailed Design for the Works has been undertaken by Design Consultants. However, the Contractor is to verify information provided and assist the **Engineer** to undertake the Executive Design. The Contractor will prepare his program of works accordingly will be responsible for the following:

- a) Geotechnical Investigation: Contractor will take the bore log samples, will conduct load bearing tests, Initial tests and Routine tests on piles and will carry out required geotechnical investigations, CBR value etc. to verify the survey results and the Engineer's designs. It will be obligatory to the works and shall not be paid separately.
- b) Topographical survey: Verify the survey results by establishing temporary bench marks, verification of levels by total station / topographical surveys,
- c) Based on above two surveys the contractor will assist the **Engineer** to review the Detailed Designs of the proposed flyover and road improvements.

### 1.4 Documents and Drawings

A list of Drawings for the proposed work is provided in Section 6.3 of the bid document.

Construction Drawings: including reinforcement details will be issued to the Contractor by the **Engineer** during progress of work.

The Contractor shall verify all dimensions, quantities and details shown on the Drawings, Schedules, or other data and the Employer shall not be held responsible for any omissions and discrepancies found therein. Failure to discover or correct error or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory works. The Contractor shall assume all responsibilities for the making of estimates of the sizes, kinds and quantities of materials and equipment included in the work to be done under the Contract. He shall not be allowed to take advantage of any errors or omissions, as full instructions will be furnished by the **Engineer** if such errors or omissions be discovered.

### **1.5 Other Contracts and Contractors**

The Contractor must ascertain to his own satisfaction the scope of the Flyover and Express-way Corridor sub project and the nature of other contracts that have been or may be awarded by the Employer in the execution of the project to the end that the Contractor may perform the Contract in the light of such other contracts.

Nothing herein contained shall be interpreted as granting to the Contractor exclusive occupancy of the sites in the project area. The Contractor shall not cause any unnecessary hindrance or delay to any other contractor working in the project area. If the performance of any contract for the project is likely to be interfered with by the simultaneous execution of some other contract or contracts, the Employer shall decide which contractor may proceed.

The Employer shall not be responsible for any damages suffered or extra costs incurred by the Contractor resulting directly, or indirectly, from the award or performance or attempted performance of any other contracts or line departments related to the project, or caused by any decision or omission of the Employer respecting the order of precedence in the performance of the contracts awarded for completion of the project.

## **2 SPECIFICATIONS OF WORK**

### **2.1 Equivalent Standards and Codes**

Wherever reference is made in the Contract to specific standards and codes to be met by the goods and materials to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise stated in the Contract. Where such standards and codes are national or related to a particular country or region other authoritative standards which ensure an equal or higher quality than the standards and codes specified will be acceptable subject to the **Engineer's** prior review and written approval. Differences between the standards specified and the proposed alternative standards must be fully described in writing by the Contractor and submitted to the **Engineer** at least 28 days prior to the date when the Contractor desires the **Engineer's** approval. In the event the **Engineer** determines that such proposed deviations do not ensure equal or higher quality, the Contractor shall comply with the standards specified in the Bid Documents

### **2.2 Sign Board**

The Contractor shall provide a sign board at the site of the Works of approved size and design which provides (i) the name of the Project and the financing agency; (ii) the names and addresses of the Employer, the Contractor and the Consultant; (iii) the name and short description of the Project, (iv) the amount of the Contract Price; and (v) the starting and completion dates. It shall be deemed to be part of contract and no extra payment shall be made for the same.

### **2.3 Costs for Mobilization and Temporary Works**

No payment above the unit prices quoted shall be made to the Contractor for mobilization costs, i.e. for providing transportation, light, power, tools, and equipment, or for furnishing building and maintaining construction plant, access roads, sanitary conveniences, disposal, work, water supply, fire protection, guards, trestles, telephone system and other temporary structures, plant and materials, or for medical attention or health protection, or for watchmen or guards, or for any other services, facilities, or materials necessary or required to execute the work in accordance with the provisions of the Contract as these shall be considered as having been included in the prices stipulated for the various items of the Bill of Quantities.

## 2.4 Contractor's Offices, Stores and Equipment

The Contractor shall make his own arrangements for renting or acquiring sufficient land for the erection of his offices and stores plus parking / maintenance area for vehicles and equipment to be used on the Works at his own expense. The contractor shall establish and maintain these utilities at his own cost and no additional payment shall be made.

The contractor shall establish a laboratory with equipments and all other facilities for carrying out tests at site and the cost will be reimbursed after completion of the sub project. The contractor shall maintain the laboratory and equipments during contract period.

The Contractor will also provide a minimum 50m<sup>2</sup> area of air conditioned office space furnished with desk, chairs, filing cabinet, shelves, including washing and toilet facilities, for the sole use of the **Engineer** and supervisory staff. The daily cleaning and maintenance of office shall be arranged at Contractor's expense, which will be reimbursed after completion along with the periodical payments.

## 2.5 Contractor's Water and Power Supply

The Contractor shall make his own arrangements for a hygienically clean and potable water supply for labour and construction work.

The Contractor shall make his own arrangements at his own expense for the supply of electricity services either using a metered connection from local mains or by providing his own generating plant to meet the requirements.

## 2.6 Transportation and Storage of Materials

Transportation of any material by the Contractor shall be by suitable vehicle which when loaded does not cause spillage and all loads shall be suitably secured. Any vehicle which does not comply with this requirement or local traffic regulation and law shall be removed from the Site. All heavy materials which are not permitted to transport by traffic and police department during day time shall be transported at night time with required permissions from local authorities. All materials when brought to site by the Contractor, shall be stacked and stored in a manner suitable to protect against slippage, damage, breakage, pilferage etc., and readily available for checking by the **Engineer** at any time. The Contractor shall arrange for watch and ward of the materials at all times in a suitable manner satisfactory to the **Engineer**, all at his own expense.

## 2.7 Setting Out of the Works

The setting out of the works should avoid un-necessary disturbance or removal of garden plants and trees. Only the removal of plants and trees that is absolutely necessary for the construction of the works will be permitted following the approval of the competent authority.

The Contractor shall at his own expense establish working or construction lines and grades as required and shall furnish and maintain stakes and other such materials and give such assistance including qualified staff as may be required by the Employer for checking setting out lines and grade marks. The Contractor shall be solely responsible for the accuracy thereof.

The Contractor shall safeguard all points, stakes, grade marks and bench marks made or established for the work, bear the cost of re-establishing them if disturbed, and bear the entire expense of rectifying work improperly done due to not maintaining or protecting, or removing without authorization, such established points, stakes and marks.

Any work done beyond the lines, levels and limits shown on the drawings or not agreed by the **Engineer** shall not be paid for and the Contractor shall make good over-excavation as directed by the **Engineer**, at his own expense.

## 2.8 Samples and Tests During Construction

For ensuring the requisite quality of construction, the Materials and Works shall be subject to the quality control tests as per IS codes as applicable. The testing frequencies set forth are desirable minimum and the **Engineer** shall have full authority to get the additional tests carried out by the Contractor as frequently as he may deem necessary, to satisfy himself that the Materials and Works comply with the appropriate Specifications.

Where no specific testing procedure is mentioned, the tests shall be carried out as per the prevalent accepted Engineering practice to the directions of the **Engineer**.

The Contractor shall be responsible to develop a quality control program and to provide all necessary materials, apparatus, instruments, equipment, facilities and qualified staff for sampling, testing and quality control of the materials and the works under the Contractor. Without limiting the generality of the foregoing, the Contractor shall either (i) establish a testing laboratory at the site of Works which is adequately equipped and staffed to carry out all sampling and testing in accordance with the requirement set out in the General Specifications and / or these Specifications and provide all field equipment and apparatus as necessary to conduct all specified in-situ tests and / or any Tests on Completion, or (ii) arrange for routine sampling, testing and reporting, as required, through a certified independent testing laboratory acceptable to the **Engineer**.

All costs of such routine sampling, testing and reporting of test results will be borne by the Contractor. The **Engineer** may also direct the Contractor to arrange additional independent sampling and laboratory testing under the supervision of the **Engineer**, the cost of which shall be borne by the contractor. The Contractor shall furnish certified copies of all test reports to the **Engineer** within 3 days of completion of the specified tests.

The Contractor shall, within 14 days after the date of the notice to proceed, submit to the **Engineer for his consent a detailed description of the arrangements for conducting the quality control program during execution of the Works**, including details of his testing laboratory, equipment, staff and general procedures. If following submission, or at any time during the progress of Works, it appears to the **Engineer** that the Contractor's quality control program is not adequate to ensure the quality of the Works, the Contractor shall produce a revised program which will be adequate to ensure satisfactory quality control.

## **2.9 Protection of Utilities**

The Contractor is required to carefully examine the location of the Works and their alignments and to make special enquiries with all authorities or service suppliers concerning all utility lines such as water supply, sewers, gas pipe, telephone (underground and/or overhead) lines, electric cable (underground and/or overhead), cable TV lines, etc.; and to determine and verify to his own satisfaction the character, sizes, position and lengths of such utilities from authentic records. The Contractor shall be wholly responsible for the protection and/or facilitating relocation of such utilities as may be required, and shall not make any claim for extra work that may be required to protect or facilitate relocating such utilities or services. If any major shifting or realignment of water supply, sewers, drains, electric and telephone lines are necessary due to their interference with the proposed Works, the same will be arranged through the line agencies. The cost of such relocations will be paid by the Contractor which will be reimbursed under the provisional sum item, following approval by the **Engineer**.

In case the alignment of the pipeline crosses the high tension electrical transmission lines belonging to the Power Development Department, Jammu & Kashmir or other authorities, the Contractor shall take all precautions necessary to see that the work is carried out with care and safety, without disturbing such transmission lines. The Contractor will be responsible to carry out all construction activities in such reaches in consultation with the owners of such facilities. However, satisfactory completion of the entire work will be the responsibility of the Contractor.

## **2.10 Workmanship.**

All workmanship shall be in conformance with the best trade practice. Particular attention shall be given to the appearance of exposed work without compromising on the Quality Standards..

## **2.11 Site Photographs**

The contractor shall arrange to take colour photographs at locations of the works to demonstrate conditions of the site before work commences / progresses during the construction period and after completion of the works. The photographs may be required as evidence in defense of claims against the contractor for damage to buildings and property due to the execution of the works. Contractor will take all necessary work photographs as per directions of **Engineer**.

