Bhopal Smart City Development Corporation

Notice Inviting Tender

"Second Call"

REQUEST FOR PROPOSAL

For

Development of Polytechnic Junction to Bharatmata Square Four Lane Smart Road with External Electrification and Cycle Track Corridor at Bhopal City

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Bhopal Smart City Development Corporation,
Zone -14, Bhopal Municipal Corporation, BHEL. Govindpura, Bhopal –462023

Notice Inviting Bid

Dated: 05/11/2016

RFP for "Development of Polytechnic Junction to Bharatmata Square Four Lane Smart Road with External Electrification and Cycle Track Corridor"

The Bhopal Smart City Development Corporation is engaged in the development of Bhopal city as a part Smart City Project it has been decided the **" Development of Polytechnic Junction to Bharatmata Square Four Lane Smart Road with External Electrification and Cycle Track Corridor"**

The Bhopal Smart City Development Corporation represented by CEO now invites bids from eligible contractors for the following project:

Name of work	Estimated cost	Completion period including rainy season	Guarantee Period
Development of Polytechnic Junction to Bharatmata Square Four Lane Smart Road with External Electrification and Cycle Track Corridor at Bhopal City	Rs 3175.79 Lakhs	9 months	3Years

The complete BID document (Tender Document) can be viewed / downloaded from the department account of Bhopal Smart City Development Corporation on e-procurement portal https://www.mpeproc.gov.in Bid must be submitted online only at https://www.mpeproc.gov.in. Bids received online shall be opened on 27.11.2016 (at 11:30 hours IST).
Bid through any other mode shall not be entertained. However, Bid Security (EMD), Power of Attorney, Consortium Agreement, etc. shall be submitted physically by the Bidder on or before 27.11.2016 (at 11:00 hours IST). Please note that the BSCDCL reserves the right to accept or reject all or any of the BIDs without assigning any reason whatsoever.

Officer In-charge
City Engineer
Bhopal Smart City Development Corporation
Zone -14, Bhopal Municipal Corporation, BHEL. Govindpura, Bhopal –462023

DISCLAIMER

The information contained in this Request for Proposal document (the "RFP") or subsequently provided to Bidder(s), whether verbally or in documentary or any other form by or on behalf of the BSCDCL or any of its employees or advisors, is provided to Bidder(s) on the terms and conditions set out in this RFP and such other terms and conditions subject to which such information is provided.

This RFP is not an Agreement and is neither an offer nor invitation by the BSCDCL to the prospective Bidders or any other person. The purpose of this RFP is to provide interested parties with information that may be useful to them in making their financial offers (BIDs) pursuant to this RFP. This RFP includes statements, which reflect various assumptions and assessments arrived at by the BSCDCL in relation to the Project. Such assumptions,

assessments and statements do not purport to contain all the information that each Bidder may require. This RFP may not be appropriate for all persons, and it is not possible for

the BSCDCL, its employees or advisors to consider the investment objectives, financial situation and particular needs of each party who reads or uses this RFP. The assumptions, assessments, statements and information contained in the Bidding Documents, especially the Feasibility Report, may not be complete, accurate, adequate or correct. Each Bidder should, therefore, conduct its own investigations and analysis and should check the

accuracy, adequacy, correctness, reliability and completeness of the assumptions, assessments, statements and information contained in this RFP and obtain independent advice from appropriate sources.

Information provided in this RFP to the Bidder(s) is on a wide range of matters, some of which may depend upon interpretation of law. The information given is not intended to be an exhaustive account of statutory requirements and should not be regarded as a complete or authoritative statement of law. The BSCDCL accepts no responsibility for the accuracy or otherwise for any interpretation or opinion on law expressed herein.

The BSCDCL, its employees and advisors make no representation or warranty and shall have no liability to any person, including any Applicant or Bidder under any law, statute, rules or regulations or tort, principles of restitution or unjust enrichment or otherwise for any loss, damages, cost or expense which may arise from or be incurred or suffered on account of anything contained in this RFP or otherwise, including the accuracy, adequacy, correctness, completeness or reliability of the RFP and any assessment, assumption, statement or information contained therein or deemed to form part of this RFP or arising in any way for participation in this BID Stage.

The BSCDCL also accepts no liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance of any Bidder upon the statements contained in this RFP. The BSCDCL may in its absolute discretion, but without being under any obligation to do so, update, amend or supplement the information, assessment or assumptions contained in this RFP.

The issue of this RFP does not imply that the BSCDCL is bound to select a Bidder or to appoint the Selected Bidder, Consortium partner or Contractor, as the case may be, for the Project and the BSCDCL reserves the right to reject all or any of the Bidders or BIDs without assigning any reason whatsoever.

The Bidder shall bear all its costs associated with or relating to the preparation and submission of its BID including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by the BSCDCL.

BHOPAL SMART CITY DEVELOPMENT CORPORATION

SECTION 1

INTRODUCTION

1.1 Background

1.1.1 The Bhopal Smart City Development Corporation represented by CEO (the **"BSCDCL"**) is engaged in the development of Smart City Projects, the BSCDCL has decided to undertake **"Development of Polytechnic Junction to Bharatmata Square Four Lane Smart Road with External Electrification and Cycle Track Corridor"** at Bhopal City on EPC mode (the **"Project"**)through an Engineering, Procurement and Construction (the "**EPC**") Contract, and has decided to carry out the bidding process for selection of a bidder to whom the Project may be awarded. A brief description of the project may be seen in the Information Memorandum of the Project at the BSCDCL's website www.mpeproc.gov.in.Brief particulars of the Project are as follows:

Name of the Work	**Length in Km**	**Estimated Project Cost**	**No of months for completion of work**
Development of Polytechnic Junction to Bharatmata Square Four Lane Smart Road with External Electrification and Cycle Track Corridor (2.205km long)	2.205	Rs. 3175.79 Lakhs	09 months

1.1.2 The selected Bidder (the "**Contractor**") shall be responsible for designing, engineering, procurement and construction of the Project under and in accordance with the provisions of an engineering, procurement and construction contract (the "**EPC Contract**") to be entered into between the Contractor and the BSCDCL in the form provided by the BSCDCL as part of the Bidding Documents pursuant hereto. The Contractor shall also be responsible for rectify the defects during defects liability period of the project, which is expected to be as per clause 1.1.3.

1.1.3 The scope of work will broadly include Development of four lane road with bituminous pavement, , culverts, road, drains, intersection, interchanges, etc. and providing and laying

underground HT/LT cables ,RMUs,PSS , Street Light etc and rectify the defects during Defect Liability Period, which shall be 3 years for Civil works and electrical works after completion of project.

1.1.4 The estimated cost of the Project (the **"Estimated Project Cost"**) has been specified in the clause 1.1.1 above. The assessment of actual costs, however, will have to be made by the Bidders.

1.1.5 The Agreement sets forth the Preliminary terms and conditions for award of the project to the Contractor, including the scope of the Contractor's services and obligations.

1.1.6 The statements and explanations contained in this RFP are intended to provide a better understanding to the Bidders about the subject matter of this RFP and should not be construed or interpreted as limiting in any way or manner the scope of services and obligations of the Contractor set forth in the Agreement or the BSCDCL's rights to

Amend, alter, change, supplement or clarify the scope of work, the work to be awarded pursuant to this RFP or the terms thereof or herein contained. Consequently, any omissions, conflicts or contradictions in the Bidding Documents including this RFP are to be noted, interpreted and applied appropriately to give effect to this intent, and no claims on that account shall be entertained by the BSCDCL.

1.1.7 The BSCDCL shall receive BIDs pursuant to this RFP in accordance with the terms set forth in this RFP and other documents to be provided by the BSCDCL pursuant to this RFP (collectively the "Bidding Documents"), and all BIDs shall be prepared and submitted in accordance with such terms on or before the BID due date for submission of BIDs (the "BID Due Date").

1.2 Brief description of Bidding Process

1.2.1 The BSCDCL has adopted a single stage two part system (referred to as the "Bidding Process") for selection of the Bidder for award of the Project. Under this process, the bid shall be invited under two parts. Eligibility and qualification of the Bidder will be first examined based on the details submitted under first part (Technical Bid) with respect to eligibility and qualifications criteria prescribed in this RFP.. The Financial Bid under the second part shall be opened of only those Bidders who's Technical Bids are responsive to eligibility and qualifications requirements as per this RFP.

1.2.2 Interested bidders are being called upon to submit their BID in accordance with the terms specified in this Bidding Document. The Bid shall be valid for a period of 120 days from the date specified in Clause 1.3 for submission of BIDs (the "Bid Due Date").

1.2.3 The complete Bidding Documents including the draft Agreement for the Project is enclosed for the Bidders. The Feasibility Report / Preliminary Project Report prepared by the BSCDCL/ consultants of the BSCDCL (the "Feasibility Report/Preliminary Project

Report") is also enclosed. Subject to the provisions of Clause 2.1.3, the aforesaid documents and any addenda issued subsequent to this RFP Document, will be deemed to form part of the Bidding Documents.

1.2.4 **Earnest Money Deposit (EMD)** of the value of **Rs.15.88 Lakhs shall** be accepted online, only through the E-Tender portal or through Bank guarantee from a scheduled Bank. For the earnest money deposit (EMD) submitted through Bank Guarantee (BG) of value as stipulated in the Notice Inviting Tenders a scanned copy shall be submitted in "Eligibility Bid Folder or Tech bid Folder" as the case may be in relevant section on the e-tendering portal. In this scenario the original BG is required to be submitted to the office of BSCDCL before opening of Technical Bid.

1.2.5 Bidders are advised to examine the Project in greater detail, and to carry out, at their cost, such studies as may be required for submitting their respective BIDs for award of the contract including implementation of the Project.

1.2.6 BIDs will be evaluated for the Project on the basis of the lowest cost required by a Bidder for implementing the Project (the "**BID Price**"). The total time allowed for completion of construction under the Agreement (the "**Construction Period**") and the period during which the Contractor shall be liable for rectification of any defect or deficiency in the Project after completion of the Construction Period (the "**Defect Liability Period**") shall be pre-determined, and are specified in the draft Agreement forming part of the Bidding Documents. In this RFP, the term **"Lowest Bidder"** shall mean the bidder who is quoting the lowest BID price.

1.2.7 Generally, the Lowest Bidder shall be the selected Bidder. In case such Lowest Bidder withdraws or is not selected for whatsoever reason, the BSCDCL shall annul the Bidding Process and invite fresh BIDs.

1.2.8 Other details of the process to be followed under this bidding process and the terms thereof are spelt out in this RFP.

1.2.9 Any queries or request for additional information concerning this RFP shall be submitted online to the BSCDCL below with identification/ title: "Queries / Request for Additional Information: "**RFP Development of Polytechnic Junction to Bharatmata Square Four Lane Smart Road with External Electrification and Cycle Track Corridor (2.205km long)** ".

1.3 **Schedule of Bidding Process**

Sl. No.	Event Description	Date
1.	Invitation of RFP (NIT)	05/11/2016
2.	Last date for receiving queries	24/11/2016
3.	Pre-BID meeting at BSCDCL office	18/11/2016 1500hrs
5.	Last date of Purchase of Bid Document	26/11/2016 upto 13:00hrs
6	BID Submission date	26/11/2016 upto upto 17:30hrs
7.	Physical Submission of Bid Security/POA etc	28/11/2016 upto 15:00 hrs
8.	Opening of Technical BIDs	28/11/2016 1600 hrs
10.	Opening of Financial BID	Will be informed by E-mail
11.	Validity of BID	120 days from BID Due Date

SECTION-2
INSTRUCTIONS TO BIDDERS

A. GENERAL

2.1. General terms of Bidding

2.1.1 No Bidder shall submit more than one BID for the Project..

2.1.2 The Feasibility Report / Preliminary Project Report of the Project is being provided only as a preliminary reference document by way of assistance to the Bidders who are expected to carry out their own surveys, investigations and other Preliminary examination of the Project before submitting their Bids. Nothing contained in the Feasibility Report/Preliminary Project Report shall be binding on the BSCDCL nor confer any right on the Bidders, and the BSCDCL shall have no liability whatsoever in relation to or arising out of any or all contents of the Feasibility Report/Preliminary Project Report.

2.1.3 Notwithstanding anything to the contrary contained in this RFP, the Preliminary terms specified in the draft Agreement shall have overriding effect; provided, however, that any conditions or obligations imposed on the Bidder hereunder shall continue to have effect in addition to its obligations under the Agreement.

2.1.4 The BID shall be furnished in the format exactly as per Appendix-I i.e. Technical Bid as per Appendix IA and Financial Bid as per Appendix IB. BID amount shall be indicated clearly in both figures and words, in Indian Rupees in prescribed format of Financial Bid and it will be signed by the Bidder's authorized signatory. In the event of any difference between figures and words, the amount indicated in words shall be taken into account.

2.1.5 The Bidder shall deposit a BID Security(EMD) of Rs. 15.88 Lakhs in accordance with the provisions of this RFP. The Bidder has to provide the BID Security (EMD)through online payment or in the form of a Bank Guarantee acceptable to the BSCDCL, as per format at Appendix-II. The bidders shall also submit online receipt of cost of tender document of Rs 50,000/- (Rupees Fifty Thousand only".

2.1.6 The validity period of the Bank Guarantee, shall not be less than 180 (one hundred and eighty) days from the BID Due Date, inclusive of a claim period of 60 (Sixty) days, and may be extended as may be mutually agreed between the BSCDCL and the Bidder. The BID shall be summarily rejected if it is not accompanied by the BID Security. The BID Security shall be refundable no later than 150 (one hundred and fifty) days from the BID Due Date except in the case of the Selected Bidder whose BID Security shall be retained till it has provided a Performance Security under the Agreement.

2.1.8 The Bidder should submit a Power of Attorney as per the format at Appendix-III, authorizing the signatory of the BID to commit the Bidder.

2.1.9 Any condition or qualification or any other stipulation contained in the BID shall render the BID liable to rejection as a non-responsive BID.

2.1.10 The BID and all communications in relation to or concerning the Bidding Documents and the BID shall be in English language.

2.1.11 The documents including this RFP and all attached documents, provided by the BSCDCL are and shall remain or become the property of the BSCDCL and are

Transmitted to the Bidders solely for the purpose of preparation and the submission of a BID in accordance herewith. Bidders are to treat all information as strictly confidential and shall not use it for any purpose other than for preparation and submission of their BID. The provisions of this Clause 2.1.12 shall also apply mutatis mutandis to BIDs and all other documents submitted by the Bidders, and the BSCDCL will not return to the Bidders any BID, document or any information provided along therewith.

2.1.13 This RFP is not transferable.

2.1.14 Any award of Project pursuant to this RFP shall be subject to the terms of Bidding Documents and also fulfilling the criterion as mentioned in clause 2.1.17.

2.1.16 While bidding is open to persons from any country, the following provisions shall apply:

then the Eligibility of such Bidder shall be subject to approval of the BSCDCL from national security and public interest perspective. The decision of the BSCDCL in this behalf shall be final and conclusive and binding on the Bidder.