## **2.12 Cooperation at Site and Night Work**

Construction may be carried out in areas of restricted circulation. The Contractor's attention is particularly drawn to;

- a. The need to maintain existing services and reasonable access for local residents and traders during the construction period; and

- b. The probable presence of other contractors on site is to be coordinated by the main Contractor.
- c. Heavy Materials shall preferably be transported to site during night time with necessary permissions from all concerned authorities.

All work shall be carried out in such a way as to allow access and afford all reasonable facilities for any other contractor and his workmen and for workmen of the Employer and any other person who may be employed in the execution and or/ operation at or near the site of any work in connection with the Contract or otherwise.

Night work in residential areas would not normally be agreed unless it was essential for safety of the public and/or property. For this, specific case-by-case authorization of the **Engineer** would be required. **However, sometimes work may be required to be only undertaken during night hours to avoid disturbance to traffic movements.** The contractor is to keep provisions for such requirements in his bid pricing.

In the preparation of his program of work the Contractor shall at all times take full account of and co – operate with the programming of the work of other contractors so as to cause the minimum of interference to them and to the public.

### **2.13 Protection of Work and Public**

The contractor shall exercise precautions at all times for the protection of labour employed and public life and property at and around the sites of work. The safety provisions of applicable laws, building and construction codes shall be observed. Machinery, equipment and all hazards shall be guarded or eliminated in accordance with safety provisions.

During the execution of the work, the contractor shall put up and maintain during the night time such barriers and lights as will effectively prevent accidents. The contractor shall provide suitable barricades, red light "Danger" or "Caution" signs and watchmen at all places where the work causes obstructions to the normal traffic or constitutes in any way a hazard to the public.

### **2.14 Environmental Protection**

The contractor will ensure that all actions are taken to ensure that the local environment of the site is protected and that surface and groundwater, soil and air are kept free from pollution (including noise) due to the works being undertaken.

**Table-1, Table-2 and Table-3 of Environmental Management Plan (EMP) provided in the document gives a list of identified impacts and mitigation measures. Contractor is required to implement Environmental Management Plan to the satisfaction of the Engineer.**

Failure to comply with this clause, may lead to the contract being terminated.

### **2.15 Record Drawings**

The contractor shall prepare reproducible drawings of the whole works "as built". The drawings shall be produced to a standard similar to that of the Contract Drawings.

Record drawings shall be prepared to the **Engineer's** approval as the work proceeds and shall be handed over to the **Engineer** on completion. The Record Drawings shall then become the property of the Employer.

### **2.16 Final Clearance of the Site**

On completion of work, wherever applicable, the contractor shall clear away and remove from the site all constructional plant, surplus materials, rubbish, scaffolding and temporary works of every kind and leave the whole of the site and works in a clean condition. Final contract payment shall be withheld until this has been done, to the satisfaction of the **Engineer**.

## **3. TECHNICAL REQUIREMENTS**

### **3.1 General Specifications**

The "Standard Specifications (Civil Works)" issued by MORT&H and IRC set out the specifications that shall be followed for construction of general civil works for this sub-project. Specifications for additional specialized items of civil works, and/or for mechanical and electrical works, shall be as set out in Particular Specifications, of this Section.

In the event of any discrepancy between the provisions of the Standard Specifications and the Particular Specifications, then the provisions of the Particular Specifications will prevail.

The General Technical Specifications for the Roads and Bridge Works shall be the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (LATEST REVISION)", as corrected in the original issued by the Ministry of Road Transport and Highways, Government of India and published by the Indian Roads Congress (IRC), hereinafter referred to as MORT&H and IRC Specifications, with a cross reference to relevant Bureau of Indian standards (BIS) for materials and other aspects not covered by the IRC.

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

### **3.2 Modifications to the specifications:**

This section of Technical Specifications also contains the Amendments / modifications / additions to the clauses of **MORT&H** Specifications.

The clauses and sub clauses of the following sections in the "**SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (LATEST REVISION OF MoRT&H SPECIFICATIONS)**" have been amended / modified / added upon:

**100, 200, 300, 400, 500, 800, 900, 1000, 1400, 1500, 1600, 1700, 2000.**

All such amendment / modifications shall supersede the original Clause & or Sub-Clause and whenever such amendment / modification / added Clause & Sub-Clause is referred to, it will be considered to refer to the original Clause and or Sub-Clause.

In the absence of any definite provisions on any particular issue in the aforesaid Specifications, reference may be made to the latest codes and specifications of **IRC, BIS, BS, ASTM or AASHTO** in that order. Where even these are silent, the construction and completion of the works shall conform to sound Engineering practice as approved by the **Engineer** and in case of any dispute arising out of the interpretation of the above, the decision of the **Engineer** shall be final and binding on the Contractor.

#### **Clause 102 Definitions**

*The following abbreviations shall be added at the end of Clause 102*

"MoRT&H": Ministry of Road Transport & Highways, Govt. of India

#### **Clause 103 Materials & Test Standard**

*Add the following at the end of Clause 103*

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

#### **Clause 106 Construction Equipment**

*Add the following after Sub Clause 106 (f)*

- g) Adequate standby equipment including spare parts shall be available as decided in consultation with the **Engineer**.
- 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**

*Add the following at end of Sub Clause 107.3*

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 15 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**.

#### **Clause 108 Site Information**

*Delete Sub-Clause 108.4 and replace with the followings*

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.

"It is the sole responsibility of the Contractor to arrange the quarries, borrow areas etc., on license/lease basis or otherwise, and study in detail before tendering, the scope of taking the quarry on lease. Advance information must be collected by the Contractor regarding the procedure laid down and the consequent delay in arranging the quarries on lease and must make alternative arrangement to procure the quarry products from lease holders. No separate payment will be made for arranging such quarries, borrow areas."

#### **Clause 109 Setting Out**

*Add the following at end of Sub Clause 109.3*

"The Reference Bench Mark for the area shall be GTS Benchmark established by Survey of India and the values of the same shall be obtained by the Contractor from Survey of India". All survey, layout work is to be done by Total station and auto level instrument.

#### **Clause 110 Public Utilities**

*Delete Sub Clause 110.7 and replace with the following*

- a) All utilities shifting (Electrical line, water supply etc.) falling in the Flyover alignment and service road shall have to be executed by the respective Line Departments. It shall be the responsibility of the Contractor to streamline the works as per their rules and regulations by making payment of their charges, fees etc. with the approval of the **Engineer**. However the PIU, ERA shall assist the contractor to keep liason with various utilities agencies and local administration for smooth implementation of the project. The contractor may put up the charges levied by respective authorities for reimbursement from provisional sums for approval of the **Engineer**.
- b) The serviceable materials, as ascertained by the **Engineer**, shall be deposited at designated store yards or as directed by the **Engineer**. No payment shall be made to the Contractor in this regard.
- c) The Contractor shall carry out the protective work for utilities as per direction by the **Engineer**. No payment shall be made to the Contractor in this regard.
- d) The Contractor is advised to ascertain the extent and the nature of the shifting involved, before commencement of work and apprise the **Engineer** of the same.

#### **Clause 115 Methodology and Sequence of Work**

*Add the following at end of Clause 115*

##### **Sub Clause 115.1 Approval of proprietary product / process /system**

Only proprietary items proven by International / National 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**.

Name of manufacturer 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 has been successfully used shall be furnished. Authenticated copies of license / collaboration agreement shall be furnished.

General features of the product/product process/system:



- I. 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.,
- II. Manufacturer shall submit a quality assurance system document. Details of acceptance test and criteria of acceptance shall be furnished in this document.
- III. Installation procedure.
- IV. Maintenance procedure and schedule.
- V. 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 of these additional tests shall be borne by the Contractor.

#### **Clause 122 Residential Accommodation for the Engineer**

*This Clause to be deleted in totality*

#### **Clause 123 Providing & Maintaining Wireless Communication System**

*This Clause to be deleted in totality*

#### **Clause 124 Providing and Maintaining Vehicles for the Engineer**

- i) *This Clause shall be read as* "providing light motor vehicle to the **Engineer** including operation, maintenance, driver and fuel etc. during contract period of 36 months shall be the sole responsibility of the Contractor and accordingly the cost of the same shall be borne by the Contractor and shall not be paid extra."

#### **Section 200 Site Clearance**

The words "lead up to 1000mts." wherever mentioned in this clause shall be replaced by "up to all leads".

The payments for such items shall be paid as per the rates quoted by the contractor for leads and lifts. No extra cost shall be paid to the contractor for any lead beyond 1000 mts. up to dumping ground as notified by Municipal Corporation, Srinagar.

#### **Section 300 Earthwork**

The words "lead up to 1000mts." wherever mentioned in this clause shall be replaced by "up to all leads".

The payments for such items shall be paid as per the rates quoted by the contractor for leads and lifts. No extra cost shall be paid to the contractor for any lead beyond 1000 mts.

#### **Clause 401.3 Strength of sub-base**

*Delete Para 2 and replace with the following*

When directed by the **Engineer**, this shall be verified by performing CBR tests in the laboratory. The CBR tests shall be conducted on specimen soaked for 4 days and compacted to 100% of the maximum dry density as per IS: 2720 (part 8)

#### **Clause 401.4.1 Preparation of sub grade**

*Add after the first paragraph*

Where the existing pavement it is to be overlaid by a granular base / sub base and embankment of less than 500 mm total thickness shall be scarified in accordance with Sub-Clause 501.3.2. 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 devised by the **Engineer**. The Contractor will verify that all bituminous layers have been removed using appropriate methods approved by the **Engineer**. The bituminous surfacing material removed from the existing pavement may be used in other parts of the works provided it complies with the relevant specification clauses.

After scarification and removal to the satisfaction of the **Engineer** of the bitumen surface from the existing pavement to be overlaid, the surface 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 surface for overlay.

#### **Clause 408 Cement Concrete Kerb and Kerb with Channel**

**Clause 408.5.1** *Substitute first sentence of Clause 408.5.1 as under;*

Concrete Channel for access road shall be of PCC M25 laid on road base as shown in drawings.