The holding or acquisition of equity or control, as above, shall include direct or indirect holding/ acquisition, including by transfer, of the direct or indirect legal or beneficial ownership or control, by persons acting for themselves or in concert and in determining such holding or acquisition, the BSCDCL shall be guided by the principles, precedents and definitions contained in the Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeovers) Regulations, 1997, or any substitute thereof, as in force on the date of such acquisition. The Bidder shall promptly inform the BSCDCL of any change in the shareholding, as above, and failure to do so shall render the Bidder liable for disqualification from the Bidding Process.

2.1.17 Notwithstanding anything to the contrary contained herein, in the event that the Bid Due Date falls within three months of the closing of the latest financial year of a Bidder, it shall ignore such financial year for the purposes of its Bid and furnish all its information and certification with reference to the 5 (five) years or 1 (one) year, as the case may be, preceding its latest financial year. For the avoidance of doubt, financial year shall, for the Purposes of a Bid hereunder, mean the accounting year followed by the Bidder in the course of its normal business.

2.1.18 Any entity which has been barred by GOI or Govt of Madhya Pradesh, MP DISCOM for the works of expressways, National highways, ISC and EI works, and the bar subsists as on the Bid Due Date, would not be eligible to submit the BID.

2.1.19 The BSCDCL reserves the right to reject an otherwise eligible bidder on the basis of the information provided under clause 2.1.19. The decision of the BSCDCL in this case shall be final.

2.2 Eligibility and qualification requirements of Bidder

2.2.1 For determining the eligibility of Bidder the following shall apply:

(a) The Bidder may be a single entity or **Consortium**, coming together to implement the Project. However, no Bidder applying individually or as a member of a Consortium, as the case may be, can be member of another Bidder. The term Bidder used herein would apply to both a single entity and a Consortium.

(b) Bidder may be a natural person, private entity, or any combination of them with a formal intent to enter into a Consortium agreement or under an existing agreement to form a Consortium. A Consortium shall be eligible for consideration subject to the conditions.

(c) An Bidder shall not have a conflict of interest **(the "Conflict of Interest")** that affects the Bidding Process. Any Bidder found to have a Conflict of Interest shall be disqualified and liable for forfeiture of the BID Security or Performance Security as the case may be. A Bidder shall be deemed to have a Conflict of Interest affecting the Bidding Process, if:

(d) A Bidder shall be liable for disqualification and forfeiture of BID Security, if any legal, financial or technical adviser of the BSCDCL in relation to the Project is engaged by the Bidder, its Member or any Associate thereof, as the case may be, in any manner for matters related to or incidental to such Project during the Bidding Process or subsequent to the (i) issue of the LOA or (ii) execution of the Agreement. In the event any such adviser is engaged by the selected Bidder or Contractor, as the case may be, after issue of the LOA or execution of the Agreement for matters related or incidental to the project, then notwithstanding anything to the contrary contained herein or in the

LOA or the Agreement and without Prejudice to any other right or remedy or the BSCDCL, including the forfeiture and appropriation of the BID Security or Performance Security, as the case may be, which the BSCDCL may have there under or otherwise, the LOA or the Agreement, as the case may be, shall be liable to be terminated without the BSCDCL being liable in any manner whatsoever to the Selected Bidder or Contractor for the same. For the avoidance or doubt, this disqualification shall not apply where such adviser was engaged by the Bidder, its Member or Associate in the past but its assignment expired or was terminated 6 (six) months prior to the date of issue of this RFP. Nor will this disqualification apply where such adviser is engaged after a period of 3 (three) years from the date of commercial operation of the Project.

2.2.2 **Qualification requirements of Bidders:**

2.2.2.2 **Technical Capacity**

A. Qualifying requirements of contractors/firms.

i) Should be primarily engaged in construction activities including Civil / Electrical works and registered/empaneled with appropriate govt. / GOI undertaking authorities

ii) Should have Permanent Account Number (PAN).

iii) Should have in-house capability for specified jobs and satisfactorily completed (Phase/Part completion of the scope of work in a contract shall not be considered, **however pre-determined phasing of the work will be accepted**) three works each of 40 % or two works each of **50%** or one work of **80% of the estimated cost** in single contract of similar nature during last seven years ending on **31.08.2016**. Similar Nature of the job(Bituminous Road Project) and for electrical work providing underground HT cables / Substation work(RMU,PSS) / street lighting work value of at least three works, each of Rs.440 lakhs or two works, each of Rs.550 lakhs or one work of Rs.880 lakhs in single contract and should possess valid electrical license.
In case a firm does not have in-house capability to execute the Electrical works, they may associate a specialized agency as a consortium member for carrying out the same. The applicant in such case shall submit consent letter of the Associates along with their credentials for Electrical works.. However, the name(s) of the associates(s) once nominated and accepted by BSCDCL, cannot be changed afterwards without written approval of BSCDCL. Credentials of associates(s) for work experience duly supported with clients' completion certificate(s) starting reference to order, the value of completed work, date of start of work, date of completion of work, duly self-attested in respect of Electrical shall be submitted along with application itself for pre-qualification.

iv) The contractor / firm shall submit Client certificate(s) in support of work experience which should show the nature of work done, the value of work, date of start, date of completion as per agreement, actual date of completion and satisfactory completion of work.

v) Should have annualized average financial turnover of 30% of estimated cost against works executed during last three years ending 31st March of the previous financial year..

vi) Should possess minimum following machinery:

a) Environmental friendly Hot mix Plant having suitable capacity with electronic control.

b) Hydrostatic Sensor Paver finisher of basic screed

Documentary proof of owning and possessing required machinery and T&P shall also be submitted along with the application. Ownership can be either freehold or lease hold.

B. Applications from Joint venture not permitted. however Consortium member can be considered for electrical work and should be considered subject to following conditions:

i) Consortium of Firms should not comprise more than two Firms.

ii) Each member of the Consortium should have Permanent Account Number (PAN).

iii) A detailed and valid agreement exist between the consortium members defining clearly the role, responsibility and scope of work of each member along with nomination of leader for the purpose of this work commensurate with their experiences and capabilities and a confirmation that the members of the Consortium assume joint and several responsibilities. It shall be mandatory for lead partner to attend all progress review meetings and answerable to all issues relating to project.

iv) The lead bidder of the Consortium of firm shall meet main qualification criteria of the project and shall accept overall responsibilities of contract obligations for the total scope of work during execution and upto defects liability period. Second partner of the Consortium member shall meet electrical work qualification criteria as defined above.

v) Both the Consortium firms should jointly possess the required T&P, machinery and man power and should produce self attested documentary proof of owning and possessing required machinery.

2.2.2.7 Submission in support of Technical Capacity

(i) The Bidder should furnish the details of Eligible Experience for the last 7 (seven) financial years immediately preceding the Bid Due Date.

2.2.2.8 The Bidder shall enclose with its Technical Bid, to be submitted as per the format at Appendix-IA, complete with its Annexes, the following:

2.3 Proprietary data

All documents and other information supplied by the BSCDCL or submitted by a Bidder to the BSCDCL shall remain or become the property of the BSCDCL. Bidders are to treat all information as strictly confidential and shall not use it for any purpose other than for preparation and submission of their Bid. The BSCDCL will not return any Bid or any information provided along therewith.

2.4 Cost of Bidding

The Bidders shall be responsible for all of the costs associated with the preparation of their BIDs and their participation in the Bidding Process. The BSCDCL will not be responsible or in any way liable for such costs, regardless of the conduct or outcome of the Bidding Process.
Tentative item of project as per applicable SOR like MPUADD, MPPWD, MPMKVVCL Non SOR/ SOR schedules attached in BOQ in this RFP accordingly bidder has to bid.

2.5 Site visit and verification of information

2.5.1 Bidders are encouraged to submit their respective BIDs after visiting the Project site and ascertaining for themselves the site conditions, traffic, location, surroundings, climate, availability of power, water & other utilities for construction, access to site, handling and storage of materials, weather data, applicable laws and

regulations, and any other matter considered relevant by them. Bidders are advised to visit the site and familiarise themselves with the Project within the stipulated time of submission of the Bid. No extension of time is likely to be considered for submission of Bids.

2.5.2 It shall be deemed that by submitting a BID, the Bidder has:

(a) made a complete and careful examination of the Bidding Documents, Schedules annexed to EPC agreement Document;

(b) received all relevant information requested from the BSCDCL;
(c) accepted the risk of inadequacy, error or mistake in the information provided in the Bidding Documents or furnished by or on behalf of the BSCDCL relating to any of the matters above. No claim shall be admissible at any stage on this account.

(d) satisfied itself about all matters, things and information including matters referred above hereinabove necessary and required for submitting an informed BID, execution of the Project in accordance with the Bidding Documents and performance of all of its obligations thereunder;
(e) acknowledged and agreed that inadequacy, lack of completeness or incorrectness of information provided in the Bidding Documents or ignorance of any of the matters referred above hereinabove shall not be a basis for any claim for compensation, damages, extension of time for performance of its obligations, loss of profits etc. from the BSCDCL, or a ground for termination of the Agreement by the Contractor;
(f) acknowledged that it does not have a Conflict of Interest; and

(g) agreed to be bound by the undertakings provided by it under and in terms hereof.

2.5.3 The BSCDCL shall not be liable for any omission, mistake or error in respect of any of the above or on account of any matter or thing arising out of or concerning or relating to RFP, including any error or mistake therein or in any information or data given by the BSCDCL.

2.6 Verification and Disqualification

2.6.1 The BSCDCL reserves the right to verify all statements, information and documents submitted by the Bidder in response to the RFP and the Bidder shall, when so required by the BSCDCL, make available all such information, evidence and

documents as may be necessary for such verification. Any such verification, or lack of such verification, by the BSCDCL shall not relieve the Bidder of its obligations or liabilities hereunder nor will it affect any rights of the BSCDCL thereunder.

2.6.2 The BSCDCL reserves the right to reject any BID and appropriate the BID Security if:

(a) at any time, a material misrepresentation is made or uncovered, or

(b) the Bidder does not provide, within the time specified by the BSCDCL, the supplemental information sought by the BSCDCL for evaluation of the BID.

Such misrepresentation/ improper response shall lead to the disqualification of the Bidder. If the Bidder is a Consortium, then the entire Consortium and each Member of the Consortium may be disqualified/rejected. If such disqualification/rejection occurs after the BIDs have been opened and the lowest Bidder gets disqualified/rejected, then the BSCDCL reserves the right to annul the Bidding Process and invites fresh BIDs.

2.6.3 In case it is found during the evaluation or at any time before signing of the Agreement or after its execution and during the period of defect liability, subsistence

thereof, that one or more of the eligibility and /or qualification requirements have not been met by the Bidder, or the Bidder has made material misrepresentation or has given any materially incorrect or false information, the Bidder shall be disqualified forthwith if not yet appointed as the contractor either by issue of the LOA or entering into of the Agreement, and if the Selected Bidder has already been issued the LOA or has entered into the Agreement, as the case may be, the same shall, notwithstanding anything to the contrary contained therein or in this RFP, be liable to be terminated, by a communication in writing by the BSCDCL to the Selected Bidder or the Contractor, as the case may be, without the BSCDCL being liable in any manner whatsoever to the Selected Bidder or the Contractor. In such an event, the BSCDCL shall be entitled to forfeit and appropriate the BID Security or Performance Security, as the case may be, as Damages, without prejudice to any other right or remedy that may be available to the BSCDCL under the Bidding Documents and/ or the Agreement, or otherwise.

B. DOCUMENTS

2.7 Contents of the RFP

2.7.1 This RFP comprises the Disclaimer set forth hereinabove, the contents as listed below, and will additionally include any Addenda issued in accordance with Clause 2.9.

Part –I

Invitation for BIDs
Section 1. Introduction
Section 2. Instructions to Bidders
Section 3. Fraud and Corrupt Practices
Section 4. Pre-BID Conference
Section 5. Miscellaneous
Section 6. Technical specification of Civil work
Section 7. Technical specification of Electrical work
Section 8 Approved make list
Section 9 Bill of quantities
Section 10 Feasibility Report / Preliminary Project Report provided by the BSCDCL

Part –II

Agreement Document with schedules

2.7.2 The draft Agreement and the Feasibility / Preliminary Project Report provided by the BSCDCL as part of the BID Documents shall be deemed to be part of this RFP.

2.8 Clarifications

2.8.1 Bidders requiring any clarification on the RFP may notify the BSCDCL in writing by e-mail in . They should send in their queries on or before the date mentioned in the Schedule of Bidding Process specified. The BSCDCL shall endeavour to respond to the queries within the period specified therein, but no later than 15 (fifteen) days prior to the BID Due Date. The responses will be sent by fax or e-mail. The BSCDCL will forward all the queries and its responses thereto, to all Bidders without identifying the source of queries.

2.8.2 The BSCDCL shall endeavour to respond to the questions raised or clarifications sought by the Bidders. However, the BSCDCL reserves the right not to respond to any question or provide any clarification, in its sole discretion, and nothing in this Clause shall be taken or read as compelling or requiring the BSCDCL to respond to any question or to provide any clarification.

2.8.3 The BSCDCL may also on its own motion, if deemed necessary, issue interpretations & clarifications To all Bidders. All clarifications & interpretations issued by the BSCDCL shall be deemed to be part of the Bidding Documents. Verbal clarifications And information given by BSCDCL or its employees or representatives shall not in any way or manner be binding on the BSCDCL.

2.9 **Amendment of RFP**

2.9.1 At any time prior to the BID Due Date, the BSCDCL may, for any reason, whether at its own initiative or in response to clarifications requested by a Bidder, modify the RFP by the issuance of Addenda.

2.9.2 Any Addendum issued hereunder will be in writing and shall be sent to all the Bidders.

2.9.3 In order to afford the Bidders a reasonable time for taking an Addendum into account, or for any other reason, the BSCDCL may, in its sole discretion, extend the BID Due Date.

C. PREPARATION AND SUBMISSION OF BIDS

2.10 Format and Signing of BID

2.10.1 The Bidder shall provide all the information sought under this RFP. The BSCDCL will evaluate only those BIDs that are received online in the required formats and complete in all respects and Bid Security, document fee, POA and Joint Bidding Agreement are received in hard copies.

2.10.2 The BID shall be typed and signed in indelible blue ink by the authorised signatory of the Bidder. All the alterations, omissions, additions or any other amendments made to the BID shall be initialled by the person(s) signing the BID.

2.11 Documents comprising Technical and Financial BID

2.11.1 The Bidder shall submit the Technical BID& Financial Bid online through **www.mpeproc.gov.in in** comprising of the following documents along with supporting documents as appropriate:

Technical Bid

(a) Appendix-IA (Letter comprising the Technical Bid) including Annexure I to VI and

supporting certificates / documents. (b) Power of Attorney for signing the BID as per the format at Appendix-III;

(c) if applicable, Power of Attorney for Lead Member of Consortium as per the format at Appendix-IV;

(d) if applicable, Joint Bidding Agreement for Consortium as per the format at Appendix-V

(e) BID Security of Rs. 15.88 Lacs (Rupees Fifteen lacs eighty eight thousand) online raeciept or scanned copy of Bank Guarantee in the format at Appendix-II from a Scheduled Bank.

(f) Online receipt of Rs.50,000/- (Rupees Fifty Thousand only) in favour of "Bhopal Smart City Development Corporation" towards cost of Bid document.

(g) An undertaking from the person having PoA referred to in Sub. Clause-(b) above that they agree and abide by the Bid documents uploaded by BHOPAL SMART CITY DEVELOPMENT CORPORATION and amendments uploaded, if any.

(h) Registration/empanelment copy of credential certificate as mentioned in eligibility criteria.

Financial Bid

(j) Appendix-IB (Letter comprising the Financial Bid)

2.11.2 The Bidder shall submit the following documents physically:

(a) Original Power of Attorney for signing the BID as per format at Appendix-III;

(b) if applicable, Original Power of Attorney for Lead Member of Consortium as per the format at Appendix-IV;

(c) if applicable, Original Joint Bidding Agreement for Consortium as per the format at Appendix-V

2.11.3 The documents listed at clause 2.11.2shall be placed in an envelope, which shall be sealed. The envelope shall clearly bear the identification "**BID for the** .mode and shall clearly indicate the name and address of the Bidder. In addition, the BID Due Date should be indicated on the right hand top corner of the envelope.

2.11.4 The envelope shall be addressed to the following officer and shall be submitted at the respective address:

(i)	ATTN. OF:	
	DESIGNATION	CITY ENGINEER
	ADDRESS:	Bhopal Smart City Development Corporation,
		Zone-14, BMC, Near Tatpar Petrol Pump, Govindpura, Bhopal, Madhya Pradesh 462023
	E-MAIL ADDRESS	smartcitycell@bmconline.gov.in

2.11.5 If the envelopes is not sealed and marked as instructed above, the BSCDCL assumes no responsibility for the misplacement or premature opening of the contents of the BID submitted and consequent losses, if any, suffered by the Bidder.

2.11.6 BIDs submitted by fax, telex, telegram or e-mail shall not be entertained and shall be summarily rejected.

2.12 Procedure for e-tendering

Please visit www.mpeproc.gov.in for details.

2.13 Validity of BIDs

The BIDs shall be valid for a period of not less than 120 (one hundred and twenty) days from the BID Due Date. The validity of BIDs may be extended by mutual consent of the respective Bidders and the BSCDCL.

2.14 Confidentiality

Information relating to the examination, clarification, evaluation and recommendation for the Bidders shall not be disclosed to any person who is not officially concerned with the process or is not a retained professional advisor advising the BSCDCL in relation to,

or matters arising out of, or concerning the Bidding Process. The BSCDCL will treat all information, submitted as part of the BID, in confidence and will require all those who have access to such material to treat the same in confidence. The BSCDCL may not divulge any such information unless it is directed to do so by any statutory entity that has the power under law to require its disclosure or is to enforce or assert any right or privilege of the statutory entity and/ or the BSCDCL or as may be required by law or in connection with any legal process.

payable to the BSCDCL for, inter-alia, time cost and effort of the BSCDCL without prejudice to any other right or remedy that may be available to the BSCDCL under the bidding documents

and / or under the Agreement, or otherwise, under the following conditions:

2.15. **Performance Security(Guarantee)**

The Contractor shall, for the performance of its obligations hereunder during the Construction Period, provide to the BSCDCL, within 10 (ten) days of the date of this Agreement, an irrevocable and unconditional guarantee from a Bank in the form set forth in Schedule-G (the "Performance Security") for an amount equal to 10% (ten percent) of the Contract Price. The Performance Security shall be valid until 60 (sixty) days after the Defects Liability Period. Until such time the Performance Security is provided by the Contractor pursuant hereto and the same comes into effect, the Bid Security shall remain in force and effect, and upon such provision of the Performance Security, the BSCDCL shall release the Bid Security to the Contractor.

SECTION-3

FRAUD AND CORRUPT PRACTICES

3.1 The Bidders and their respective officers, employees, agents and advisers shall observe the highest standard of ethics during the Bidding Process and subsequent to the issue of the LOA and during the subsistence of the Agreement. Notwithstanding anything to the contrary contained herein, or in the LOA or the Agreement, the BSCDCL may reject a BID, withdraw the LOA, or terminate the Agreement, as the case may be, without being liable in any manner whatsoever to the Bidder, if it determines that the Bidder, directly or indirectly or through an agent, engaged in corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice in the Bidding Process. In such an event, the BSCDCL shall be entitled to forfeit and appropriate the BID Security or Performance Security, as the case may be, as Damages, without prejudice to any other right or remedy that may be available to the BSCDCL under the Bidding Documents and/ or the Agreement, or otherwise.

3.2 Without prejudice to the rights of the BSCDCL under Clause 4.1 hereinabove and the rights and remedies which the BSCDCL may have under the LOA or the Agreement, or otherwise if a Bidder or Contractor, as the case may be, is found by the BSCDCL to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice during the Bidding Process, or after the issue of the LOA or the execution of the Agreement, such Bidder shall not be eligible to participate in any tender or RFP issued by the BSCDCL during a period of 2 (two) years from the date such Bidder, or Contractor, as the case may be, is found by the BSCDCL to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practices, as the case may be.

3.3 For the purposes of this Section 4, the following terms shall have the meaning hereinafter respectively assigned to them:

(a) "corrupt practice" means (i) the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the actions of any person connected

with the Bidding Process (for avoidance of doubt, offering of employment to or employing or engaging in any manner whatsoever, directly or indirectly, any official of the BSCDCL who is or has been associated in any manner, directly or indirectly, with the Bidding Process or the LOA or has dealt with matters concerning the Agreement or arising therefrom, before or after the \ execution thereof, at any time prior to the expiry of one year from the date such official resigns or retires from or otherwise ceases to be in the service of the BSCDCL, shall be deemed to constitute influencing the actions of a person connected with the Bidding Process); or (ii) save and except as permitted under the Clause 2.2.1(d) of this RFP, engaging in any manner whatsoever, whether during the Bidding Process or after the issue of the LOA or after the

execution of the Agreement, as the case may be, any person in respect of any matter relating to the Project or the LOA or the Contract Agreement, who at any time has been or is a legal, financial or

(b) "fraudulent practice" means a misrepresentation or omission of facts or suppression of facts or disclosure of incomplete facts, in order to influence the Bidding Process;

(c) "coercive practice" means impairing or harming, or threatening to impair or harm, directly or indirectly, any person or property to influence any person's participation or action in the Bidding Process;

(d) "undesirable practice" means (i) establishing contact with any person connected with or employed or engaged by the BSCDCL with the objective of

canvassing, lobbying or in any manner influencing or attempting to influence the Bidding Process; or (ii) having a Conflict of Interest; and

(e) "restrictive practice" means forming a cartel or arriving at any understanding or arrangement among Bidders with the objective of restricting or manipulating a full and fair competition in the Bidding Process.

SECTION-4

4. PRE-BID CONFERENCE

4.1 Pre-BID conference of the Bidders shall be convened at the designated date, time and place. A maximum of two representatives of prospective Bidders shall be allowed to participate on production of BSCDCL letter from the Bidder.

4.2 During the course of Pre-Bid conference(s), the Bidders will be free to seek clarifications and make suggestions for consideration of the BSCDCL. The BSCDCL shall endeavour to provide clarifications and such further information as it may, in its sole discretion, consider appropriate for facilitating a fair, transparent and competitive Bidding Process.

SECTION-5

5. MISCELLANEOUS

5.1 The Bidding Process shall be governed by, and construed in accordance with, the laws of India and the Courts at Bhopal shall have exclusive jurisdiction over all disputes arising under, pursuant to and/ or in connection with the Bidding Process.

5.2 The BSCDCL, in its sole discretion and without incurring any obligation or liability, reserves the right, at any time, to;

5.2.1 suspend and/ or cancel the Bidding Process and/ or amend and/ or supplement the Bidding Process or modify the dates or other terms and conditions relating thereto;

5.2.2 consult with any Bidder in order to receive clarification or further information;

5.2.3 retain any information and/ or evidence submitted to the BSCDCL by, on behalf of, and/ or in relation to any Bidder; and/ or

5.2.4 Independently verify, disqualify, reject and/ or accept any and all submissions or other information and/ or evidence submitted by or on behalf of any Bidder.

5.3 It shall be deemed that by submitting the Bid, the Bidder agrees and releases the BSCDCL, its employees, agents and advisers, irrevocably, unconditionally, fully and finally from any and all liability for claims, losses, damages, costs, expenses or liabilities in any way related to or arising from the exercise of any rights and/ or performance of any obligations hereunder, pursuant hereto and/ or in connection with the Bidding Process and waives, to the fullest

extent permitted by applicable laws, any and all rights and/ or claims it may have in this respect, whether actual or contingent, whether present or in future.

APPENDIX IA
LETTER COMPRISING THE TECHNICAL BID

City Engineer
Bhopal Smart City Development Corporation,
Zone 14, near Tatpar petrol pump, BHEL
Govindpura, Bhopal
Madhya Pradesh- 462023

Sub: BID for ".mode**" Project**

Dear Sir,

With reference to your RFP document dated *** **, I/we, having examined the Bidding Documents and understood their contents, hereby submit my/our BID for the aforesaid Project. The BID is unconditional and unqualified.

2. I/ We acknowledge that the BSCDCL will be relying on the information provided in the BID and the documents accompanying the BID for selection of the Contractor for the aforesaid Project, and we certify that all information provided in the Bid and its the Annexure I to VI along with the supporting documents are true and correct; nothing has been omitted which renders such information misleading; and all documents accompanying the BID are true copies of their respective originals.

3. This statement is made for the express purpose of our selection as EPC Contractor for the development, construction, rehabilitation and augmentation of the aforesaid Project and maintenance of the Project during the Defect Liability Period.

4. I/ We shall make available to the BSCDCL any additional information it may find necessary or require to supplement or authenticate the BID.

5. I/ We acknowledge the right of the BSCDCL to reject our BID without assigning any reason or otherwise and hereby waive, to the fullest extent permitted by applicable law, our right to challenge the same on any account whatsoever.

6. I/ We certify that in the last three years, we/ any of the consortium partners have neither failed to perform on any contract, as evidenced by imposition of a penalty by an arbitral or judicial BSCDCL or a judicial pronouncement or arbitration award, nor been expelled from any project or contract by any public BSCDCL nor have had any contract terminated by any public BSCDCL for breach on our part.

7. I/ We declare that:

(a) I/ We have examined and have no reservations to the Bidding Documents, including any Addendum issued by the BSCDCL; and

(b) I/We do not have any conflict of interest in accordance with the RFP document; and

(c) I/We have not directly or indirectly or through an agent engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice, as defined in the RFP document, in respect of any tender or request for proposal issued by or any Agreement entered into with the BSCDCL or any other public sector enterprise or any government, Central or State; and

(d) I/ We hereby certify that we have taken steps to ensure that in conformity with the provisions of Section 4 of the RFP, no person acting for us or on our behalf has engaged or will engage in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice; and

(e) the undertakings given by us along with the Application in response to the RFP for the Project and information mentioned for the evaluation of the BID Capacity in Annexure VI were true and correct as on the date of making the Application and are also true and correct as on the BID Due Date and I/we shall continue to abide by them.

8. I/ We understand that you may cancel the Bidding Process at any time and that you are neither bound to accept any BID that you may receive nor to invite the Bidders to BID for the Project, without incurring any liability to the Bidders, in accordance with the RFP document.

9. I/We believe that we/our Consortium satisfy(s) the Threshold Technical Capacity, Net Worth criteria and meet(s) the requirements as specified in the RFP document.

10. I/ We declare that we/ any Member of the Consortium or our/Consortium member, are not a Member of any other Consortium submitting a BID for the Project.

11. I/ We certify that in regard to matters other than security and integrity of the country, we/ any Member of the Consortium or any of our/their Consortium member have not been convicted by a Court of Law or indicted or adverse orders passed by a regulatory BSCDCL which could cast a doubt on our ability to undertake the Project or which relates to a grave offence that outrages the moral sense of the community.

12. I/ We further certify that in regard to matters relating to security and integrity of the country, we/ any Member of the Consortium or any of our/their Consortium member have not been charge-sheeted by any agency of the Government or convicted by a Court of

Law.

13. I/ We further certify that no investigation by a regulatory BSCDCL is pending either against us/any member of Consortium or against our CEO or any of our directors/ managers/ employees.

14. I/ We undertake that in case due to any change in facts or circumstances during the Bidding Process, we are attracted by the provisions of disqualification in terms of the guidelines referred to above, we shall intimate the BSCDCL of the same immediately.

16. I/We further acknowledge and agree that in the event such change in control occurs after signing of the Agreement upto its validity. It would, not withstanding anything to the contrary contained in the Agreement, be deemed a breach thereof, and the Agreement shall be liable to be terminated without the BSCDCL being liable to us in any manner whatsoever.

17. I/ We hereby irrevocably waive any right or remedy which we may have at any stage at law or howsoever otherwise arising to challenge or question any decision taken by the BSCDCL in connection with the selection of the Bidder, or in connection with the Bidding Process itself, in respect of the above mentioned Project and the terms and implementation thereof.

18. In the event of my/ our being declared as the Selected Bidder, I/we agree to enter into a Agreement in accordance with the draft that has been provided to me/us prior to the BID Due Date. We agree not to seek any changes in the aforesaid draft and agree to abide by the same.

19. I/ We have studied all the Bidding Documents carefully and also surveyed the project highway and the traffic. We understand that except to the extent as expressly set forth

    in the Agreement, we shall have no claim, right or title arising out of any documents or information provided to us by the BSCDCL or in respect of any matter arising out of or relating to the Bidding Process including the award of Agreement.

20. I/ We offer a BID Security (EMD) of Rs. 15.88 Lacs (Rupees Fifteen lacs eighty eight thousand only) to the BSCDCL in accordance with the RFP Document.

21. The BID Security (EMD) paid as mentioned in the RFP.

22. The documents accompanying the Technical BID, as specified in the RFP, have been submitted in separate files.

23. I/ We agree and understand that the BID is subject to the provisions of the Bidding Documents. In no case, I/we shall have any claim or right of whatsoever nature if the

Project / Contract is not awarded to me/us or our BID is not opened or rejected.

24. The BID Price has been quoted by me/us after taking into consideration all the terms and conditions stated in the RFP, draft Agreement, our own estimates of costs and after a careful assessment of the site and all own the conditions that may affect the project cost and implementation of the project.

25. I/ We agree and undertake to abide by all the terms and conditions of the RFP document.

26. {We, the Consortium agree and undertake to be jointly and severally liable for all the obligations of the EPC Contractor under the Contract Agreement}.