**Clause 408.5.2** Add the words "or to accommodate drainage pipes" at the end of para after the words "drainage openings"

#### **Clause 501.8.8.2: Rate for premixed bituminous material**

*Item (ii) shall read as:*

'Preparation of surface to receive the materials except rates for prime / tack coats'

#### **Clause 504.2.5 Proportioning of materials**

*Add below Table 500-4*

"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 803.3.2**

*This Clause shall read as under*

"The road markings shall be laid with appropriate road marking machinery as approved by the **Engineer**".

#### **Clause 901.5**

*This Clause shall read as under*

The Contractor shall provide necessary co-operation 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 and personnel, including labour, attendants, assistance in packing and dispatching and any other assistance considered necessary in connection with the tests."

#### **Clause 1006 Cement**

*Add the following at the end of the Clause.*

"The Contractor shall submit, for approval, certified laboratory test data and/or manufacturer's certificate and data for the following parameters:

- Chemical and physical properties
- Initial/final setting time
- Soundness test
- Tensile Strength Test"

#### **Clause 1007 Coarse Aggregates**

(i) *Delete from the first sentence "crushed gravel.... inert material" appearing in 3<sup>d</sup> and 4<sup>th</sup> line.*

(ii) *Add the following at the end of the Clause*

Except where it can be shown to the satisfaction of the **Engineer** that a supply of properly graded aggregate of uniform quality can be maintained over the period of the Works, the grading of aggregate shall be controlled by obtaining the coarse aggregate in different sizes and blending them in correct proportions as or when required.

#### **Clause 1009 Steel**

##### **Clause 1009.3 Reinforcement / Untentioned steel**

Add the following note under table 1000-3

Thermo Mechanically Treated Bars (TMT bars) Conforming to IS: 1786 may also be used.

The TMT bars shall be procured from Ingot / Billet manufacturers only.

#### **Clause 1014.3 Storage of Materials: Aggregates**

*The following shall be added to this clause*

Aggregates shall be stored or stockpiled in such a manner that segregation of fine and coarse sizes will be avoided and also that the various sizes will not become intermixed before proportioning. They shall be stored, stockpiled and handled in such a manner that will prevent contamination by foreign materials.

#### **Clause 1502 Materials**

*This clause shall read as under*

"All materials shall comply with the requirement of IRC: 87(Latest Version)

Materials and components used for formwork shall be examined for damage or excessive deterioration before use or reuse and shall be used if found suitable after necessary repairs. Only steel formwork shall be used. The steel used for forms shall be of such thickness that the forms remain true to shape. All bolts should be countersunk. The use of approved internal steel ties or plastic spacers shall be permitted. Structural steel tube used as support for forms shall have a minimum wall thickness of 4 mm".

#### **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".

#### **Clause 1508 Removal of Formwork**

Add the following as Para 5 Clause 1508.

"For pre-stressed units, the side forms shall be released, as early as possible. For supports and forms for cast in situ members shall not be removed until sufficient pre-stress has been applied to carry the dead load and any form work supported by the member and anticipated construction loads".

#### **Clause 1605 Placing of Reinforcement**

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:

<u>Structural depth d (mm)</u>	<u>Tolerance (mm)</u>
d < 1000	<10
1000 < d < 2000	<0.01d
2000 < d	<20

#### **Clause 1606.2 Bar Splices Welding**

Add the following at the end of the paragraph.

"In pre-stressed concrete members, when welding of unintended reinforcement is permitted by the **Engineer**, it shall be carried out before insertion of the pre-stressing tendons".

#### **Clause 1703.1 Grade of Concrete**

Following "Notes" shall be added in the "Notes applicable to Table 1700-2 and 1700-3".

- v) "Severe condition of Exposure" shall be considered for the purpose of this sub-clause.

- vi) The Grades of concrete in various components (in PCC or in RCC) shall be as shown on drawings or as directed by the **Engineer**.

**Clause 1705 Admixtures**

*This Clause shall read as under:*

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

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

**Clause 1706 Size of Coarse Aggregate**

"Maximum nominal size of coarse aggregates given under Table 1700-7 against items (ii), (iii) & (iv) *shall be read as 20 mm*".

**Clause 1713.1 Water Curing**

*Add the following at the end of Para I*

"Wherever possible, use of water sprinklers or perforated pipes should be encouraged for curing of concrete. Such arrangement must be maintained for a minimum period of 14 days after concreting."

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

**Clause 1802.2.2** Replace existing Clause with the following:

The internal area of the sheathing duct shall be as shown on the drawings.

**Clause 1802.2.3** Replace existing clause with the following:

"Cables shall be threaded after concreting. In such cases a temporary tendon shall be inserted in the sheathing, or the sheathing shall be stiffened by other suitable method during concreting. The sheathing supports shall be such as to prevent floatation of empty cable duct during concreting".

**Clause 2005.1 Raw Materials**

*In Para 2 of notes given in this clause read IS 2062 in place of IS 226.*

**Clause 2005.3 Acceptance Specifications**

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

**Clause 2005.3.5 Inspection Certificate**

In Para 4, substitute the words "the **Engineer** or his authorized representative" for the word "Inspector".

**Section 2300 Concrete Superstructure**

*Add the following clause 2310 after clause 2309*

**Clause 2310 Load Testing**

If the **Engineer** in his opinion considers load test of superstructure is necessary for one or more of the reasons specified below, he shall instruct the contractor to undertake the same:

The work test cubes failing to attain the specified strength

The shuttering being prematurely removed

Over loading during construction of the structure or part thereof

Concrete improperly cured and/or any other circumstances attributable to negligence on the part of the contractor which is the opinion of the **Engineer**, results in the structure or part thereof, being of less than the expected strength.

The load test of the structure, which may be considered necessary by the **Engineer** for the reasons stated above, shall be carried out at the contractor's own expense. The methodology, and acceptance criteria shall follow the Guidelines as given in IRC: SP51, "Guidelines for Load Testing of Bridges".

#### 4. PARTICULAR SPECIFICATIONS:

##### 4.1 Clause A-1 Strip / Box seal expansion joint

###### a) Components

Strip seal expansion joint shall comprise the following items:

###### a) Edge Beam

This shall be either extruded or hot rolled steel section or cold rolled cellular section with suitable profile to mechanically lock the sealing element in place throughout the normal movement cycle. Further, the configuration shall be such that the section has a minimum thickness of 10mm all along its cross section (flange & web). Thickness of lips holding the seal shall not be less than 6 mm. The minimum height of the edge beam section shall be 80 mm. The minimum cross sectional area of the edge beam shall be 1500 mm<sup>2</sup>.

###### b) Anchorage

Edge beams shall be anchored to the deck by reinforcing bars, or anchor plates cast in concrete or a combination of anchor plates and reinforcing bars, Anchor bars, shall engage the main structural reinforcement of the deck and in case of anchor plates or loops, this shall be achieved by passing transverse bars through the loops or plates.

The minimum thickness of anchor plate shall be 12 mm. Total cross sectional area of bar on each side of the joint shall not be less than 1600 mm Sq. per metre length of the joint and the centre to centre spacing shall not exceed 250mm. The ultimate resistance of each anchorage shall not be less than 600 KN/m in any direction.

###### b) Material

- i) The steel for edge beams shall conform to any of the steel grade corresponding to **RST 37-2 OR 37-3 (DIN), ASTM A36 or A588, CAN/CSA Standard G40.21 Grade 300 W** or equivalent.
- ii) Anchorage steel shall conform to **IS: 2062** or equivalent.
- iii) All steel sections shall be protected against corrosion by hot dip galvanizing or any other approved anticorrosive coating with a minimum thickness of 100 micron.
- iv) Chloroprene of strip seal element shall conform to Clause 915.1 of IRC:83(Part-II). The properties of chloroprene shall be as specified in the table below:

##### STRIP SEAL ELEMENT SPECIFICATION

PROPERTY	SPECIFIED VALUE
Hardness* DIN 53505 ASTAM D 2240 (Modified)	63 ± 5 Shore A 55 ± 5 Shore A
Tensile strength* DIN 53504 ASTM D412	Min 11 Mpa Min 13.8 Mpa
Elongation at fracture* DIN 53504 ASTM D412	Min 350 per cent Min 250 per cent
Tear Propagation Strength Longitudinal Transverse Shock Elasticity Abrasion	Min 10 N/mm Min. 10 N/mm Min 25 per cent Min 220 Cu.mm.
Residual Compressive Strain 22 h/70 deg.C/30 percent strain) Ageing in hot air (14 days/70 dg.C	Max 28 percent
Change in hardness	Max + 7 Shore A

Change in tensile strength	Max – 20 per cent
Change in elongation at fracture	Max – 20 percent
Ageing in ozone (24 h/50 pphm25 deg. C/20 per cent elongation)	No cracks
Swelling behaviour in Oil (168h/25 deg.C) ASTM oil No.1 Volume Change Change in hardness	Max + 5 per cent Max – 10 Shore A
ASTM Oil No.3 Volume change Change in hardness Cold Hardening Point	Max + 25 percent Max – 20 Shore A Max – 35 deg.c

\*Only one set of specifications viz ASTM or DIN shall be followed depending on the source of supply

**c) Fabrication (Pre-installation)**

- i) The strip seal joint system and all its component parts including anchorages shall be supplied by the manufacturer/system supplier.
- ii) The width of the gap to cater for movement due to thermal effect, pre – stress, shrinkage and creep, superstructure deformations (if any) and sub-structure deformations (if any) shall be determined and intimated to the manufacturer. Depending upon the temperature at which the joint is to be installed, the gap dimension shall be preset.
- iii) Each strip seal expansion joint system shall be fabricated as a single entity unless stage construction or excessive length prohibits monolithic fabrication. It shall fit the full width of the structure as indicated on the approved drawing. The system shall be preset by the manufacturer prior to transportation. Presetting shall be done in accordance with the joint opening indicated on the drawing.
- iv) The finally assembly joint shall then be clamped and transported to the work site.

**d) Handling and Storage.**

- i) For transportation and storage, auxiliary brackets shall be provided to hold the joint assembly together.
- ii) The manufacturer/supplier shall supply either directly to the **Engineer** or to the Bridge Contractor all the materials of strip seal joints including sealants and all other accessories for the effective installation of the joints.
- iii) Expansion joint material shall be handled with care. It shall be stored under cover on suitable lumber padding.