27. I/ We shall keep this offer valid for 120 (one hundred and twenty) days from the BID Due Date specified in the RFP.

28 I/ We hereby submit our BID and offer a BID Price as indicated in Financial Bid for undertaking the aforesaid Project in accordance with the Bidding Documents and the Agreement.

In witness thereof, I/we submit this BID under and in accordance with the terms of the RFP document.

Yours faithfully,

Date: (Signature, name and designation

Place: of the Authorised signatory)

Name & seal of Bidder/Lead Member

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APPENDIX - IB

Letter comprising the Financial BID

Dated:

City Engineer
Bhopal Smart City Development Corporation,
Zone 14, near Tatpar petrol pump, BHEL
Govindpura, Bhopal
Madhya Pradesh- 462023

Sub: BID for "..... "Project

Dear Sir,

With reference to your RFP document dated *** **, I/we, having examined the Bidding Documents and understood their contents, hereby submit my/our BID for the aforesaid Project. The BID is unconditional and unqualified.

2. I/ We acknowledge that the BSCDCL will be relying on the information provided in the BID and the documents accompanying the BID for selection of the Contractor for the aforesaid Project, and we certify that all information provided in the Bid are true and correct; nothing has been omitted which renders such information misleading; and all documents accompanying the BID are true copies of their respective originals.
3. The BID Price has been quoted by me/us after taking into consideration all the terms and conditions stated in the RFP, draft Agreement, our own estimates of costs and after a careful assessment of the site and all own the conditions that may affect the project cost and implementation of the project.
4. I/ We acknowledge the right of the BSCDCL to reject our BID without assigning any reason or otherwise and hereby waive, to the fullest extent permitted by applicable law, our right to challenge the same on any account whatsoever.

5. In the event of my/ our being declared as the Selected Bidder, I/we agree to enter into a Agreement in accordance with the draft that has been provided to me/us prior to the BID Due Date. We agree not to seek any changes in the aforesaid draft and agree to abide by the same.

6. I/ We shall keep this offer valid for 120 (one hundred and twenty) days from the BID Due Date specified in the RFP.

7. **I/ We hereby submit our BID and offer a BID Price (Item rates) on-line item rate (comprises of SIX (6) Sheets in financial bid document) / [Three(3) for Electrical &**

Three(3) for Civil] for undertaking the aforesaid Project in accordance with the Bidding Documents and the Agreement.

Yours faithfully,

Date: (Signature, name and designation of the

Place: Authorised Signatory)

Name & seal of Bidder/Lead Member:.....

ANNEX-I

Details of Bidder

1. (a) Name:
   (b) Country of incorporation:
   (c) Address of the corporate headquarters and its branch office(s), if any, in India:
   (d) Date of incorporation and/ or commencement of business:

2. Brief description of the Bidder including details of its main lines of business and proposed role and responsibilities in this Project:

3. Details of individual(s) who will serve as the point of contact/ communication for the BSCDCL:

   (a) Name:
   (b) Designation:
   (c) Company:
   (d) Address:
   (e) Telephone Number:
   (f) E-Mail Address:
   (g) Fax Number:

4. Particulars of the Authorised Signatory of the Bidder:
   (a) Name:
   (b) Designation:
   (c) Address:
   (d) Phone Number:
   (e) Fax Number:
   (f) Class III Digital Signature Certificate ID number

5. In case of a Consortium:

   (a)The information above (1-4) should be provided for all the Members of the Consortium.

   (b)A copy of the Jt. Bidding Agreement, as envisaged in Clause 2.1.15(g) should be attached to the Application.

(c) Information regarding the role of each Member should be provided as per table below:

Sl. No.	**Name of Member**	**Role***	**Share of work in the Project**
1.			
2.			
3.			

ANNEX-IV

Details of Eligible Projects

Project Code: **Entity: Self/Members:**

Item	Refer Instruction	Particulars of the Project
Title & nature of the project		
Category	5	
Year-wise (a) payments received for construction, and/or (b) revenues appropriated for self construction under PPP projects	6	
Entity for which the project was constructed	7	
Location		
Project cost	8	
Date of commencement of project/ contract		
Date of completion/ commissioning	9	
Equity shareholding (with period during which equity was held)	10	

Instructions:

1. Bidders are expected to provide information in respect of each Eligible Projects in this Annex. The projects cited must comply with the eligibility criteria specified RFP

ANNEX-V

Statement of Legal Capacity

(To be forwarded on the letterhead of the Applicant/ Lead Member of Consortium)

Ref. Date:

To,
City Engineer
Bhopal Smart City Development Corporation,
Zone 14, near Tatpar petrol pump, BHEL
Govindpura, Bhopal
Madhya Pradesh- 462023

Dear Sir,

We hereby confirm that we/ our members in the Consortium (constitution of which has been described in the application) satisfy the terms and conditions laid out in the RFP document.

We have agreed that …… (insert member's name) will act as the Lead Member of our Consortium.*

We have agreed that …….. (insert individual's name) will act as our representative/ will act as the representative of the Consortium on its behalf* and has been duly authorized to submit the RFP. Further, the authorised signatory is vested with requisite powers to furnish such letter and authenticate the same.

Thanking you,

Yours faithfully,

(Signature, name and designation of the authorised signatory)

For and on behalf of……..

**Please strike out whichever is not applicable.*

APPENDIX - II

Bank Guarantee for BID Security (Refer

B.G. No. Dated:

1. In consideration of you, *** **, having its office at *** **, (hereinafter referred to as the

"BSCDCL", which expression shall unless it be repugnant to the subject or context thereof include its, successors and assigns) having agreed to receive the BID of

……and having its registered office at …… (and acting on behalf of its JV) (hereinafter referred to as the "Bidder" which expression shall unless it be repugnant to the subject or context thereof include its/their executors, administrators, successors and assigns), for the .mode

(hereinafter referred to as "the Project") pursuant to the RFP Document dated

…… issued in respect of the Project and other related documents including without limitation the draft contract Agreement(hereinafter collectively referred to as "Bidding Documents"), we (Name of the Bank) having our registered office at

…… and one of its branches at …….. (hereinafter referred to as the "Bank"), at the request of the Bidder, do hereby in terms of Clause

2.1.6 read with Clause 2.1.7 of the RFP Document, irrevocably, unconditionally and without reservation guarantee the due and faithful fulfilment and compliance of the terms and conditions of the Bidding Documents (including the RFP Document) By the said

Bidder and unconditionally and irrevocably undertake to pay forthwith to the BSCDCL an amount of Rs. 15.88 lakhs (Rupees fifteen lakhs eighty eight thousands)

(hereinafter referred to as the "Guarantee") as our primary obligation without any demur, reservation,

recourse, contest or protest and without reference to the Bidder if the Bidder shall fail to fulfil or comply with all or any of the terms and conditions contained in the said Bidding Documents.

2. Any such written demand made by the BSCDCL stating that the Bidder is in default of the due and faithful fulfilment and compliance with the terms and conditions contained in the Bidding Documents shall be final, conclusive and binding on the Bank.

3. We, the Bank, do hereby unconditionally undertake to pay the amounts due and payable under this Guarantee without any demur, reservation, recourse, contest or protest and

without any reference to the Bidder or any other person and irrespective of whether the claim of the BSCDCL is disputed by the Bidder or not, merely on the first demand from the BSCDCL stating that the amount claimed is due to the BSCDCL by reason of failure of the Bidder to fulfil and comply with the terms and conditions contained in the Bidding Documents including failure of the said Bidder to keep its BID open during the BID validity period as set forth in the said Bidding Documents for any reason whatsoever. Any such demand made on the Bank shall be conclusive as regards amount due and payable by the Bank under this Guarantee. However, our liability under this Guarantee shall be restricted to an amount not exceeding Rs15.88 lakhs (Rupees fifteen lakhs eighty eight thousands).

4. This Guarantee shall be irrevocable and remain in full force for a period of 180 (one hundred and eighty) days from the BID Due Date inclusive of a claim period of 60 (sixty) days or for such extended period as may be mutually agreed between the

BSCDCL and the Bidder, and agreed to by the Bank, and shall continue to be enforceable till all amounts under this Guarantee have been paid.

5. We, the Bank, further agree that the BSCDCL shall be the sole judge to decide as to whether the Bidder is in default of due and faithful fulfilment and compliance with the terms and conditions contained in the Bidding Documents including, inter alia, the failure of the Bidder to keep its BID open during the BID validity period set forth in the said Bidding Documents, and the decision of the BSCDCL that the

Bidder is in default as aforesaid shall be final and binding on us, notwithstanding any differences between the BSCDCL and the Bidder or any dispute pending before any Court, Tribunal, Arbitrator or any other BSCDCL.

6. The Guarantee shall not be affected by any change in the constitution or winding up of the Bidder or the Bank or any absorption, merger or amalgamation of the Bidder or the Bank with any other person.

7. In order to give full effect to this Guarantee, the BSCDCL shall be entitled to treat the Bank as the principal debtor. The BSCDCL shall have the fullest liberty without affecting in any way the liability of the Bank under this Guarantee from time to time to vary any of the terms and conditions contained in the said Bidding Documents or to extend time for submission of the BIDs or the BID validity period or the period for

conveying acceptance of Letter of Award by the Bidder or the period for fulfilment and compliance with all or any of the terms and conditions contained in the said Bidding Documents by the said Bidder or to postpone for any time and from time to time any of the powers exercisable by it against the said Bidder and either to enforce or forbear from enforcing any of the terms and conditions contained in the said Bidding Documents or the securities available to the BSCDCL, and the Bank shall not be released from its liability under these presents by any exercise by the BSCDCL of the liberty with reference to the matters aforesaid or by reason of time being given to the said Bidder or

any other forbearance, act or omission on the part of the BSCDCL or any indulgence by the BSCDCL to the said Bidder or by any change in the constitution of the BSCDCL or its absorption, merger or amalgamation with any other person or any other matter or thing whatsoever which under the law relating to sureties would but for this provision have the effect of releasing the Bank from its such liability.

8. Any notice by way of request, demand or otherwise hereunder shall be sufficiently given or made if addressed to the Bank and sent by courier or by registered mail to the Bank at the address set forth herein.

9. We undertake to make the payment on receipt of your notice of claim on us addressed to name of Bank along with branch address and delivered at our above branch which shall be deemed to have been duly authorised to receive the said notice of claim.

10. It shall not be necessary for the BSCDCL to proceed against the said Bidder before proceeding against the Bank and the guarantee herein contained shall be enforceable against the Bank, notwithstanding any other security which the BSCDCL may have obtained from the said Bidder or any other person and which shall, at the time when proceedings are taken against the Bank hereunder, be outstanding or unrealised.

11. We, the Bank, further undertake not to revoke this Guarantee during its currency except with the previous express consent of the BSCDCL in writing.

12. The Bank declares that it has power to issue this Guarantee and discharge the obligations contemplated herein, the undersigned is duly authorised and has full power to execute this Guarantee for and on behalf of the Bank.

13. For the avoidance of doubt, the Bank's liability under this Guarantee shall be restricted to Rs. 15.88 lakhs (Rupees fifteen lakhs eighty eight thousands). The Bank shall

be liable to pay the said amount or any part thereof only if the BSCDCL serves a written claim on the Bank in accordance with paragraph 9 hereof, on or before ***

(indicate date falling 180 days after the BID Due Date).

14. This guarantee shall also be operatable at our …….Branch at----, from whom, confirmation regarding the issue of this guarantee or extension/renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.

Signed and Delivered by ……. Bank

By the hand of Mr./Ms …….., its …….. and authorised official.

(Signature of the Authorised Signatory)
(Official-Seal)

APPENDIX-III

Format for Power of Attorney for signing of BID

Know all men by these presents, We…….. (name of the firm and address of the registered office) do hereby irrevocably constitute, nominate, appoint and authoriseMr/ Ms (name), …… son/daughter/wife of

…… and presently residing at ……., who is presently employed with us/ the Lead Member of our Consortium and holding the position of

……. , as our true and lawful attorney (hereinafter referred to as the "Attorney") to do in our name and on our behalf, all such acts, deeds and things as are necessary or required in connection with or incidental to submission of our BID for the .mode Project proposed or being developed by the Bhopal Smart City Development Corporation (the

"BSCDCL") including but not limited to signing and submission of all applications, BIDs and other documents and writings, participate in Pre-BID and other conferences and providing information/ responses to the BSCDCL, representing us in all matters before the BSCDCL, signing and execution of all contracts including the agreement and undertakings consequent to acceptance of our BID, and generally dealing with the BSCDCL in all matters in connection with or relating to or arising out of our BID for the said Project and/ or upon award thereof to us and/or untill the entering into of the EPC Contract with the BSCDCL.

AND we hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us.

IN WITNESS WHEREOF WE, ……., THE ABOVE NAMED PRINCIPAL HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS …… DAY OF

……. 2…..

For ……..
(Signature, name, designation and address)
of person authorized by Board Resolution
(in case of Firm/ Company)/ partner in case of
Partnership firm

Witnesses:
1.
2.
Accepted
……

(Signature)

(Name, Title and Address of the Attorney)

(Notarised)

Person identified by me/ personally appeared before me/
Attested/ Authenticated*

(*Notary to specify as applicable)

(Signature Name and Address of the Notary)

Seal of the Notary

Registration No. of the Notary

Date:……

Notes:

- *The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure*.

- *Wherever required, the Bidder should submit for verification the extract of the charter documents and documents such as a board or shareholders' resolution/ power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Bidder.*

- *For a Power of Attorney executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the Power of Attorney is being issued. However, the Power of Attorney provided by Bidders from countries that have signed the Hague Legislation Convention 1961 are not required to be legalised by the Indian Embassy if it carries a conforming Appostille certificate.*

APPENDIX-IV

Format for Power of Attorney for Lead Member of Consortium

Whereas the Bhopal Smart City Development Corporation ("the BSCDCL") has invited BIDs from applicants for .mode **Project** (the "Project").Whereas, ……..., ……..., and …….. (collectively the "Consortium") being Members of the Joint

Venture are interested in bidding for the Project in accordance with the terms and conditions of the Request for Proposal (RFP) and other BID documents including agreement in respect of the Project, and

Whereas, it is necessary for the Members of the Consortium to designate one of them as the Lead Member with all necessary power and BSCDCL to do for and on behalf of the consortium, all acts, deeds and things as may be necessary in connection with the consortium BID for the Project and its execution.