**e) Installation:**

- i) The joint shall be installed by the manufacturer/supplier or their authorized representative who will ensure compliance to the manufacturer's instructions for installation.
- ii) Taking the width of gap for movement of the joint into account, the dimensions of the recess in the decking shall be established in accordance with the drawings or design data of the manufacturer. The surfaces of the recess shall be thoroughly cleaned and all dirt and debris removed. The exposed reinforcement shall be suitably adjusted to permit unobstructed lowering of the joint into the recess.
- iii) The recess shall be shuttered in such a way that dimensions in the joint drawing are maintained. The formwork shall be rigid and firm.
- iv) Immediately prior to placing the joint, the presetting shall be inspected. Should the actual temperature of the structure be different from the temperature provided for presetting correction of the presetting shall be done. After adjustment, the brackets shall be tightened again.

- v) The joint shall be lowered in a pre-determined position. Following placement of the joint in the prepared recess, the joint shall be leveled and finally aligned and the anchorage steel on one side of the joint welded to the exposed reinforcement bars of the structure. Upon completion, the same procedure shall be followed for the other side of the joint. With the expansion joint finally held at both sides, the auxiliary brackets shall be released, allowing the joint to take up the movement of the structure.
- vi) High quality concrete shall then be filled into the recess. The packing concrete must feature low shrinkage and have the same strength as that of the superstructure, but in any case not less than M 35 grade. Good compaction and careful curing of concrete is particularly important. After the concrete has cured, the movable installation brackets and shuttering still in place shall be removed.
- vii) The neoprene seal shall be field installed in continuous length spanning the entire roadway width. To ensure proper fit of the seal and enhance the ease of installation, dirt, spatter or standing water shall be removed from the steel cavity using a brush, scraper or compressed air. The seal shall be installed without any damage to the seal by suitable hand method or machine tools.
- viii) As soon as the concrete in the recess has become initially set, a sturdy ramp shall be placed over the joint to protect the exposed steel beams and neoprene seals from the site traffic. Expansion joint shall not be exposed to traffic before the carriageway surfacing is placed.
- ix) The carriageway surfacing shall be finished flush with the top of the steel sections. The actual junction of the surfacing/wearing coat with the steel edge section shall be formed by a wedge shaped joint with a sealing compound. The horizontal leg of the edge beam shall be cleaned beforehand. It is particularly important to ensure thorough and careful compaction of the surfacing in order to prevent any premature depression forming in it.

**f) Acceptance Criteria**

- i) All steel elements shall be finished with corrosion protection system.
- ii) For neoprene seal, the acceptance test shall conform to the requirements in Table as above. The manufacturer/supplier shall produce a test certificate accordingly, conducted in a recognized independent laboratory, in India or abroad.
- iii) The manufacturer shall produce test certificates indicating that anchorage system had been tested in a recognized laboratory to determine optimum configuration of anchorage assembly under dynamic loading.
- iv) Prior to acceptance 25 percent of the completed and installed joints, subject to a minimum of one joint, shall be subjected to water tightness test. Water shall be continuously ponded along the entire length for a minimum period of 4 hours for a depth of 25 mm above the highest point of deck. The width of ponding shall be at least 50 mm beyond the anchorage block of the joint on either side. The depth of water shall not fall below 25 mm anytime during the test. A close inspection of the underside of the joint shall not reveal any leakage.
- v) Investigation of fatigue strength of the edge beam section with anchorages to withstand  $2 \times 10^6$  load change cycles of 85 KN vertical load and 10 KN of horizontal load without showing sign of distress shall be required. The supplier shall produce a test certificate in this regard conducted in a recognized laboratory, in India or abroad.
- vi) As strip seal type of joint is specialized in nature, generally of the proprietary type, the manufacturer shall be required to produce evidence of satisfactory performance of this type of joint.

**g) Tests Standards of Acceptance:**

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

#### **4.2 Clause A-2 Reinforced Earth Retaining Wall:**

The work of Reinforced Earth retaining walls proposed in ramp portions of Flyover and Express-way Corridor as per drawings shall be carried out as per Clause 3100 of Ministry of Road Transport and Highways "Specifications for Road & Bridge Works" (Fourth Revision). Specific requirement of 'fill material' as stipulated under clause 3103, which shall be strictly met with. The reinforcing element shall be either galvanized steel strips or Geo-grids conforming to clause 3100 of MORT&H Specification (Latest Revision). The design and drawings of reinforced Earth Retaining Walls shall be submitted by the contracting agency for approval of **Engineer** – in – Charge. Design of RE wall shall be done keeping in view of available bearing capacity. No compensation shall be payable to improve bearing capacity of soil under RE wall if any required during design and construction.

#### **4.3 Clause A-3 Bearings:**

POT PTFE bearing considering free, fixed type, guided, Design, supply & necessary fixing arrangement shall be provided by contractor. Before execution of the actual work design, drawing and methodology for installation of different type of POT PTFE bearing duly proof checked by Reputed agency shall be got approved from the **Engineer**.

#### **4.4 Clause A-4 Wearing Coat:**

Wearing coat over Flyover and Express-way Corridor deck shall comprise of 40 mm thick bituminous concrete over laid with 25 mm thick bitumen mastic layer. The work of B.C. and mastic asphalt shall be done in conformity with Clauses 2702.2, 509 and 515 respectively of MORT&H Specification (Latest Revision).

#### **4.5 Clause A-5 Reinforced Concrete / Prestress Concrete:**

- 4.5.1 Precast - Prestressed concrete (PSC) Beams have been proposed for Flyover and Express-way Corridor main spans. Materials, workmanship, supervision and safety precautions during tensioning shall conform to Clause 1500, 1700, 1800 of MORT & H Specification (latest Revision). Precast girders shall be placed in position with cranes of appropriate capacity / type.
- 4.5.2 Prestressing operation shall be entrusted to only specially trained and qualified personnel as stipulated in Appendix – 4 of IRC 18-2000. Grouting of cables shall be carried out as per recommended practice given at Appendix – 5 of IRC 18-2000.
- 4.5.3 Controlled concrete of required grade shall be produced in an automatic batching plant of 15 cum / hr (min) capacity and transported to site of work through transit mixers. A suitable casting yard shall be established by the contractor.

#### **4.6 Clause A-6 Sub-Structures & Superstructures:**

The work pertaining to sub structures and superstructures shall conform to guide line given under Clauses 2200 and 2300 respectively of MORT&H Specification (Latest Revision). Requirement of structural concrete shall conform to Clause 1700.

#### **4.7 Clause A-7 Steel Reinforcement (un-tensioned):**

Only TMT steel reinforcement (un-tensioned) conforming to clause 1600 of MORT&H Specification shall be used for all the component of Flyover and Express-way Corridor. The steel shall be procured from Billot original /ingot manufacturers only.

#### **4.8 Clause A-8 Materials:**

Materials for structures shall conform to Clause 1000 of MORT&H Specifications (Latest Revision).

#### **4.9 Clause A-9 Soil Investigations:**

Geo-technical investigation works for Flyover and Express-way Corridor has been carried out for computing the properties and bearing capacity of the soil. The contractor is supposed to carry out the Geo-technical investigation after the award of work to ascertain the soil properties before execution of the foundation works. The Geo-technical report of the tests carried out by the contractor shall be submitted to the **Engineer**. No payment shall be made to the contractor for such investigations.



**4.10 Clause A-10** Approaches (Solid Embankment in between Reinforced Retaining Walls):

The work of laying hard crust and earth work in embankment shall be carried out as per relevant Clauses 305 of MORT & H Specification (Latest Revision). Requirement of soil materials passing through 75 micron sieve shall be met with as per clause 3103 of MORTH specifications.

**4.11 Clause A-11** For items not covered in the above specifications / MORT & H / IRC specifications for civil works, the provisions of following standards shall be followed in the given order of priority:

- (a) Provisions of IS Codes of practices.
- (b) Relevant provisions of B.S. Codes of practices.
- (c) Sound Engineering practice, Technical literature / Papers and provisions of relevant Codes of other nations.

**4.12 Clause A-12** GSB (Granular Sub-Base) material shall be produced by mechanical means using pug mill.

**4.13 Clause A-13** Use of mechanical Grader for construction of embankment, sub-grade & sub-base shall be mandatory.

**4.14 Clause A-14** WMM layers shall be laid only by paver.

**4.15 Clause A-15** Bituminous layers shall be laid by pavers.

**5. ENVIRONMENTAL MANAGEMENT PLAN**

Environmental Management Plan (EMP) as given in the table below will be a part of contract for execution of Project works.

**Table 1: Environment Management Plan (Pre-Construction Stage)**

Sl.	Environmental issue	Management Measures	Location/frequency
P1	Preservation of Trees	All efforts will be made to preserve trees including evaluation of minor design adjustments/ alternatives to save trees. Specific attention will be given for protecting big trees and locally important trees (religiously important etc.). Tree cutting is to proceed only after all the legal requirements including attaining of in-principle and formal clearances from the Forest Department are completed and subsequently a written order is issued to the Contractor Particular species declared as 'protected' by the State's Forest Department in the private land will be felled only after due clearance from the Forest Department/ concerned agencies is obtained. In the event of design changes, additional assessments including the possibility to save trees shall be made. Stacking, transport and storage of the wood will be done as per the relevant norms. Systematic corridor level documentation for the trees cut and those saved will be maintained with implementation Agency.	Throughout the Corridor/ Prior to commencement of work
P2	Relocation of Community Utilities and common Property Resources	All community utilities and properties i.e., water supply line, telephone and power supply cable, sewer line, buildings, health centers will be relocated before construction starts. The PIU will relocate these properties in consultation and written agreement with the agency/ owner/community. Environmental considerations with suitable/required actions including health and hygiene aspects will be kept in mind while relocating all community utilities and resources.	Throughout the Corridor/ Prior to commencement of work
P3	Crushers, hot-	Hot mix/ spot mix plants will be sited away from	Selected