NOW THEREFORE KNOW ALL MEN BY THESE PRESENTS

We, ……having our registered office at ……., M/s. ….. having our registered office at …, M/s. …having our registered office at ….., and ….. having our registered office at ……,

(hereinafter collectively referred to as the "Principals") do hereby irrevocably designate, nominate, constitute, appoint and authorize M/S ……. having its registered office at ……., being one of the Members of the Consortium, as the Lead Member and true and lawful attorney of the Consortium (hereinafter referred to as the "Attorney"). We hereby irrevocably authorize the Attorney (with power to sub-delegate) to conduct all business for and on behalf of the consortium and any one of us during the bidding process and, in the event the consortium is awarded the contract, during the execution of the Project and in this regard, to do on our behalf and on behalf of the consortium, all or any of such acts, deeds or things as are necessary or required or incidental to the pre-qualification of the consortium and submission of its BID for the Project, including but not limited to signing and submission of all applications, BIDs and other documents and writings, participate in pre BID and other conferences, respond to queries, submit information/ documents, sign and execute contracts and undertakings consequent to acceptance of the BID of the consortium and generally to represent the consortium in all its dealings with the BSCDCL, and/ or any other Government Agency or any person, in all matters in connection with or relating to or arising out of the consortiums BID for the in all respect Project and/ or upon award thereof till the Contract is entered into with the BSCDCL & Compelled.

AND hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our

said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us/ consortium

IN WITNESS WHEREOF WE THE PRINCIPALS ABOVE NAMED HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS ……. DAY OF ……. 2..…

For …….. (Signature) …….. (Name & Title)	For …….. (Signature) …….. (Name & Title)	For …….. (Signature) …….. (Name & Title)

(Executants) (To be executed by all the Members of the Consortium)

Witnesses:
1.
2.

Notes:

- *The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure*.

- *Also, wherever required, the Bidder should submit for verification the extract of the charter documents and documents such as a board or shareholders' resolution/ power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Bidder.*

- *For a Power of Attorney executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the Power of Attorney is being issued.However, the Power of Attorney provided by Bidders from countries that have signed the Hague Legislation Convention 1961 are not required to be legalised by the Indian Embassy if it carries a conforming Appostille certificate.*

SECTION-6

Bhopal Smart City Development Corporation Limited

:: TECHNICAL SPECIFICATIONS (Civil Work)::

Embankment and Sub Grade Construction

Materials for use in Embankment shall not contain particles larger than 75mm.However in the 500mm below sub-grade top level in both embankments and cuttings shall not contain particles larger than 50mm.

In-situ materials in the 500mm below sub-grade top level in cutting that does not meet these requirements, shall either be spoiled or if suitable, placed in the embankment and replaced with material from cutting or borrow pits that do meet the requirements for use in the 500mm below sub-grade top level.

The Contractor shall ensure that earthworks (Embankment / sub-grade) proceed towards completion in orderly and continuous manner. The Contractor shall submit a written request for approval of any layer at least 3 working days in advance before he intends to cover a completed layer. Fill material for subsequent layer shall be placed immediately after approval of the previous layer to ensure retention of moisture.

TABLE 300-1

Density Requirements of Embankment and Subgrade Materials

Type of Work	**Maximum laboratory dry unit Weight when tested as per IS:2720 (Part 8)**
• **Embankments up to 3 meters Height, not subjected to Extensive flooding**	**not less than 1.52 gm/cc.**
• **Embankments exceeding 3 meters height or embankments of any height subjected to long periods of inundation**	**not less than 1.60 gm/cc.**
• **Sub grade and earthen Shoulders/backfill**	**Not less than 1.75 gm/cc.**

The moisture content of fill material shall be adjusted immediately prior to the compaction by either uniformly mixing water or drying out the materials so that the moisture content during compaction shall be in accordance with the Optimum Moisture Content determined in the laboratory.

Each layer shall be compacted at the Optimum Moisture Content to a dry density equal to the percentage of Maximum Dry Density (MDD) Specified below (AS PER MORTH Table No.-3.02):

- All fill materials in embankment : 95% of MDD (Modified Proctor Density)
- Materials in 500mm. below sub- : 97% of MDD(Modified Proctor

Grade top level in embankment Density)

- Materials in 500mm. below sub- grade top level in cutting and shoulder : 97% of MDD (Modified Proctor Density)

Compaction of embankment layers, and the layers, 500mm. below the sub grade top level, shall be completed to the procedures proposed by the Contractor in accordance with the clauses of Specification. The materials, 500mm. below sub grade top level in both fill areas and in cuttings, shall be completed in three compacted layers.

The specification shall apply to the construction of embankment including Sub-grade and earthen shoulders with approved materials obtained from roadway and drain Excavation or borrow pits. All embankments shall be constructed as per specification and as per drawings.

CONTROL TEST ON BORROW MATERIALS:

- Sand content -Two test per 3000m^3 (as per IS-2720 Part iv).
- Plasticity - Two test for each type of soil (as per IS-2720 Part -v)
- Proctor Test - Two test of each type of soil (as per IS-2720 Part-iix)
- Deleterious content- As Required (as per IS-2720 Part xxiiv)
- Natural moisture content -Two test of each type of soil (as per IS-2720 Part-ii)
- Field density test:

For embankment- One test for 1000m^2 of compacted area

(Minimum 6nos. in a set)

For sub-grade- One Set of two test for 500m^2 of compacted

Area (Minimum 6 no. in a set)

- CBR Test - One test per for each kind of soil or closer & when required by the engineer (as per IS-2720 Part xvi (for sub-grade only)

Sand Replacement method as approved by Engineer shall be used at site.

Granular Sub Base

The material used for the work shall be confirming to MORTH Table-400-1 Grading IV.

The sub-base material of grading specified in the contract shall be spread on the prepared Sub-grade with the help of motor grader of adequate capacity. Moisture content of the loose material shall be checked and suitable adjusted by sprinkling additional water from the water tanker suitable for applying water uniformly and at controlled quantities to variable widths. At the time of the compaction, the moisture content shall be 1% above or 2% below the optimum moisture content. Immediately thereafter, rolling shall start. Vibratory roller of minimum 8 to 10 tones capacity shall be used for compaction. Rolling shall start at the lower edge and proceed toward the upper edge. Each pass of the roller shall uniformly overlap not less then 1/3 of the track made in the preceding pass. The speed of the roller shall not exceed 5km per hour. The required compaction shall be 98% of maximum dry density achieved with Modified Proctor Test.

TESTE FOR GRANULAR SUB-BASE

• Gradation-	As require by MORTH specification one test per 400m^3	
• Alterberg Limits(LL.,PL,PI.)	-One test per 400m^3 (L.L.-25 Max.,P.I.-6Max)	
• Field Density	-	One test per 1000m^2 (minimum 6nos.in a set) 98% minimum.
• Moisture content Before compaction	-	One test per 400m^2 (+) 1% to (-) 2% of OMC
• Deleterious Constituent	-	As Required
• C.B.R.(96 Hour soaked)	- -	As Required Minimum 30% at 98% compaction
• Water Absorption value of course aggregate	-	2% maximum As per IS : 2386, Part III
• AIV	-	As per IS : 2386 Part IV (MAX-40%) Required if water absorption is more than 2%

Wet Mix Macadam

The work shall consist of laying compacting clean, crushed, graded aggregates and granular materials pre mixed water to a dense mass on a prepared sub-base in accordance with the requirements of the specification. If crushed gravel/ single is used, not less than 90 per cent by weight of the gravel/ single pieces retained on 4.75 mm sieve shall have at least two fractured faces. The thickness of a single compacted wet mix macadam layer shall not be less than 75mm. When vibrating or other approved types of compacting equipment are used, the compacted depth of a single layer of the sub- base course may be increased to 200mm upon approval of the Engineer.

Wet mix macadam shall be prepared in an approved mixing plant having provision for controlled addition of water or a batching plant. The mix shall be spread by a paver finisher / Grader having compacted thickness should not be more than 125 mm each layer. The surface to the layer shall be carefully checked with the templates and all height and low spots remedied by removing or adding aggregates as may be required. After the mix has been laid to the required thickness, the same shall be uniformly compacted to the full depth with suitable roller. Compaction shall be done by a vibratory roller with a maximum speed of not more than 5 km per hour. Rolling shall be continued till the density achieved is at least 98% of the Maximum Dry Density. When tested with a straight edge, 3m long, the irregularities must not exceed more than 12mm on the surface. After final compaction of wet mix macadam course, the surface shall be allowed to dry for maximum 24 hour. Traffic shall not be allowed on the road till the surface is primed and overlaid with the next layer.

The material to be used for work shall confirm to clause 410.2 of MORT&H specifications**.**

TEST FOR WET MIX MACADAM:

● Minimum compacted layer thickness	-	75 mm
● Maximum compacted layer thickness	-	200 mm
● Aggregate Impact Value	-	As per IS : 2386 Part IV Maximum 30% one test per 1000 Cum.
● Los Angeles Abrasion Value	-	Maximum 40%
● Grading		- As per Table No.400-13 of MORTH Specification One test per 100m^3
● Combined Flakiness and Elongation		-One test per 500Cum. Maximum 35%
● Altenburg Limits (LL. PL,PI.) of portion aggregate. Passing 425mm micron sieve		- One test per 200 Cum. of Aggregate
● Field Density of Compacted layer	-	One set of 3 tests per 1000Sqm. - Minimum 98%
● Water absorption of Aggregates	-	Maximum 2% - Minimum One per source of aggregate
● Soundness		- As per IS 383/ IS2386Part V Required only when Water Absorption is more than 2%

Prime Coat

The work shall consist of an application of a single coat of slow setting bituminous emulsion to a porous granular surface.

The primer shall be conforming to IS-8887 with Kinematic viscosity in the range of 30 to 60 centistokes at 60 ^{0}C and also confirming IS-217 spread at the rate of 7.0 to 10.0 Kg for per 10 Sqm.

The surface to be primed shall be carefully swept clean of dust and loose particles with mechanical brooms. The surface shall be sprayed lightly with water and shall be allowed to dry. Primer shall not be sprayed when the whether is foggy, rainy or windy or when the temperature in shade is less than 10 ^{0}C.

The surface to be primed shall be checked for line, camber and level, and the surface corrected, made good as necessary and approved by the Engineer before any bituminous spray is applied.

As soon as possible after the surface to be sprayed has been prepared as specified and approved by the Engineer, the prime or tack coat shall be sprayed on to it at the specified rate.

The rate of application of Primer shall be 7.0 to 10.0 kg per 10 sqm, as per MORTH Specifications. And it shall be sprayed uniformly all over the surface to be primed to seal the surface pores and make the surface of the base course water resistant and also to harden and toughen the base course layer. The surface shall be allowed to cure for at least 24 hours or more after priming and no traffic shall be allowed on it. Any unabsorbed primer shall be blotted with an application of minimum quantity of sand.

Bitumen distributor shall be used for spraying prime coat and tack coat. It shall be truck mounted and shall have sufficient power to maintain uniform speed for the proper application of the binder. The truck shall be equipped with an accurate tachometer showing to the driver the speed in meters per minute.

The truck shall be fitted with a gauge bar and chain or any other acceptable device clearly visible to the driver to enable him to follow the required edge. The distributor tank shall have the capacity of at least 4,000 liters and shall be fitted with a derive for indicating the quantity in the tank at any time. It shall be equipped with heaters capable of maintaining temperature and be fitted with an accurate thermometer.

Spray bars shall be available for spraying in widths varying from 2.5 m to 4 m and shall be adjustable transversely so that the operator can follow the required edge independently. The spray nozzles shall be arranged to give a uniform spray and the shut off shall be quick acting with an anti- drip device. The pressure in the spray bar shall be sufficient to give a good distribution and spraying of the binder.

Distributors shall be checked and calibrated before starting any work or when required by the Engineer. This shall include the calibration of all the metering devices and checking the uniformity of the transverse distribution of spray.

All distributors shall be furnished with a “rate of / machine speed” chart.

No had spraying shall be permitted except in small areas, inaccessible to the distributor or in narrow strips or to make good a defective area caused by a blocked nozzle. Primer shall not be applied on a wet surface.

TEST FOR PRIME COAT:

● Quality of primer	-	No. of Samples per lot and test as per IS-73 , IS-217 and IS-8887 AS applicable
● Temperature at application	-	At regular close intervals
● Rate of spread of primer	-	Three Test per day

Tack Coat

The work shall consist of application of a single coat rapid setting bituminous emulsion to an existing bituminous road surface or granular surface treated with primer, preparatory to the superimposition of a bituminous mix. The rate of application shall be 0.20 to .25 Kg. per square meter for bituminous surfaces and 0.25 to 0.30 Kg. per square meter for granular surfaces treated with primer. Tack coat may not be essential between each and every bituminous layers and shall be applied as directed by the Engineer.

The material used for tack coat shall be bituminous emulsion complying with IS: 8887. It shall not be applied when weather is foggy or windy or rainy and when the temperature is les than 10^0 c.

The tack coat shall be carefully swept clean of dust and loose particles with brooms. The surface should be dry. Tack coat shall not be sprayed when the weather is foggy, rainy or windy or when the temperature in shade is less than 10 ^{0}C.

The surface to be primed shall be checked for line, camber and level, and the surface corrected, made good as necessary and approved by the Engineer before any bituminous spray is applied.

As soon as possible after the surface to be sprayed has been prepared as specified and approved by the Engineer, the tack coat shall be sprayed on to it at the specified rate i.e. (0.2 to 0.25 Kg. & 0.25 to 0.30 kg. for non hungry & hungry surface respectively). As per MORTH Specifications and it shall be sprayed uniformly all over the primed surface and make the surface of the base course water resistant and also to harden and toughen the base course layer. The surface shall be allowed to cure for at least 3 hours.

Bitumen distributor shall be used for spraying tack coat. It shall be truck mounted and shall have sufficient power to maintain uniform speed for the proper application of the binder. The truck shall be equipped with an accurate tachometer showing to the driver the speed in meters per minute.

The truck shall be fitted with a gauge bar and chain or any other acceptable device clearly visible to the driver to enable him to follow the required edge. The distributor tank shall have the capacity of at least 4,000 liters and shall be fitted with a derive for indicating the quantity in the tank at any time. It shall be equipped with heaters capable of maintaining temperature and be fitted with an accurate thermometer.

Spray bars shall be available for spraying in widths varying from 2.5 m to 4 m and shall be adjustable transversely so that the operator can follow the required edge independently. The

spray nozzles shall be arranged to give a uniform spray and the shut off shall be quick acting with an anti- drip device. The pressure in the spray bar shall be sufficient to give a good distribution and spraying of the binder.

Distributors shall be checked and calibrated before starting any work or when required by the Engineer. This shall include the calibration of all the metering devices and checking the uniformity of the transverse distribution of spray.

All distributors shall be furnished with a "rate of / machine speed" chart.

No had spraying shall be permitted except in small areas, inaccessible to the distributor or in narrow strips or to make good a defective area caused by a blocked nozzle. Primer shall not be applied on a wet surface.

TEST FOR TACK COAT:

● Quantity of binder	-	No. of sample per lot/400Mt as per IS-73, IS-217 as applicable
● Temperature at application	-	At regular close intervals
● Rate of spread	-	Three test per day

Dense Graded Bituminous Macadam

Dense Graded Bituminous Macadam (DBM) shall be a hot- laid plant mixture of well- graded aggregate and VG-30 grade bitumen.