	mix/ spot mix plants location	<p>settlements and any commercial establishments.</p> <p>The Contractor shall submit a detailed layout plan for all such sites and approval of Environmental Expert/ Engineer shall be necessary prior to their establishment.</p> <p>Arrangement to control dust pollution through provision of windscreens, sprinklers and dust encapsulation will have to be provided at all such sites.</p> <p>Specifications of crushers, hot mix plants will comply with the requirements of the relevant current emission control legislations and Consent/NOC for all such plants shall be submitted to the PIU through Independent Consultant.</p> <p>The Contractor shall not initiate plant's operation till the required legal clearances are obtained and submitted. The Engineer will ensure that the regulatory and legal requirements are being complied with.</p>	location/ Prior to commencement of work
P4	Borrow Areas	<p>Finalizing borrows areas for borrowing earth and all logistic arrangements as well as compliance to environmental requirements, as applicable, will be the sole responsibility of the contractor.</p> <p>Locations finalized by the contractor shall be reported to the Environmental Expert of IC and who will in turn report to PIU.</p> <p>Planning of haul roads for accessing borrows materials will be undertaken during this stage. The haul roads shall be routed to avoid congested area.</p> <p>The IC will make sure that each such site is in line with IRC and other Project Guidelines.</p>	Specified or selected locations/ Prior to commencement of work
P5	Joint Field Verification	<p>The Environmental Experts of IC/IA and the Contractor will carry out joint field verification to ascertain any additional possibility to saving trees, environmental community resources.</p> <p>The verification exercise should assess the need for additional protection measures or changes in design/ scale/ nature of protection measures including the efficacy of enhancement measures suggested in the EMP. Proper documentation and justification/ reasons shall be maintained in all such cases where deviation from the original EMP is proposed.</p>	Throughout the Corridor/ Once prior to start of construction and DPR finalization
P6	Statutory environmental and other regulatory approvals and clearances	All applicable statutory environmental clearances/ approvals at the national, local levels and from other relevant authorities must be obtained prior to commencement of physical works.	Along the Project Road/ Once prior to commencement of physical work
P7	Arrangement for Construction Water	<p>The contractor will use ground water as a source of water for the construction.</p> <p>To avoid disruption/disturbance to other water users, the contractor will extract water from fixed locations and consult the Environmental Expert of IC/IA before finalizing the locations.</p>	Along the Project Road/ Periodic during construction
P8	Labour requirements	The contractor preferably will use unskilled labour drawn from local communities to give the maximum benefit to the local community.	Near the Project Area/ Throughout the construction
P9	Construction Camp locations – Selection, Design and Lay-out	<p>Setting of the construction camps will be selected by the contractor as per the guidelines. The site for construction camps will be selected in construction with DSC Engineer to avoid conflicts and stress over the infrastructure facilities with the local community and contractor will start construction of camp only after getting the layout approved from Engineer.</p> <p>The waste disposal and sewage system for the camp will</p>	Near the Project Road/ Once – prior to start of work.

		be designed, built and operated such that no odor is generated.	
<b>Table 2: Environmental Management Plan (Construction Stage)</b>			
C1	Clearing and Grubbing	<p>Vegetation will be removed from the construction zone before commencement of construction. All works will be carried out such that the damage or disruption to flora other than those identified for cutting is minimum.</p> <p>Only ground cover/ shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval from the Environmental Expert of IC.</p> <p>The Contractor under any circumstances will not cut trees other than those identified for cutting and for which he was written instructions from the PIU. The PIU will issue these instructions only after receiving all stages of clearances from the Forest Department.</p> <p>Vegetation only with girth of over 30 cm will be considered as trees and shall be compensated, in the event of PIU's instruction to undertake tree cutting.</p>	Along the work in progress/ periodic reviews during construction works
C2	Disposal of debris from dismantling and road surface	<p>The contractor shall identify disposal sites. The identified locations will be reported to the Environmental Expert of IC. These locations will be checked on site and accordingly approved by Environmental Expert of IC prior to any disposal of waste materials.</p> <p>All arrangements for transportation during construction including provision, maintenance, dismantling to the work and will be planned and implemented by the contractor as approved and directed by the Environmental Expert of IC/IA.</p>	Along the work in progress/ periodic reviews during construction works
C3	Other Construction wastes disposal	<p>The pre-identified disposal locations will be apart of Comprehensive Waste Disposal Management Plan to be prepared by the Contractor in consultation and with approval of Environmental Expert of IC/IA. Location of disposal sites will be finalized prior to initiation of works on any particular section of the road.</p> <p>The Environmental Expert of IC will approve these disposal sites after conducting a joint inspection on the site with the Contractor.</p> <p>Contractor will ensure that any spoils of material unsuitable for embankment fill will not be disposed off near any water course and natural habitat. Such spoils from excavation can be used to reclaim borrow pits and low-lying areas.</p>	Along the Road/ periodic reviews during construction works
C4	Accessibility	<p>The contractor will provide safe and convenient passage for vehicles, pedestrians to and from roadsides and property access connecting the project road, providing temporary connecting road.</p> <p>The Contractor will ensure that schools and religious places are accessible to public. The contractor will also ensure that the work on / at existing accesses will not be undertaken without providing adequate provisions and to the prior satisfaction of Environmental Expert of IC.</p> <p>The contractor will take care that the cross roads are constructed in such a sequence that construction workover the adjacent cross roads are taken up one after one so that traffic movement in any given area not get affected much.</p>	Along the Road/ periodic reviews during construction works
C5	Planning for Traffic Diversions and Detours	Temporary diversions will be constructed with the approval of the Engineer and Environmental Expert of IC/IA for which contractor will seek prior approval for such plans.	Along the Road/ continuous during implementation

		<p>Detailed Traffic Control Plans will be prepared and submitted to the Engineer for approval, seven days prior to commencement of works on any section of road. The traffic control plans shall contain details diversions; traffic safety arrangement during construction; safety measures for night – time traffic and precautions for transportation of hazardous materials. Traffic control plans shall be prepared in line with requirements of IRC: SP-55 document and the Contractor will ensure that the diversion/detour is always maintained in running conditions, particularly during the monsoon to avoid disruption to traffic flow.</p> <p>The contractor will also inform local community of changes to traffic routes, conditions and pedestrian access arrangements with assistance from IC and PIU. The temporary traffic detours will be kept free of dust by sprinkling of water three times a day and as required under specific conditions (depending on weather conditions, construction in the settlement areas and volume of traffic).</p>	and when required.
C6	Quarry Operations – collection of stone aggregates	<p>The contractor shall obtain materials from quarries only after the consent of the Department of Mining/ SPCB (both the states) / District Administration or will use existing approved sources of such materials. Copies of consent/ approval/ rehabilitation plan for opening a new quarry or use of an existing quarry source will be submitted to Environmental Expert of IC and the Resident Engineer.</p> <p>The quarry operations will be undertaken within the rules and regulations in force in the state.</p>	Quarry Areas/ periodic during construction
C7	Earth from Borrow areas for Construction	<p>The unpaved surfaces used for the haulage of borrow materials, if passing through the settlement areas or habitations; will be maintained dust free by the contractor. Sprinkling of water will be carried out twice a day to control dust along such roads during their period of use. During dry seasons (winter and summer) frequency of water sprinkling will be increased in the settlement areas and Environmental Expert of IC will decide the numbers of sprinkling depending on the local requirements.</p> <p>Contractor will rehabilitate the borrow areas as soon as borrowing is over from a particular borrow area in accordance with the Guidelines for Redevelopment of Borrow Areas or as suggested by Environmental Expert of IC.</p> <p>The final rehabilitation plans will be approved by the Environmental Expert of IC.</p>	Borrow Areas/ periodic during construction and after construction
C8	Transporting Construction Materials and Haul Road Management	<p>All vehicles delivering fine materials to the site will be covered to avoid spillage of materials.</p> <p>All existing roads used by vehicles of the contractor or any of his sub-contractor or suppliers of materials will be kept clear of all dust/mud or other extraneous materials dropped by such vehicles.</p> <p>Contractor will arrange for regular water sprinkling as necessary for dust suppression of all such roads and surfaces with specific attention to the settlement areas.</p> <p>The unloading of materials at construction sites/close to settlement will be restricted to daytime only.</p>	All Roads used/ Periodic during construction
C9	Construction Water	<p>Contractor will arrange adequate supply and storage of water for the whole construction period at his own costs. The Contractor will submit a list of source/s from where water will be used for project to PIU through the Engineer.</p>	Along and near the Project road/ period during construction

		The Contractor will take all precaution to minimize the wastage of water in the construction process/ operation.	
C10	Drainage	Contractor will ensure that no construction materials like earth, stone, or appendage is disposed off in a manner that blocks the drainage channels. In addition to the design requirements, the contractor will take all required measures as directed by the Environmental Expert/ IC and Engineer to prevent temporary or permanent flooding of the site or any adjacent area.	Drainage line along the road/ periodic during construction
C11	Embankment protection	The contractor will take embankment protection measures as per design, or as directed by the Environmental Expert of IC to control any erosion.	Along the Roads/ periodic during construction
C12	Water Pollution from Construction Wastes	The Contractor will take all precautionary measures to prevent the waste water generated during construction. All waste arising from the project is to be disposed off in the manner that is acceptable and as per norms of the State Pollution Control Board.	Along the Roads/ periodic during construction
C13	Pollution from Fuel and Lubricants	The contractor will ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipments maintenance and refueling sites will be located at safe area. Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refueling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Contractor will arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites and approved by the Environmental Expert of IC. All spills and collected petroleum products will be disposed off in accordance with MoEF and state PCB guidelines.	Along the Roads/ periodic during construction
C14	Dust Pollution	The contractor will take every precaution to reduce the level of dust from crushers/hot mix/ spot mix plants, construction sites involving earthwork by sprinkling of water, encapsulation of dust source and by erection of screen/barriers. The contractor will provide necessary certificates to confirm that all crushers used in construction conform to relevant dust emission control legislation. The suspended particulate matter value at a distance of 40m from a unit located in a cluster should be less than 500 micro gm/m <sup>3</sup> . The pollution monitoring is to be conducted as per the monitoring plan. Hot mix plant will be fitted with dust extraction units.	Along the Roads, Construction site/camps/ During construction periodically
C15	Emission from Construction Vehicles, Equipment and Machineries	Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of SPCB. The Contractor will submit PUC certificates for all vehicles/ equipments/ Machinery used for the project. Monitoring results will also be submitted to PIU through the Engineer.	Along the Roads, all vehicles used/ camps/ During construction periodically
C16	Noise Pollution: Noise from vehicles, plants and equipments	The Contractor will confirm the following: <ul style="list-style-type: none"> <li>All plants and equipment used in construction shall strictly conform to the CPCB noise standards.</li> <li>All vehicles and equipment used in construction will be fitted with exhaust silencers.</li> <li>Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of</li> </ul>	Along the Roads, all vehicles used/ camps/ During construction periodically