The Dense Graded Bituminous Macadam shall mainly but exclusively, be used in base/binder and profile corrective courses. DBM shall also be used as road base material. The thickness of a single layer shall be 75 mm to 100 mm (Grade -1).

● **Bitumen**	-	Shall be paving Bitumen of VG-30 grade Complying with IS- 73
● **Coarse Aggregate**	-	As per MORTH Specification
● **Fine Aggregate**	-	As per MORTH Specification
● **Filler**	-	Shall consist of finely grounded particles such as Rock dust, per article 505.2.4(MORTH specification)

The combined grading of the coarse and fine aggregate and added filler for the particular mixture shall fall within the limits shown in MORTH Specifications (Table500-10 Grade- 1 , having minimum bitumen content 4.0%).

Physical requirements for Coarse Aggregate

Property	Test	Specification
• Cleanliness (dust)	Grain Size Analysis	Max 5% passing 75 micron sieve
• Particle Shape	Flakiness and Elongation Index (combined)	Max 35%
• Strength	Los Angels Abrasion Value Aggregate Impact Value	Max 35% Max 27%
• Durability	Soundness Sodium Sulphate Magnesium Sulphate	Max 12% Max 18%
• Water Absorption		Max 2%
• Striping	Coating and Stripping of Bitumen – Aggregate	Minimum retained coating 95%
• Water Sensitivity	Retained Tensile Strength	Minimum 80%

- **Filler** - As per Table 5.9 MORTH Specification
- **Mix design** - AS per MORTH Specification 505.3 & MS-2

The base on which Dense Graded Bituminous Macadam is to be laid shall be prepared in according with the specification. The surface shall be thoroughly swept clean by a mechanical broom and the dust be removed by compressed air. After the application of tack coat, DBM mix produced as per the Job mix Formula shall be laid by pavers and rolled in accordance with the specification requirements till the specified density is achieved.

Job mix formula shall be submitted for the approval of the engineer at least 21 days before the start of work at site. The plant and laying trial shall be carried out satisfactorily before the actual start of the work, test for job mix formula design in presence of BSCDCL engineer's representative & all tests should be conducted in presence of authorized representative.

TABLE 500-11

REQUIRMENTS FOR DENSE GRADED BITUMINOUS MACADAM

Minimum Stability (KN at 60^0 C)	20.25
Minimum flow (mm)	2.00
Maximum flow (mm)	4.00
Compaction level (Number of Blows)	112 blow on each of the two faces of the Specimen
Marshall Quotient	2-5 as per MS-2
% air voids	3-5
Percent air voids in Mineral aggregate (VMA)	As per Table 500-12 of MORTH
Percent air voids filled with bitumen (VFB)	65- 75

TESTS FOR DENSE GRADED BITUMINOUS MACADAM

i)	Quality of Binder	-	Number of Samples per lot and tests as per 1S:73 or IRC-Sp-53
ii)	AIV/ Los Angeles Abrasion value	-	One test per 350 M^3 of aggregate for each source & whenever there is change in the quality of aggregate
iii)	FI & EI	-	One test per 350 M^3 of aggregate for each source & whenever there is change in the quality of aggregate
iv)	Stripping Value	-	Initially one set 3 representative specimens for each source of supply
v)	Soundness (Magnesium and (Sodium Sulphate)	-	Initially, one determination by each method for each source of supply
vi)	Water absorption of aggregates	-	One test set of 3 representatives

			specimens for each source of supply
vii)	Sand equivalent	-	One test set of 3 representatives specimens for each source of supply
viii)	Plasticity Index	-	One test set of 3 representatives specimens for each source of supply
ix)	Polished Stone Value	-	One test for each source of supply
x)	Percentage of fractured faces	-	When gravel is used, one test per 350 M^3 of aggregate
xi)	Mix grading	-	One set of tests on individual Constituents and mixed aggregate From the dryer for each 400 tons of mix subject to a minimum of two tests per plant per day.
xii)	Stability of Mix	-	For each 400 tones of mix produced, a set of 3 Marshall specimens to be prepared and tested for stability, flow value, density and void content subject to a minimum of two sets being tested per day.
xiii)	Water sensitivity off Mix (Retained Tensile Strength)	-	Initially one set of 3 representative specimens for each source of supply. subsequently when warranted by changes in the quantity at aggregate. (if required)
xiv)	Binder content	-	One set for each 400 tones of mix subjected to minimum of two testes per day
xv)	Control of temperature of Binder in Boiler, aggregate in the dryer and mix at the	-	At regular close intervals

time of laying and rolling

xvi)	Rate of spread of mixed material and layer thickness.	-	After every 5th truck load
xvii)	Density of compacted layer	-	One test per 700 Sqm. area.
xviii)	Moisture Susceptibility of Mix	-	One test for each mix type whenever there is change in the quality of coarse aggregate or fine aggregate

Bituminous Concrete

This work shall consist of construction of Bituminous Concrete for use in wearing course in a single layer on a previously prepared Bituminous Bound surface. The single layer thickness shall be 40mm as required by the contract drawing and specifications.

- **Bitumen** - Shall be paving Bitumen of VG-30 Grade Complying with IS 73
- **Coarse Aggregate** - Shall be Conforming to MORTH Specifications-2013
- **Fine aggregate** - Shall be Conforming to MORTH Specifications-2013
- **Filler** - Shall be Conforming to MORTH Specifications-2013

The mix shall be designed and approved under pursuance of MORTH Fifth revision 2013

The surface where the wearing course is to be laid shall be thoroughly swept clean by mechanical broom and dust be removed by compressed air. Tack coat shall be applied if directed by the engineer. Asphalt mix shall be transported in tipper trucks, covered while in transit & laying of wearing course should not done in bad weather or while raining. The wearing course shall not be laid when the temperature is less than10^0 C and the wind speed exceeds 40 Km. per hours. The rate of delivery of material to paving site shall be regulated to enable the pavers to operate continuously .Mix shall be laid and compacted before the temperature falls below the specified temperature. The compaction shall be continued till the specified density is achieved. Rollers shall not have a speed of more than 5 Km per hours.

Job mix formula shall be submitted for the approval of the engineer at least 21 days before the start of work at site. The plant and laying trails shall be carried out satisfactorily before the actual start of the work. Adequate quantity control at every stage of the work shall be maintained and fully equipped laboratory shall be setup to ensure the quantity of the work.

Periodic sieve analysis of each type or aggregates from the cold bins shall be done to ensure the gradation of the mix as per Job Mix Formula. Three Marshall Specimens shall be prepared and tested for stability, flow value, voids content and density and the obtained value shall be as per the design values.

The longitudinal profile of the finished surface shall be tested with the straight edge 3 meter long parallel to the center line and the transverse profile with camber plate. Any irregularities greater than 6mm shall

be corrected. The longitudinal profile of the finished surface shall also be tested with a rough meter / project meter and the value shall be according to the Specification.

TEST FOR BITUMNOUS CONCRETE:.

i)	Quality of Binder	-	Number of Samples per lot and tests as per 1S:73 or IRC-SP-53
ii)	AIV/ Los Angeles Abrasion value	-	One test per 350 M^3 of aggregate for each source & whenever there is change in the quality of aggregate
iii)	FI & EI	-	One test per 350 M^3 of aggregate for each source & whenever there is change in the quality of aggregate
iv)	Stripping Value	-	Initially one set 3 representative specimens for each source of supply
v)	Soundness (Magnesium and (Sodium Sulphate)	-	Initially, one determination by each method for each source of supply
vi)	Water absorption of aggregates	-	One test set of 3 representatives specimens for each source of supply
vii)	Sand equivalent	-	One test set of 3 representatives specimens for each source of supply
viii)	Plasticity Index	-	One test set of 3 representatives specimens for each source of supply
ix)	Polished Stone Value	-	One test for each source of supply
x)	Percentage of fractured faces	-	When gravel is used, one test per 350 M^3 of aggregate
xi)	Mix grading	-	One set of tests on individual Constituents and mixed aggregate From the dryer for each 400 tons of mix subject to a minimum of two tests per plant per day.
xii)	Stability of Mix	-	For each 400 tones of mix

			produced, a set of 3 Marshall specimens to be prepared and tested for stability, flow value, density and void content subject to a minimum of two sets being tested per day.
xiii)	Water sensitivity off Mix (Retained Tensile Strength)	-	Initially one set of 3 representative specimens for each source of supply. subsequently when warranted by changes in the quantity at aggregate. (if required)
xiv)	Binder content	-	One set for each 400 tones of mix subjected to minimum of two testes per day
xv)	Control of temperature of Binder in Boiler, aggregate in the dryer and mix at the time of laying and rolling	-	At regular close intervals
xvi)	Rate of spread of mixed Material	-	After every 5^{th} truck load and layer thickness.
xvii)	Density of compacted layer	-	One test per 700 Sqm. area.
xviii)	Moisture Susceptibility of Mix	-	One test for each mix type whenever there is change in the quality of coarse aggregate or fine aggregate

REQUIREMENTS MIX DESIGN FOR BITUMINOUS CONCRETE

TABLE 500- 11

Minimum Stability (KN at 60^0 C)	9.0
Minimum flow (mm)	2.00
Maximum flow (mm)	4.00
Compaction level (Number of Blows)	75 blow on each of the two faces of the Specimen
Marshall Quotient	2-5 as per MS-2
% air voids	3-5
Percent air voids in Mineral aggregate (VMA)	As per Table 500-12 of MORTH
Percent air voids filled with bitumen (VFB)	65- 75

ROLLING:

- Initial Rolling - 8 to 10 tons capacity static weight smooth roller
- Intermediate Rolling -8 to 10 tones capacity static weight Vibratory roller or 12 to 15 tons capacity P.T.R.
- Finish Rolling -6 to 10 tones capacity static weight tandem roller

Rolling shall be continued till the required density with respect to the laboratory Marshall Density is achieved. All the activities shall be done as per the contract specifications. The mix shall be prepared in an approved hot mix plant. Minimum two test per plants per day

Concrete For Structures

All materials shall conform to the MORTH Specifications & relevant IS Codes for cement (OPC-43), aggregate, water, admixture and Steel etc.

GRADING OF CONCRETE Please refer table no.-1700-2 MORTH Minimum cement content and maximum water cement ratio shall be as per MORTH table 1700.2 / IS-10262

GRADE DESIGNATION	Specified characteristic compressive strength of 150 mmx150mmx150mm cubes at 28 days, in M Pa tested as per IS-512	Minimum Cement Content	Maximum Water Cement Ratio
M 15	15	250	.045
M 20	20	310	0.45
M 25	25	360	0.45
M 30	30	360	0.45
M 35	35	380	0.45

M 40	40	380	0.45

COARSE AGGREGATE

Table No-1000-1 of MORTH specification 2013 & IS 383

Sl. No.	Test	Test Method	Min frequency	Acceptance rage			
1	Flakiness Index	IS – 2386 PART – I	At every 100 M^3 or part thereof	Not more than 35%			
2	Grading Requirement	IS – 2386 PART – I	- DO-	IS – SIEVE SIZE	% by wt. passing the sieve		
					40 mm	20 mm	12.5 mm
				63 mm	100	-	-
				40 mm	95-100	100	-
				20 mm	30-70	95-100	100
				12.5 mm	-	-	90-100
				10 mm	10-35	25-55	40-85
				4.75 mm	0-5	0-10	0-10
3	Impact value Or Los Angeles abrasion value	IS – 2386 PART – IV	-DO-	A.I.V. – MAX 45% L.A.A.V. – MAX 40%			
4	Specific gravity & void content	IS – 2386 PART – II	-DO-				
5	Water absorption	IS-2386 PART – II	-DO-	MAX 2%			
6	Moisture content	IS-456 & 383	One per stack of 100 m^3 or part thereof and in monsoon time every day before starting of work	Water content of concrete will be decided accordingly.			

7	Soundness	IS-2386 PART V	One per source	Sodium Sulphate – 12% Max. Magnesium Sulphate – 18% Max.
8	Deleterious materials	IS – 2386 PART – II	-DO-	As per IS – 383
9	Acid & alkali reactivity	IS – 2386 PART-VII	-DO-	As per IS – 383
10	Petrographic Examination	IS-2386 PART-VIII	-DO-	As per IS – 383

SAND/FINE AGGREGATE

Shall conform to table 1000-2 of MORTH specifications-2013 & IS-383

Sl. No.	**Test**	**Test Method**	**Min frequency**	**Acceptance rage**
1	Fineness Modulus	IS-2386 Part-I	Before every Concrete	Not less than 2.0 Not more than 3.5
2	Grading Requirements	IS-2386 Part-I	-DO-	As per Table 1000-2 of MORTH Specification
3	Silt Content	IS-2386 Part-II & IS 383	-DO-	As per IS code
4	Moisture Content	-	Every day before start of work	Water quantity to be adjusted accordingly in the design mix.

TEST FOR MATERIALS WATER

Sl. No.	Test	Test Method	Min frequency	Acceptance rage
1	PH Value	Section 1010 of MORTH Specifications and IS-3025-1964	Every Source/	Not less than 6
2	Chlorides	-Do-	For every source	Max. 250 mg/lit. In case of structures of length 30 m and below, this may be increased upto 1000 mg/lit.
3	Sulphates	-Do-	-Do-	Max 500 mg/lit
4	Organic solids	-Do-	-Do-	Max 200 mg/lit
5	Inorganic Solids	-Do-	-Do-	Max 3000 mg / lit
6	Suspended Solids	-Do-	-Do-	Max 2000 mg/lit
7	Qty. of 0.1 normal N_2OH to neutralize 200 ml sample of Water	MORTH clause 1010	-Do-	Not more than 2 ml.
8	Qty. of 0.1 normal HCL to neutralize 200 ml sample of Water	-Do-	-Do-	Not more than 10 ml

CEMENT ORDINARY PORTLAND CEMENT

Sl. No.	Test	Test Method	Min Frequency	Acceptance Range
1	Fineness, by Blaine's air permeability method	IS-4031 Part 2	For every consigned	Not less than 225
2	Compressive strength	IS-4031 Part 6	"	As per the provision of IS codes
3	Setting time I) Initial II) Final	IS-4031 Part 5	 " "	 Not less than 30 Minutes Not more than 600 Minutes
4	Total chloride content (%) by mass of cement	IS-12423 – 1988	For each source	Not more than 0.05%

Steel Reinforcement Bars

Shall be Thermo mechanically Treated Bars (Fe 500) conforming to IS-1786

Sl. No.	Test	Test Method	Min frequency	Acceptance rage
1	Wt In kg/m	IS-1786	For every consignment	As per IS-1786
2	0.2% proof stress/yield stress	IS-1608-1972	-Do-	Min 500 Mpa
3	Tensile strength	IS-1608-1972	-Do-	8% more than the actual 0.2% proof stress but not less than 545 Mpa
4	% elongation on a gauge length of 5.65 A where A=sectional Area of test pieces	-Do-	-Do-	12.0% Min
5	Bend & Re-bend Test	IS-1599-1974	-Do-	Should be Satisfactory

The cement content (OPC alone) shall be as less as possible but not less than the quantities specified in the MORTH Specifications. In no case shall it exceed 450 kg/cum & minimum 340 Kg. /Cum.

Prior to the start of construction the mix design shall be submitted to BSCDCL Engineer for their review. The mix design shall be verified with Trial batches in the concrete batching plant. No concrete shall be placed in the work until the Engineer approves the materials and the mix design of which it is composed. The Sub Contractor shall design all the concrete mixes called for on the drawing, making use of the ingredients, which have been approved by the Engineer.

The Mix shall have the consistency, which shall allow proper placement and consolidation in the required position. Every attempt shall be made to obtain uniform consistency.

Additional Requirements

Total chloride content as percentage of mass of cement shall be limited to values given below:

- Pre-stressed concrete - 0.06%
- Reinforced concrete exposed to sea water - 0.06%
- Other Reinforced concrete - 0.01%

The total sulphuric anhydride (SO3) content in the concrete is to be limited to 4% of cement. Use of admixtures in concrete may be required under the contract to promote special properties in the finished concrete or may be proposed by the Contractor to assist him in compliance with the Specification.

The maximum size of coarse Aggregate for concrete to be used in various components shall be as per Table no. 1700-7 of MORTH Specifications.

When it is necessary to deposit concrete under water concrete it shall contain 10% more cement than that required for the same mix placed in the dry. Concrete shall not be placed in water having temperature

below 5 ^{0}C. All under water concreting shall be carried out by tremie method only. The temperature of concrete, when deposited shall not be less than 16 degree Celsius or not more than 33 ^{0}C. Concrete shall be protected during the first stage of hardening from loss of moisture and from the development of temperature differential within the concrete sufficient to cause cracking.

The methods used for curing shall not cause damage of any kind to the concrete. Curing shall be continued for as long as may be necessary to achieve the above objectives but in any case for at least 14 days or until the concrete is covered by later construction whichever is the shorter period.

The curing process shall commence as soon as the concrete is hard enough to resist damage from the process, and in the case of large area or continuous pours, shall commence on the completed section of the pour before the rest of the pour is finished.

Water used for curing shall be of the same quality as that used for mixing. Curing compound shall become stable and impervious to the evaporation of water from the concrete surface within 60 minutes of application. The material shall not react chemically with the concrete and shall not crack, peel or disintegrate within 3 weeks after the application.

Immediately after removing the forms, exposed bars shall be cut to a depth of at least 50 mm below the surface of concrete and the resulting holes shall be filled with cement mortar. All fins caused by form joints, all cavities, honeycomb spots, broken edges etc. shall be thoroughly cleaned and rectified by mortar of cement and fine aggregates. All construction and expansion joints in the concrete work shall be tooled and free from any mortar or concrete.

CONCRETE: QUALITY OF WORK

Check	Method	Frequency	Accepted range
I. Prior to concreting			
1. Mix design		For every change of source	To conform to the respective specifications
2. Weigh batching			
3. Line & level		For every concreting operation	To be Satisfactory
4. Formwork			
5. Placing of reinforcement			
6. Plant & Equipment			
7. Adequate man power			
8. Curing Arrangement			
9. Walk-way for inspection			
10. Safety arrangement			
11. Lighting, if night work			
II. Batching and pouring of concrete 1. Mixing 2. Transportation, placing and compacting of Concrete 3. Construction of Joint 4. Collection of Test cubes		-Do-	-Do-
III. Post – Concreting 1. Curing 2. Stripping side shutters 3. Stripping soffit shutters 4. Removal of props		-Do-	-Do-
IV. Quality of workmanship (Clause 1700 OF MORTH specification)			-Do-

Sl. No.	Check	Method	Frequency	Acceptance Range	
1	Min Strength of concrete	IS-512	For every concrete Operation	As per approved design and drawing	
2	Minimum cement content and Max. w/c ratio		-Do-	-Do-	
3.	Maximum Cement Content		-Do-	450 kg/cum(OPC)	
4	Consistency by slump test	IS-516	-Do-	**Type of Structure**	**Slump in mm**
				RCC with widely spaced reinforcement	40-50
				RCC with fairly spaced reinforcement	50-75
				RCC & PSC with highly congested reinforcement.	75-125
				Underwater concreting throug tremie e.g. button plug, cast i situ pilling	100-200
5	Compressive strength of working cubes (28 days)		As per Table 1700-9 of MORTH - 2013	1) Mean strength determined from any group of 3 consecutive samples should exceed the specified characteristic strength 2) Strength of any sample is not less than specified characteristic strength minus 3.5 MPa	

FREQUENCY

Quantity of Concrete in m^3	No. of Samples
1-5	1
6-15	2
16 – 30	3
31-50	4
51 & above	4 plus one addl. For each addl. 50 m^3 or part thereof

MORTAR

Mortar shall be composed of fine aggregate and ordinary Portland cement. The mix proportions shall be as stated on the drawings or elsewhere in the specification.

The mixing shall be done in a mechanical mixer. Hand mixing can be restored to as long as uniform density of mix and its strength are assured subject to prior approval of the Engineer. Mortar shall be mixed only in such quantity as required for immediate use.

Check List

1) Working benchmarks shall be established with reference to B.M. given by the Client

2) Levels of working B.M. to be got approved by the Client

3) Survey instruments

i. Leveling Instruments : Precision automatic levels having standard deviation of 5 mm/km .
ii. Measurement of Angle: Total Station having an accuracy of Two Second
iii. Measurement of distance: Distomate (Electronic distance meter)

4) A proper record of all benchmarks, survey control points and setting out points with suitable supporting sketches should be maintained.

SUB STRUCTURE

Sl. No.	Test	Specification	Frequency	Specified Value
1	Material	Most specification-2013 Section 1000	As specified	
2	Form Work	Section 1500 of MORTH Specification-2013	For each member	
3	Concreting	As per specification	For each concreting	
4	Tolerance in Concrete elements	Clause 2208 of MORTH specification	Each Member	

Variation in c/s dimensions	+ 10 mm, - 5 mm
Misplacement from specified position in plan	10 mm
Variation of level at Top	$\pm$ 10 mm
Variation of R.L. of bearing Area	$\pm$ 5 mm
Variation from plumb over full height	$\pm$ 10 mm
Surface irregularities measured with 3m straight edge • All surfaces except bearing areas • Bearing area	5 mm

	3 mm

SUPERSTRUCTURE

Sl. No.	Test	Specification	Frequency	Specified Value
1	Materials	To conform to section 1000 of MORTH Specification test as indicated in the manual	As indicated	As indicated
2	Dimensions line and level	As approved Drawing	Each Member	As per approved drawing
3	Form Work	Section 1500 of MORTH specification	Each Member	
4	Steel reinforcement	Section 1600 of MORTH Specification	-Do-	
5	Structural Conc.	Section 1700 of MORTH specification	-Do-	
6	Prestressing	Section 1800 of MORTH specification	-Do-	
7	Quality and workmanship	Section 2300 of MORTH specification	-Do-	
8	Tolerance for cast-in-situ super-structure	Cl2306.2 of MORTH specification	-Do-	

TOLERANCE IN VARIATIONS

1	Thickness of top and bottom slab for box girder and bottom flange for T girder or slab	- 5 mm to + 10mm
2	Web Thickness	- 5 mm to + 10 mm
3	Overall width or depth	$\pm$ 5 mm
4	Length overall and length between bearing	Not more than $\pm$ 10mm or $\pm$ 0.1% of span which ever is lesser
5	Surface irregularities on 3m straight edge	5 mm

Filter Media, Backfilling behind Abutment & Wing Wall

This item of work deals with activities of Filter media, Backfilling behind Abutments and Wing Wall with approved materials as per the terms of contract conditions, approved Drawings. This item of work shall confirm to the clause 2504.2.2, 305 & 309.3.2 and IRC – 78 of the Technical specifications.

Filter Media is proposed from the tests conducted in the laboratory and checked for its suitability as per Clause 2504.2.2 of MORTH Specification.

Back filling will be done with the material from approved borrow areas.

Procedure

a) Initially filter media is laid with coarse filter towards weep hole of Abutment and finer material towards earthen side layer by layer as per the technical requirement.

b) After completion of each filter media layer to the required suitable height back filling will be done simultaneously in layers matching the height with the filter media layer till it reaches the existing ground level behind Abutment and compacted as per requirement.

c) Embankment construction will also be taken up either separately or simultaneously along with filter media and back filling layers.

Stone Pitching

This work consists of covering the slopes of road embankments with stones over a layer of granular material (Filter).

As per approved drawings and MORTH Specifications.

The stone will be sound, hard, durable and fairly regular in shape. Quarry stone would be used. The round boulders and the stones subjected to the marked deterioration by water or weather will not be accepted.The material for filter will be sand, gravel, stone or coarse sand and it will prevent escape of the embankment material through the voids of the stone pitching and as well as to allow free movement of water without creating any uplift head on the pitching.

Road Marking

Hot applied thermoplastic road marking paint will be carried as per section -800.3 of MORTH Specification 2013 and as approved by engineer in charge. This work consists of marking traffic strips using thermoplastic compound meeting the requirements of section -800 of MORTH. As per the contract drawings and MORTH article 800.3, IRC-35 & IRC-54

Thermoplastic Material

The Thermoplastic material should meet the requirement of table 800-9 of MORTH specification and reflectorizing glass beads confirming the requirement of table 800-10

Composition

The pigment, beads and aggregate will be uniformly dispersed in the resin. The material will be free from all skins, dirt and foreign objects and will comply with requirements given in Table 800-3 of MORTH.

Properties

The properties of thermoplastic material, when tested in accordance with ASTM D 36 / BS – 3262 will be as follows.

a)	Luminance	:	For white, daylight luminance at 45 degrees – 65% min as per AASHTO M 249
b)	Drying Time	:	When applied at a temperature specified by the manufacturer and to the required thickness, the material will set to bear traffic in not more than 15 minutes.
c)	Skid Resistance	:	Not less than 45 as per BS – 6044.
d)	Cracking resistance at low temperature	:	The material shall show no cracks on application to concrete blocks.
e)	Softening Point	:	102.5 +/- 9.5 deg^0.C as per ASTM D 36.
f)	Flow resistance	:	Not more than 25% as per AASHTO M 249.
g)	Yellowness Index	:	For white thermoplastic paint not more than 0.12 as per AASHTO M 249.

Reflectoring Glass Beads

Reflectoring glass beads are two types. Type 1 beads are those, which are a constituent of the basic thermoplastic compound vide Table 800-3 and Type 2 beads are those, which are sprayed on the surface of hot paint line vide clause 803.6.3. The glass beads shall be transparent, colorless and free from milkiest color , dark particles and excessive air inclusions and these will conform to the requirements given in Table 800.10 of MOST.

Graduation Requirements of Glass Beads

Sieve Size	Type - 1 (% Retained)	Type - 2 (% Retained)
1.18 mm	0 - 3	-
850 µ	5 - 20	0 - 5
600 µ	-	5 - 20
425 µ	65 - 95	-
300 µ	-	30 - 75
180 µ	0 - 10	10 - 30
180 µ Below	-	0 - 15

Roundness

The glass beads will have a minimum of 70% true spheres.

Refractive Index

The glass beads will have a minimum refractive index of 1.50.

Free Flowing properties

The glass beads shall be free of hard lumps and clusters and shall dispense readily under any conditions suitable for paint striping. They shall pass the free flow-test.

Surface Preparation and Application

a) The surface will be cleaned by broom / wire brush and the surface are free from dirt, grit and all other foreign matter.

b) In case the paint is to be laid over cement concrete pavement, a coat of primer will be applied on the surface to ensure proper bonding of paint with the surface.

c) The pavement temperature will not be less than 10ºC during application.

d) Marking will be done before lying of paint thermoplastic Road Marking Paint will be heated in mechanically agitated pre-heater. The normal workable temperature of thermoplastic road marking paint will be between 150ºC – 200º C (as per recommendation of manufacturer)

e) Thermoplastic road marking paint thereafter will be transferred in paint applicator. The paint will thereafter be applied with paint applicator on the pre marked lines.

f) Thermoplastic paint will be applied in intermittent or continuous lines of uniform thickness of atleast 2.5 mm. Where arrow or letters are to be provided, thermoplastic compound may be hand-sprayed. In addition to the beads included in the material, a further quantity of glass beads of Type – 2, conforming to the specification will be sprayed uniformly into a mono-layer on to the hot paint line in quick succession of the paint spraying operation. The glass beads will be applied at the rate of 250 gms per square meter area.

g) The finished lines will be free from ruggedness on sides and ends and be parallel to the general alignment of the carriageway. The upper surface of the lines will be level, uniform and free from streaks.

h) Though the drying time of paint is 15 minutes, yet considering the temperature, the traffic will be allowed after 30 minutes.

Traffic Signs

Traffic signs will be installed as per Clauses given in the MORTH specification 2013 section 8000 for regulating traffic movement. As per the contract drawings and technical specification Clause No: 800 & IRC-54. Necessary manpower and display boards will be placed to regulate the flow of traffic without causing congestion or traffic jam. The various materials and fabrication of traffic signs will be conform as per technical specification Clause No: 801.2 of MORT&H.

Traffic Signs Having Retro-reflective Sheeting

The retro-reflective sheeting used on the sign will be conforming as per technical specification Clause No: 801.3 of MORT&H.

High intensity grade sheeting

High intensity grade sheeting used on the sign shall be conform as per technical specification Clause No: 801.3.2 of MORT&H, and dry condition shall have the minimum co-efficient of retro-reflection (determined in accordance with ASTM Standard E : 810) will be conform to the requirements given in Table 800-1 of MORT&H.

Messages/borders : The messages (legends, letters, numerals etc.) and borders will be conform to the requirements as per technical specification Clause No: 801.3.4 of MORT&H.

For screen-printed transparent colored areas on white sheeting, the co-efficient of retro-reflection shall not be less than 50 percent of the values of corresponding colour in Tables 800-1 and 800-2, as applicable.

Cut-out messages and borders, wherever used, shall be made out of retro-reflective sheeting (as per Clause 801.3.2 or 801.3.3 as applicable), except those in black which shall be of non-reflective sheeting.275

Colour The Colors used on the sign will be conforming as per technical specification Clause No: 801.3.7 of MORT&H.

Adhesives The sheeting will either have a pressure sensitive adhesive of the aggressive-tack type will be conforming as per technical specification Clause No: 801.3.8 of MORT&H.

Fabrication The Fabrications will be conforming as per technical specification Clause No: 801.3.10 of MORT&H.

NON SOR

Providing and Laying of PLASTITRAK/Roll-on Surfacing Material :A Solvent Free, High Build, Two pack, Seamless, Tough, skid resistant 1.0-1.5 mm thick red (or as required) based on Gloss and color retaining Acrylic Cross Linking Resin System for Cycle track and similar applications including surface cleaning and cost of all material etc. complete.