		<p>exhaust silencers will be checked and if found defective will be replaced.</p> <ul style="list-style-type: none"> <li>Limits for construction equipment used in the project such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75Db(A) (measured at one meter from the edge of equipment in the free field), as specified in the Environment (Protection) rules 1986.</li> <li>Maintenance of vehicles, equipment and machinery shall be regular to keep noise levels at the minimum.</li> <li>Monitoring shall be carried out at the construction sites as per the monitoring schedule and results will be submitted to IC through the Engineer.</li> </ul>	
C17	Personal Safety Measures for Labour	<p>Contractor will provide:</p> <ul style="list-style-type: none"> <li>Protective footwear and protective goggles to all workers employed on mixing asphalt materials, cement, lime mortars, concrete etc.</li> <li>Welder's protective eye-shields to workers who are engaged in welding works.</li> <li>Protective goggles and clothing to workers engaged in stone breaking activities and workers will be seated at sufficiently safe intervals.</li> <li>Earplugs to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation.</li> <li>Adequate safety measures for workers during handling of materials.</li> <li>The contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells and safe means of entry and egress.</li> </ul> <p>The contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labour Organization (ILO) Convention No.62 as far as those are applicable to this contract.</p> <p>The contractor will make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (Regulation of Employment and Conditions of Services) Act, 1996 are adhered to.</p> <p>The contractor will not employ any person below the age of 14 years for any work and no woman will be employed on the work of painting with products containing lead in any form.</p> <p>The contractor will also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint.</p> <p>Contractor will provide facemasks for use to the workers when paint is applied in the form of spray or a surface having lead paint dry is rubbed and scrapped.</p> <p>The contractor will mark 'hard hat' and 'no smoking' and other 'high risk' areas and enforce non-compliance of use of PPE with zero tolerance. These will be reflected in the Construction Safety Plan to be prepared by the Contractor during mobilization and will be approved by IC and PIU.</p>	Along the Roads used/ Camps/ periodically during construction
C18	Traffic Safety and	The contractor will take all necessary measures for the safety during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights	Along the Roads, all vehicles used/ Camps/ As per

		and flagman as proposed in the Traffic Control Plan/Drawings and as required by the Environmental Expert of EA and the Engineer for the information and protection of traffic approaching or passing through the section of any existing cross roads. The contractor will ensure that all signs, barricades, pavement markings are provided as per the MoRT&H Specifications. Before taking up of construction on any section of the existing lanes of the highway, a Traffic Control Plan will be devised and implemented to the satisfaction of IC and Resident Engineer.	requirement
C19	Risk from Electrical Equipment(s)	The Contractor will take all required precautions to prevent danger from electrical equipment and ensure that: <ul style="list-style-type: none"> <li>No material will be so stacked or placed as to cause danger or inconvenience to any person or the public.</li> <li>All necessary fencing and lights will be provided to protect the public in construction zones.</li> <li>All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provision and to the satisfaction of the Resident Engineer.</li> </ul>	Along the Roads/ periodically during construction
C20	First Aid	The contractor will arrange for: <ul style="list-style-type: none"> <li>A readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone.</li> <li>Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital.</li> <li>Equipment and trained nursing staff at construction camp.</li> </ul>	Along the Roads, Camps/ Through out the construction
C21	Informatory Signs and Hoardings	The contractor will provide, erect and maintain informatory/safety signs, hoardings written in English and local language, wherever required as per IRC and MoRT&H Specifications.	Along the Roads, construction Camps/ periodically during construction
C22	Road side Plantation Strategy	The contractor will do the plantation as per the tree plantation strategy prepared for the project. Minimum 80 percent survival rate of the saplings will be acceptable otherwise the contractor will replace dead plants at his own cost. The contractor will maintain the plantation till they handover the project. The Environmental Expert of IC will inspect regularly the survival rate of the plants and compliance of tree plantation guidelines.	Along the Roads/ periodically during construction
C23	Potable Water	The Contractor will construct and maintain all labour accommodation in such a fashion that uncontaminated water is available for drinking, cooking and washing.	Along the Roads, construction Camps/ construction sites/ periodically during construction
C24	Sanitation and Sewage System	The contractor will ensure that: <ul style="list-style-type: none"> <li>The sewage system for the camp are designed, built and operated in such a fashion that no health hazards occurs and no pollution to the air, ground water or adjacent water courses take place.</li> </ul>	Along the Roads, construction Camps/ construction sites/ periodically

		<ul style="list-style-type: none"> <li>Separate toilets/bathrooms, wherever required, screened from those from men (marked in vernacular) are to be provided for women.</li> <li>Adequate water supply is to be provided in all toilets and urinals.</li> </ul>	during construction
C25	Waste Disposal	The contractor will provide garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner as per the Comprehensive Solid Waste Management Plan approved by the Environmental Expert of IC.	Along the Roads, construction Camps/ periodically during construction
C26	Clean-up Operations, Restoration and Rehabilitation	Contractor will prepare site restoration plans, which will be approved by the Environmental Expert of IC. The clean-up and restoration operations are to be implemented by the contractor prior to demobilization. The contractor will clear all temporary structures; dispose all garbage, and POL waste as per Comprehensive Solid Waste Management Plan and as approved by IA.	Along the Roads, construction Camps

**Table 3: Environmental Monitoring Plan**

Environmental Component	Project Stage	Monitoring					
		Parameters	Special Guidance	Standards	Location	Frequency	Duration
Air	Construction Stage	SPM, RSPM, SO <sub>2</sub> , NO <sub>x</sub> , CO	High volume sampler to be located 50m from the spot mix/ hot mix plant in the downwind direction. Use method specified by CPCB for analysis	Air (P&CP) Act, 1981 and its amendment	Hot mix Plant/ Spot mix plant	Three times in a year for two years	Continuous 24 hours or for 1 full working day
		SPM, RSPM, SO <sub>2</sub> , NO <sub>x</sub> , CO	High volume sampler to be located 40m from the earthworks site downwind direction. Use method specified by CPCB for analysis	Air (P&CP) Act, 1981 and its amendment	Stretch of the road where construction is in progress at the site	Three times in a year for two years	Continuous 24 hours or for 1 full working day
	Operation	SPM, RSPM, SO <sub>2</sub> , NO <sub>x</sub> , CO	High volume sampler to be located near to flyover specified by CPCB for analysis	Air (P&CP) Act, 1981 and its amendment	Stretch of the road where movement of the vehicle will be take place	Three times in a year for one years	Continuous 24 hours or for 1 full working day
Noise Levels	Construction Stage	Noise levels on dB (A) scale	Free field at 1m from the equipment whose noise	Noise standards by CPCB	At equipment yards	Once every 3 month (max) for two years,	Reading to be taken at 15 seconds interval for



			levels are being determined			as required by the engineer	15 minutes every hour and than averaged
	Operation	Noise levels on dB (A) scale	Equivalent Noise levels using an integrated noise level meter kept at a distance of 15m from edge of pavement	Noise standards by CPCB	As directed by the Engineer (At maximum 4 locations)	Thrice a year for 1 year	Reading to be taken at 15 seconds interval for 15 minutes every hour and than averaged
Construction sites and Construction Camps (if established)	Construction Stage	Monitoring of Storage Area Drainage arrangements Sanitation in construction Camps		To the satisfaction of the EA	At storage area and construction camp	Quarterly in the construction stage	

## 6 Flyover and Express-way Corridor & Road Lighting

### 6.1 SCOPE OF WORK

The Scope of work of the contractor shall include the following:

- (a) Supply, Installation, Testing & Commissioning of Flyover, Service Road and Bus - Terminal lighting, control panels including supply & installation of all electrical components of the panel along with installation hardwares as well as accessories & connected civil work.
- (b) Supply, installation, testing & commissioning of 415V AC Transmission and distribution electrical system with poles/structures, conductors, insulators, stay (guy) wires, earthing conductors, ground wire, 1100V cables, pillar boxes etc. including related civil works along the proposed alignment of the project road to replace the existing electrical distribution systems which are coming if any on the proposed widening portion of the road.
- (c) Supply, Installation, Testing & Commissioning of LT cables conforming to IS 1554 and sizes conforming to BOQ including all civil works.
  - i) To co-ordinate with the Employer & the Power Development Department at Srinagar to install transformers with secondary voltage of 415V near the flyover work site for feeding LT supply to the street lighting system.
  - ii) To co-ordinate with the Employer & the Power Development Department at Srinagar for getting connection to the street lighting system through respective street lighting control panel and commission the system
  - iii) To prepare site electrical drawings and obtain the necessary approved of the **Engineer** & Power Development Department. To get approval for the installation after completion of installation works of all electrical equipments/items of the system by the **Engineer**, Power Development Department at Srinagar.
- (d) Supply, Installation, Testing & Commissioning of Earthing system with Earth pits, Earth electrodes and Earth flats/wires as per sizes indicated in BOQ with necessary approvals from line agency.

### 6.2 Shifting and Realignment of existing HT & LT Systems and Telephone lines at proposed work site:

The scope of work of the contractor shall include the following:

- (a) To co-ordinate with the Employer and concerned Line Authorities, in dismantling of existing HT supply lines and 415V AC Transmission and distribution lines and which are coming on the proposed widening portion of the road with towers/poles/structures, ACSR conductors, Insulators, stay (guy) wires, earthing conductors, ground wire, 1100 V cables, pillar boxes etc.
- (b) To Co-ordinate with the Employer and concerned Line Authorities, in dismantling of existing lighting poles, lighting fixtures, underground 1100V cables and other accessories which are coming on the proposed widening of the road and re-erection of the same in the new alignment.
- (c) To co-ordinate dismantling and shifting of the existing telephone poles and lines and re-erection of the same in the new alignment in co-ordination with the Employer and the concerned Line Authorities and local authorities.

### **6.3 Implementation of works connected with HT/ LT Transmission and distribution system realignment:**

- (a) The works shall conform to the following requirement:
  - (i) Indian Electricity Act and rules and regulations framed there under.
  - (ii) Fire insurance regulations.
  - (iii) Rules and regulations laid down by the Power Development Department and local statutory authorities like Power Development Department at Srinagar.
  - (iv) Any equipment, materials or fittings not specifically mentioned in this specification or drawings, but are genuinely necessary for the safe and efficient operation and maintenance of the works as per sound Engineering practice and prevailing statutory requirement shall also be supplied / fabricated / erected / tested / commissioned by the contractor, and it is specifically agreed and understood that such items are also deemed to be included in the scope of work of the contractor within the quoted price and no extra payment will be made on this account.
- (b) All safety procedures and practices shall be kept in view during execution of work in accordance with good practice. (Refer **IS: 5216 – 1969** – guide for safety procedures and practices in electrical work).
- (c) To take care of existing services and co-ordinate with other such contractor at site and shall co-ordinate his works with works of other contractors with least amount of damage and interference to their works.
- (d) At any point of time one responsible person should be kept from the beginning to end of the job on full time basis.
- (e) All meters have to be calibrated in an approved testing laboratory before energisation and test report should be furnished.
- (f) All rates quoted shall be inclusive of all sundry materials like hardware, clamps, cleats, nuts and bolts, cement and sand, coke and salt, solders, fluxes including all consumables like electrodes, gases etc.
- (g) After completion of all the activities described in the BOQ and Specification to the entire satisfaction of Supply Co. / Engineer, the Contractor shall handover the same after energizing, testing and commissioning of the system as a whole along with "As Built" electrical drawings.

### **6.4 System Parameters**

- (a) Voltage: 415V $\pm$  10% , 3 phase & neutral
- (b) Frequency: 50 c/s  $\pm$  3 %
- (c) Ambient Temp.: 50<sup>0</sup>C
- (d) Earthing system: solidly earthed

(e) Control circuit : AC, 240V, SPN.

#### 6.5 Relevant I.S. to be followed

- |     |                                    |   |   |
|-----|------------------------------------|---|---|
| 1.  | IS:10322 (Part 5/Sec-3) 1987       | - | Luminaries - particular requirements for road and street lighting.                                |
| 2.  | IS:7537 (Latest revision)          | - | Road traffic signals.   |
| 3.  | IS:732 (Latest revision)           | - | Code of practice for electrical wiring installations.   |
| 4.  | IS:8061 (Latest revision)          | - | Code of practice for design, installation and maintenance of service lines upto & including 650V. |
| 5.  | IS:2309 (Latest revision)          | - | Code of practice for the protection of allied structures against lightning.                       |
| 6.  | IS:3043 (Latest revision)          | - | Code of practice for Earthing.  |
| 7.  | IS:13947 (Latest revision)         | - | Specification for low-voltage switchgear and control gear   |
|     |                                    |   |   |
| 8.  | IS:13032 (Latest revision)         | - | Miniature air breaks circuit breakers for voltages not exceeding 1000V.                           |
| 9.  | IS:13947 Part-4, Section-4         | - | Contactors for voltages not exceeding 1000V AC.   |
| 10. | IS:8623 (Part I) (Latest Revision) | - | Specification for low-voltage switchgear and control gear Assemblies.                             |
| 11. | IS:1554(Latest revision)           | - | PVC insulated heavy duty electric cables for voltages upto & including 1100V AC & 1200V DC.       |
| 12. | IS:9974 (Part 1) (Latest revision) | - | High pressure sodium vapour lamps (General requirements and tests).                               |
| 13. | IS:13947:Part1                     | - | Degree of protection.   |
| 14. | IS:1944 (Latest revision)          | - | Code of practice for lighting of public thoroughfares.  |
| 15. | IS:5216 (Latest revision)          | - | Guide for safety procedures & practices in electrical works.                                      |
| 16. | IS : 2551                          |   | Danger notice plates.   |
| 17. | IS : 104                           | - | Ready mixed paint brushing, zinc chrome priming.  |
| 18. | IS : 398 Part 1 to 5               | - | Aluminium conductors for overhead transmission purposes.  |
| 19. | IS : 1913 (Latest revision)        | - | Electrical light fitting, general & safety requirements.  |

#### 6.6 Equipment Specifications

The electrical equipments shall be designed based on the following basic requirements:

- The design ambient air temperature for all electrical equipment shall be considered as 50<sup>0</sup>C
- The percentage variation of voltage, frequency and combined voltage & frequency at all levels shall be considered as  $\pm 10\%$ ,  $\pm 5\%$  and  $10\%$  (absolute sum) respectively for equipment design purpose

- The equipment for 415 V system shall be designed suitable for solidly earthed system, The minimum fault level for various voltage levels shall be considered as under:
  - a) 415 V : 35 MVA (50.0 KA)
- The Contractor shall prepare the route layout drawings with due consideration to the proposed road and flyover alignment, site conditions and with due coordination with Supply Co. The route layout drawings shall be got approved from the **Engineer** before taking up the work
- The Voltage boosters / stabilizers shall be provided to raise the voltage to overcome low voltage problem wherever found necessary.

### 6.7 Road Lighting Cubicle Panels

- (1) The Road lighting control panel shall conform to Bid Specifications. Since these are to be installed in outdoor, these shall conform to IP55 degree of protection. The technical particulars, specification, rating and make of electrical components/items etc as well as construction features shall also conform to the drawing enclosed.
- (2) At works, before dispatch of the panel, metal surfaces shall be cleaned free of rust, given two coats of zimpolite primer and finished with two coats of epoxy based paint of shade 632 as per IS 5. An additional coat of epoxy based paint of shade 632 as per IS 5 shall also be applied on the panel after erection of the same at site.

### 6.8 Enclosure and protection

- I. The enclosure shall be metal clad comprising of standard prefabricated 14 SWG MS sheet and assembled to form a free standing dead front structure.
- II. The enclosure shall be totally enclosed dust and vermin proof housing conforming to protection class IP 55. It shall have opening for natural ventilation. The opening shall be louvered with mesh.
- III. Doors and openings shall be provided with neoprene gaskets.

### 6.9 Earthing

- I. Copper earth bus of 25mm x 3mm shall be provided for the entire length of the panel. The frame work of the enclosure shall be connected to this earth bus. Provisions shall be made for connection from this earth bus to the main earthing busbar coming from the earth pit on both side of the panel.
- II. The earth continuity conductor of each incoming and outgoing feeder shall be connected to this earth bus. The armour of cables shall be properly connected with earthing clamp and the clamp shall be ultimately bonded with the earth busbar.

### 6.10 Lables

Engraved PVC labels shall be provided for all incoming and outgoing feeders. Single line circuit diagram showing the arrangements of circuit shall be pasted inside on the back of the panel door and covered with transparent laminated plastic sheet.

### 6.11 Name Plate

- I. A name plate with the clear designation in bold letters shall be fixed at top of the control panel. A separate name plate giving feeder details shall be provided for each feeder.
- II. Inside the panel the electrical components, equipments, accessories like control gear, lamps, relays etc. shall suitably be identified by providing stickers.
- III. Name plates shall preferably be of 3 ply (Red-White-Red or Black-White-Black) lamicoid sheet however black engraved perpex sheet name plates shall also be acceptable. Engraving shall be done with square groove cutters.
- IV. Name plates shall be fastened by counter sunk screws and not by adhesives.

**6.12 Danger notice plates**

- I. The danger notice plate shall be affixed in a permanent manner on operating side of the panel indicating danger notice in Hindi and English and with a sign of skull and crossbones as per recommendations of IS:2551-1982. The letters, the figures, the sign of skull and crossbones shall be painted in single red colour as per IS:5-1978.
- II. Overall dimension of the danger notice plate shall be 200mm wide x 150mm high. The danger notice plate shall be made from minimum 1.6mm thick sheet steel and after due pretreatment to the plate, the same shall be painted white with vitreous enamel paint on both front and rear surface of the plate.

**6.13 Cable Entry**

- I. The panel shall have provisions of cable entry from bottom. The removable cable gland plate is provided to make entry dust, light and vermin proof.
- II. The panel shall have provisions for fixing the multicore cable glands.
- III. The cable glands support plates shall be 4mm thick.
- IV. Cable gland shall be screwed type and made of brass and shall be double compression type.

**6.14 Mountings**

- I. All equipment in front of panel shall be flush mounting type.
- II. All equipment shall be so mounted that the removal and replacement may be accomplished individually without interruption of service of others.
- III. All equipment inside the panel shall be so located that their terminals and adjustments are readily accessible for inspection or maintenance.

**6.15 Switch Fuse Unit**

- I. 415 V , TPN , 50 Hz switch fuse unit shall be provided as incomer.
- II. The isolator shall be load break type and the fuses shall be HRC cartridge link type.
- III. The isolator switch and the fuses shall comply with the requirements of relevant IS.

**6.16 Contactors**

- I. Contactor shall be of the electromagnetic type rated for uninterrupted duty as defined in applicable standards.
- II. Main contacts of contactors shall be provided with NO and NC auxiliary contacts, in required numbers as shown in the control circuit diagram.
- III. Insulation class of operating coils shall be class E.
- IV. Operating coils of contactors shall be suitable for operation from the control supply system shown in enclosed control scheme.
- V. Contactors shall be of the double break, non gravity type.

**6.17 Sheet metal work**

- I. Sheet steel used for fabrication of cubicle shall be cold rolled and as per IS 2062:2006.
- II. Doors, covers and gland plates shall be gasketed all around the perimeter. All louvers shall have screens and filters. Panel shall be totally enclosed vermin proof, moisture proof and dust proof and shall meet to IP 55 protection classification.
- III. Floor mounting panel shall be provided with channel base frame and shall be dead front operated.

- IV. All sheet steel work shall be painted for surface protection and to prevent rusting.

**6.18 System**

The Panel shall be suitable for operation on 415 volt, 3 phase, 4 wire, 50 c/s, A.C. supply system.

**6.19 Components**

- I. Panel shall comprise an incoming Switch fuse unit and requisite number of outgoing circuits protected by MCB. Three phase and neutral buses as well as an earth busbar of high conductivity copper shall be provided in the distribution board.
- II. Panel shall be provided with a hinged front door. The incoming S/F unit shall be mounted in such a way as to facilitate operation from the front.
- III. All internal electrical connections shall be carried out using 660 / 1100 volt grade, PVC insulated, copper conductor of ISI approved make, having rated current carrying capacity to carry continuous full current of respective circuit at operating conditions prevailing at the project site.
- IV. The panel internals shall be earthed using GI wires/ strips to earth busbar, running throughout the length of the panel.

**6.20 Miniature circuit breakers**

Miniature circuit breakers for use on circuits shall comply with the requirement of applicable standard.

**6.21 Indicating lamps**

Indicating lamps shall be of filament type, with low watt consumption. Indicating lamp shall be of the double contact, bayonet cap type rated for operation at 240 V AC. Indicating lamps shall be provided with series resistors to increase the lamp life. Lamps shall be provided with translucent lamp covers. Bulbs and lenses shall be interchangeable and easily replaceable from the front.

**6.22 Watt hour meter**

- I. Watt hour meter shall be of 3 phase two element type suitable for measurement of unbalanced loads in 3 phase, 4 wire circuits. They shall be suitable for semi flush mounting on vertical plane.
- II. Watt hour meter shall be suitable for operation from the secondary of CT. They shall be provided with a separate 3 phase 4 wire type test terminal blocks for testing without disturbing CT secondary connection.
- III. Meters shall be provided with potential indicating lamps and shall have reverse running stops.
- IV. Watt-hour meter shall comply with IS14697.

**6.23 Voltmeter**

Voltsmeter shall comply with BS – 90. The dial of the meter shall be square in shape of 10 x10 cm. size. The voltmeter shall be moving iron type, flush pattern, with dust and moisture proof enclosure.

**6.24 Timer switch**

Timer switch with single pole air break contacts suitable for 240 volts, 16 A complete with starting motor driver clock "ON" and OFF" automatic arrangement at any predetermined time during each 24 hours shall be erected in the cubicle for street light circuit.

**6.25 Lighting Fixtures**

1. The types & makes and catalogue numbers of lighting fixtures offered by the bidder shall be clearly mentioned in bill of quantities. Fixtures shall be complete

- with bulb, ballast, starter, capacitor, igniter etc as required and duly wired. The ballast shall be copper wound.
2. Luminaries shall be approved by the Engineer before installation. All fittings shall be weather proof and rain proof type and shall conform to IP 65 class of protection.
  3. All luminaries shall be supplied complete with lamps suitable for operation on a supply voltage and the variation in supply voltage, frequency and combined voltage and frequency of  $\pm 10\%$ ,  $\pm 5\%$  and  $10\%$  respectively.
  4. The luminaries and accessories shall be designed to have low temperature rise. The temperature rise above the ambient temperature shall be as indicated in the relevant Standards.
  5. Sodium vapour type luminaries shall be complete with accessories like lamps, ballasts, power factor improvement capacitors and starters. These shall be mounted in the luminaries housing only.
  6. Each luminaire shall have terminal block suitable for loop-in, loop-out and T-off connection by 250/400 V, 1 core, PVC insulated copper conductor wires upto 2.5 sq. mm in size. In outdoor areas the termination at the fuse box shall be suitable of 1100 V, PVC insulated, aluminium conductor, armoured cables of sizes upto 25 sq. mm. Terminals shall be of stud or clamp type. The internal wiring should be completed by means of stranded copper wire upto 2.5 sq. mm size and terminated on the terminal block. Terminal blocks shall be mounted with minimum two fixing screws.
  7. Mounting facility and conduit knock-outs for the luminaries shall be provided.
  8. Each luminary shall be provided with an earthing terminal suitable for connection to the earthing conductor of PVC insulated flexible wire (copper).
  9. All metal or metal enclosed parts of the luminary/ control gear box shall be bonded and connected to the earthing terminal so as to ensure satisfactory earthing continuity.
  10. The surface shall be scratch resistant and shall show no sign of cracking or flaking when bent through 90 deg. over 1/2:" dia. mandrel.

#### **6.26 Street/Road Lighting Fixture**

1. Epoxy gray powder coated single piece die-cast aluminium housing for lamp and control gear accessories shall be provided.
2. The housing shall have synthetic/EPDM rubber gasket impregnated with insecticide for preventing insects entry in the housing.
3. The lamp compartment shall be fixed with a pot/bowl type reflector and the reflector design shall comply with the requirement of throw, spread and control adjustment in light distribution as per IS specification. The reflector shall be of aluminum and it shall be electrochemically brightened and anodized.
4. Either an elegantly shaped high transparency acrylic cover or a heat resistant toughened clear glass cover shall be provided in the housing and secured with minimum five (5) nos. stainless steel toggle catches to make the luminaries insect, weather and dust proof.
5. Adjustable lamp holder bracket with porcelain GLS lamp holder shall be provided for toe-in-angle adjustment.
6. The control gear compartment shall be equipped with copper wound polyester ballast, power factor improving capacitor, electronic igniter, a lamp holder and mains connector, all duly wired.
7. The integral luminaries shall be provided with HPSV lamp. All the required control gear accessories shall operate on 220/240V single phase nominal voltage.

8. The Luminaries shall be cut-off light distribution type or semi-cut off light distribution type as per IS 1944.

#### 6.27 Fuse Boxes

1. The construction of fuse box shall conform to drawing enclosed.
2. The rating, make and technical specification of electrical items etc. in the fuse box shall also conform to the details furnished in the Bid Document.

#### 6.28 Conduits and Accessories

Conduits for looping in and out of cables in the street lighting poles shall be GI conduits of class C with the diameter of 40mm.

#### 6.29 Lighting Poles

1. The construction of the lighting pole shall conform to the drawing enclosed.  
Poles shall be coated twice with bituminous preservative solution on inside & outside of the ground portion at works. When brought to site and before erection, one additional coat shall be applied with bituminous preservative solution. The remainder of the outside surface shall be given two coats of red oxide primer and finished with two coats of aluminium paint before dispatch to site after fabrication at works. Before erection at site, one coat of aluminium paint shall also be applied.
2. M.S. sleeves of 400 mm in length shall be welded in on the bottom portion of the pole from the MS base plate of 300 mm × 300 mm × 5 mm thick in such a way that the centre of the sleeve shall be at the ground level i.e. half of the sleeve shall be buried and half in the muffing, where poles are installed on footpath at ground level.
3. Poles shall be erected in plumb complete with excavation suitable to bury the pole to 15 to 20% of height of the pole. The pole shall be provided with cement concrete foundation in 1:2:4 proportions complete with suitable coping, muffing with plaster finish shall be provided above ground level upto 45cms in circular shape.
4. Rate of sleeve, G.I. pipe 32 / 40 mm, 1.5 mtrs, GI clamps of 18 gauge, concrete foundation, coping, muffing, plastering is included in the rate of pole.
5. Suitable top section canopy (hood) shall be provided to the pole.

#### 6.30 Wires

1. Wires shall be PVC insulated, flexible and shall be of 660V grade as per IS 694. Conductor shall be multi stranded copper and size shall be upto 2.5 sq. mm.  
Red/Yellow/Blue wires for phases, Black wire for neutral and green wire for earth shall be used. The sizes of the earth / neutral wires shall be the same as that of phase wire.  
Three wires of 2.5 sq.mm stranded copper conductor shall be provided in PVC sleeves from terminal box to fixture.

#### 6.31 Earthing System

The Earthing system shall be as per **I.S. 3043** and shall comprise of earth pits with electrodes, GI earth flat / wires. The specification of pits & materials shall conform to drawings enclosed and the BOQ.

#### 6.32 LT Cables

1. The cables to be used in the 415V AC 3 phase and neutral distribution system shall be rated for 1100V AC and shall be 4 core aluminium conductor, armoured, PVC insulated and PVC sheathed.
2. LT cable shall conform to **IS 1554** and shall be suitable to operate at an ambient air temp of 50deg C and ground temp of 40deg C.



**6.33 Cable Termination**

1. Epoxy cable termination kit (1100V grade) shall be used for termination of 1100V AC LT cables in poles/structures & solder-less lugs. The lugs shall be crimped with the conductors of the cables and termination shall be done accordingly with proper supports.

**6.34 Inspection, Testing and Commissioning**

- a. The inspection of all items / equipments shall be carried out as per the approved drawing in presence of inspection agency employed by the Employer.
- b. Testing & commissioning of all the above equipment / items shall also be carried out at site for their required performance in the presence of **Engineer**.
- c. The system in complete form shall be tested and commissioned to the satisfaction of **Engineer** at site.
- d. All testing and commissioning of the completed electrical works shall be the responsibility of the Contractor. He shall also obtain the necessary permission wherever required from the Power Development Department. The Contractor shall arrange all instruments and equipment required for testing.
- e. The inspection and testing shall be carried out in accordance with **Indian Electricity Rules 1956 and IS : 732** by the Contractor in the presence of **Engineer** or his representative and Supply Co. In the event of defects being found out, these shall be rectified as soon as possible and the installation retested by the Contractor.
- f. Some of the tests and inspections to be carried out are:
  - (i) Testing of insulation resistance of all cables and wires.
  - (ii) Testing of earth continuity path.
  - (iii) Testing of polarity of single pole switches.
  - (iv) Lighting circuits to be tested for insulation resistance to earth in the following manner:
    - (a) All switches 'ON' with the consuming devices in circuit.
    - (b) All switches 'ON' with the consuming devices removed test for the IR value between poles and Earth.
    - (c) All switches 'OFF' with the consuming devices in position test for the IR value between poles and Earth.
  - (v) Testing the earth resistance of earth pits and full earthing grid as a whole.
  - (vi) Inspection and testing of cables:
    - Before and after laying of cables at site, cables shall be tested for IR value and continuity test in the presence of **Engineer or his authorized representative**.

**6.35 Filling and Compaction**

Filling in trenches shall be commenced immediately after laying of cables by using grades of materials required to be compacted either individually and in suitable combination.

**6.36 List of approved Materials**

1	L.T. Switchgears	-	L&T, Siemens, Schneider, Havell, ABB
2	Cables	-	Tropodur, Gloster, Asian, Polycab, Finolex, Nicco, Incab
3	Sockets / lugs	-	Dowells, Jaison
4	PVC Wires	-	Finolex, Gazlet, Polycab, Nicco

5	Conduit	-	BEC, Vinco, BI, EWC
6	Lamps	-	Bajaj, Crompton, Philips
7	Light Fittings	-	Philips, Crompton, Bajaj
8	Meters	-	Atomatic Electric, Simpson, Meco, Indian Meters
9	GI Pipes	-	Zenith, Tata, Jindal