General:

The following documents are required to be furnished along with the application of PLASTITRAK/Roll on surfacing material as an essential condition of the tender:

1. A current dated Authorization certificate issued by the Cold Plastic manufacturer. Certificate issued by distributor dealer/ power of attorney holder shall be disqualified.
2. The Indian Cold Plastics manufacturer shall have an International collaboration / tie up with a company of repute having a manufacturing & supply experience for supply of two component Cold plastic Road surfacing materials.
3. The Indian Cold Plastics manufacturer shall supply a third party test certificate from the Principal International Collaborator / tie up company for Two component Cold plastic Road surfacing material
4. The Indian Cold Plastics manufacturer shall be an ISO 9001 certified company for manufacturing and supply of two component Cold plastic Road surfacing material.
5. The Indian manufacturer shall have a testing facility / laboratory for a) wear resistance b) Spectro -photometer for color matching.
6. The Indian Cold Plastics manufacturer shall provide a warranty certificate for performance for a period of 2 years
7. The bidder shall provide an authorization certificate for specific tender from the Indian manufacturer qualifying the above criteria's for the tender
8. The Bidder shall produce the original Batch Test Certificate for the Cold Plastics materials from the Indian manufacturer
9. Product Specification for Roll-On Surfacing material : PLASTITRAKHIGH BUILD ROLL-ON ROAD SURFACING MATERIAL
    i. TYPE: 2-PACK COLDCURING SOLVENT FREE COMPOUND, ACRYLIC RESINS FOR HAND APPLICATION
    ii. Viscosity:-Thick fluid compound
    iii. Density :Approx 1.8 gram/ cm3
    iv. Skid Resistance :-> 45 S.R.T.
    v. Hardening Time:-Approx.20 minutes by 30 degree C
    vi. Flashpoint :Approx 10 degree C
    vii. Storage Stability:-At Least 6 months if stored in a cool place
    viii. Mixing ratio:-2 sachets of hardener to 20 kg plastitrak Roll on base
    ix. Potlife (mixed):-10 minutes by 20 degreeC.

Application: In one coat (single application) with requirement of primer on smooth surface

Laying / Painting shall be done by machine. For locations where painting cannot be done by machine, approved manual methods shall be used with prior approval of the Engineer. The Contractor shall maintain control over traffic while painting operations are in progress so as to cause minimum inconvenience to traffic compatible with protecting the workmen.

The material shall be applied in fresh condition. After transfer to the laying apparatus, the material shall be laid at a temperature within the range specified by the manufacturer the particular method of lying being used. The paint shall be applied using a screed or extrusion machine.

The pavement temperature shall not be less than 10'C during application. All surfaces to be marked shall be thoroughly cleaned of all dust, dirt/grease, oil and all other foreign matter before application of the paint.

The material, when formed into traffic stripes, must be readily by placing an overlay of new material directly over an old' line of compatible material. Such new material shall so bond itself to the old line that no splitting or separation takes place.

Mode of Measurement: Per Sq.mts basis

Pavement marking for showing symbol of CYCLE on White/ yellow/ Blue or Suitable colored as directed by engineer in charge for cycle track , at junctions (and at c/c 50 m t inside for item no,3) with hot applied thermoplastic paints of 2.5 mm thickness including reflectorising glass beads @ 250 gms per sqm area as per IRC:35 .

Thermoplastic Road Marking of Cycle track: Providing & laying hot applied thermoplastic Compound in white/yellow colour in marking of edge lines(15cm wide) etc.2.5mm minimum thickness as directed including cost of marking compound, making arrangement for heating and its application with requisite machine, making arrangement for spraying of drop-on glass beads etc.@ 250 gms. per sqm area, thickness of 2.5mm is exclusive of surface applied glass beads as per IRC 35-1997 & Clause 803 of MORT&H specification. The finished surface to be level, uniform and free from streaks and holes and also including cost of all material, labor, machinery etc. required for proper completion

General : The thermoplastic material shall be homogeneously composed of aggregate, pigment, resins and glass reflectorizing beads.

Requirements:

1. Composition: The pigment, beads, and aggregate shall be uniformly dispersed in the resin. The material shall be free from all skins, dirt and foreign objects and shall comply with requirements indicated in Table 800 3.

TABLE 900 3. PROPORTIONS OF CONSTITUENTS OF MARKING MATERIAL

(Percentage by weight)

Component	White	Yellow
Binder	18.0 min.	18.0 min.
Glass Beads	30 40	30 40
Titanium Dioxide	10.0 min.	
Calcium Carbonate and Inert Fillers	42.0 max.	See
Yellow Pigments		Note

2. Properties: The properties of thermoplastic material, when tested in accordance with ASTM D36/BS 3262 (Part 1), shall be as below:
    a. Luminance : White: Daylight luminance at 45 degries 65 per cent min. as per AASHTO M 249; Yellow: Daylight luminance it 45 degien 45 per cent min. as per AASHTO M 249
    b. Drying time: When applied at a temperature specified by the manufacturer and to the required thickness, the material shall set to ben traffic in not more than 15 minutes.

c. Skid resistance: not less than 45 as per BS 6044.
d. Cracking resistance at low temperature: The material shall show no cracks on application to concrete blocks.
e. Softening point 102.5 :t 9.50 C as per ASTM D 36.
f. Flow resistance Not more than 25 per cent as per AASHTO M 249.
g. Yellowness Index (for white thermoplastic paint): not more than 0.12 as per AASHTO M 249

3. Storage Life : The material shall meet the requirements of these Specifications for a period of one year. The thermoplastic material must also melt uniformly with no evidence of skins or un-melted particles for the one year storage period. Any material not meeting the above requirements to be replaced by the manufacturer/ supplier/Contractor.
4. Reflectorisation : Shall be achieved by incorporation of beads. the grading and other properties of the bonds shall be as specified in Clause 803.4.3.
5. Marking : Each container of the thermoplastic material shall be clearly and indelibly marked with the following information:
   - The name, trade mark or other means of identification of manufacturer
   - Batch number
   - Date of manufacture
   - Colour (white or yellow)
   - Maximum application temperature and maximum safe beating temperature.
6. Sampling and testing: The thermoplastic material shall be sampled and tested in accordance with the appropriate ASTM/BS method. The Contractor shall furnish to the Employer a copy of certified test reports from the manufacturers of the thermoplastic material showing results of all tests specified herein and shall certify that the material meets all requirements of this Specification.

Reflectorized glass beads

General : This Specification covers two types of glass beads to be used for the production of reflectorized pavement markings

- Type I beads are those which are a constituent of the basic thermoplastic compound vide Table 800 3 and Type 2 beads are those which are to be sprayed on the surface vide Clause 803.6.3.
- The glass beads shall be transparent, colourless and free from milkiness, dark particles and excessive air inclusions.
- These shall conform to the requirements spelt out in Clause 803.4.3.3.

Specific requirements

a. **Gradation:** Ile glass beads shall meet the Gradation requirements for the two types as given in Table 8W 4.

TABLE 800 4. GRADATION REQUIREMENTS FOR GLASS BEAD

Per cent retained	Type I	Type II
Sieve size		
1.18 mm	0 to 3	
850 micron	5 to 20	0 to 5
600 do	5 to 20	
425 do	65 to 95	
300 do	30 to 75	
180 do	0 to 10	10 to 30
below 180 micron	0 to 15	

b. **Roundness:** The glass beads shall have a minimum of 70 per cent true spheres.

c. **Refractive index:** The glass beads. shall have a minimum reflective index of 1.50.
d. **Free flowing properties:** The glass beads shall be free of hard lumps and clusters and shall dispense readily under any conditions suitable for paint striping. They shall pass the free flow test.
e. **Test methods:** The specific requirements shall be tested with the following methods:

- Free flow test: Spread 100 grams of beads evenly in a 100 mm diameter glass dish. Place the (fish in a 250 nun inside diameter desiccator which is filled within 25 mm of the top of a desiccator plate with sulphuric acid water solution (specific gravity 1. 10). Cover the desiccator and lot it stud for 4 hours at 20 to 29 degree C. Remove sample from desiccator, transfer beads to a pan and inspect for lumps or clusters. Then pour beads into a clean, dry glass funnel having a 100 nun stem and 6 nun orifice. If necessary, initiate flow by lightly tapping the funnel. 1"he glass spheres shall be essentially free of lumps and clusters and shall flow freely through the funnel.
- The requirements of gradation, roundness and refractive index of glass beads and the amount of glass beads in the compound shall be tested as per BS 6088 and BS 3262 (Part 1).
- The Contractor shall furnish to the Employer a copy of certified test reports from the manufacturer of glass beads obtained from a reputed laboratory showing results of all tests' specified herein and shall certify that the material meets all requirements of this Specification. However, if so required. these tests may be carried out as directed by the Engineer.

Application properties of thermoplastic material

The thermoplastic material shall readily get screeded/ extruded at temperatures specified by the manufacturers for respective method of application to produce a line of specified thickness which shall be continuous and uniform in shape having clear and sharp edges.

The material upon heating to application temperatures shall not exude fumes, which are toxic, obnoxious or injurious to persons or property.

Preparation:

(i) The material shall be melted in accordance with the manufacturer's instructions in a heater fitted with a mechanical stirrer to give a smooth consistency to the thermoplastic material to avoid local overheating. The temperature of the mass shall be within the range specified by the manufacturer, and shall on no account be allowed to exceed the maximum temperature stated by the manufacturer. The molten material should be used as expeditiously as possible and for thermoplastic material which has natural binders or is otherwise sensitive to prolonged heating, the material shall not be maintained in a molten condition not more than 4 hours.

(ii) After transfer to the laying equipment, the material shall be maintained within the temperature range specified by the manufacturer for achieving the desired consistency for laying.

Properties of finished road marking

- The stripe shall not be slippery when wet.
- The marking shall not lift from the pavement in Freezing weather.
- After application and proper drying, the stripe shall show no appreciable deformation or discolouration under traffic and under road temperatures up to 600C
- The marking shall not deteriorate by contact with sodium chloride, calcium chloride or oil drippings from traffic.
- The stripe or marking shall maintain its original dimensions and position. Cold ductility of the material shall be such as to permit normal. movement with the road surface without chopping Or cracking.
- The colour of yellow. Marking shall conform to IS Colour No. 356 as given in IS: 164.

Reflectorised Paint: If used, shall conform to the Specification by the manufacturers and approved by the Engineer. Reflectorising glass beads for reflectorising paints where used shall conform to the requirement of Clause 803.4.3.

Application: Marking shall be done by machine. For locations where painting cannot be done by machine, approved manual methods shall be used with prior approval of the Engineer. The Contractor shall maintain control over traffic while painting operations are in progress so as to cause minimum inconvenience to traffic compatible with protecting the workmen.

The thermoplastic material shall be applied hot either by screeding or extrusion process. After transfer to the laying apparatus, the material shall be laid at a temperature within the range specified by the manufacturer the particular method of lying being used. The paint shall be applied using a screed or extrusion machine.

The pavement temperature shall not be less than 10'C during application. All surfaces to be marked shall be thoroughly cleaned of all dust, dirt/grease, oil and all other foreign matter before application of the paint.

The material, when formed into traffic stripes, must be readily renewable by placing an overlay of new material directly over an old' line of compatible material. Such new material shall so bond itself to the old line that no splitting or separation takes place.

Thermoplastic paint shall be applied in intermittent or continuous lines of uniform thickness of at least 2.5 mm unless specified otherwise. 'Where arrows or letters are to be provided, thermoplastic compound may be hand sprayed. In addition to the beads included in the material, a further quantity of glass beads of Type 2, conforming to the above noted Specification shall be sprayed uniformly into a mono layer on to the hot paint line in quick succession of the paint spraying operation. The glass beads shall be applied at the rate of 250 grams per square meter area.

The minimum thickness specified is exclusive of surface applied glass beads. The method of thickness measurement shall be in accordance with Appendices B and C of BS 3262 (Part 3).

The finished lines shall be free from ruggedness on sides and ends and be parallel to the general alignment of the carriageway. The upper surface of the lines shall be level, uniform and free from streaks.

USAGE CONFORMANCE CERTIFICATE

CLIENT NAME_____

CONVERTER NAME_____

CONTRACTOR NAME_____

WORK ORDER DETAILS_____

Details of the thermoplastic painting work is carried out using Name of Manufacturer

sr no.	Type of work with location	size	Qty	Remarks

Certified that the above Hot Applied Thermoplastic Road Marking have been manufactured using Brand Name of thermoplastic material and Glass bid (according to ASTMD 36/BS3262)and are covered by
the Warranty No.....Dated.....
Which will expire on dated.....

Name of Thermoplastic Material Manufacturer Name of Converter

Authorized Signatory Authorized Signatory

Measurements for Payment

- The painted markings shall be measured in sq. metres of actual area marked (excluding the gaps, if any).

- In respect of markings like directional arrows and lettering, etc., the measurement shall be by numbers.
- Contractor shall have to Submit the manufacture test certificate before Starting the work at no Extra cost
- Contractor Shall have to Submit the test report of Both thermoplastic paint and glass beads from approved Laboratory for paint & glass beads at no extra cost before producing bill and then after on end when asked by BSCDCL.
- Contractor shall have to submit the filled form as mentioned above in Soft (Signed & scanned) and two hard copies.

Rate

- The Contract unit rate for road markings shall be payment in full compensation for furnishing a labour, materials, tools, equipment, including all incidental costs necessary for carrying out the work at the site conforming to these Specifications complete as per the approved drawing(s) or as directed by the Engineer and all other incidental costs necessary to complete the work to these Specifications.

Supplying and fixing at site retroreflectorised CYCLE TRACK / ONLY FOR CYCLE type sign boards/signs made of encapsulated lense type of reflective sheeting fixed over aluminum sheeting 2.0 mm thick complete including vertical pipes/ angles/ posts etc. all complete as per drawing as per direction of Engineer in Charge .

Providing and fixing Bollard (Swiss Type) at cycle track entry point to prevent othe vehicles at disctance of 0.50 m c/c/, made out of 1.5mm CRC sheet ,height 140cms,bottom dia 23cm,top dia 12cm with direction plate of 30 cm dia fabricated necessary anchors as directed and also provide throughout length pipe of 25 NB for the strenthing of bollard and reflectorised Micro Prismatic Grade Sheet (Type XI)and three yellow strip 6 Inches wide of Type XI Retro reflective Sheeting, fixing with P.C.C M25 grade concrete(Foundation size 30cm×30cm×35cm)

The Swiss type bollard shall be approved from the Engineer-In charge before commencement of work.

1. **Retro Reflective Sheeting**

The retro reflective sheeting used on the signs shall consist of white or coloured sheeting having a smooth outer surface which has the property of retro reflection over its entire surface. It shall be weather resistant and exhibit colour fastness. It shall be new and unused and show no evidence of cracking, scaling, and pitting, blistering, edge lifting or curling and shall have negligible shrinkage or expansion. A certificate of having the sheeting tested for coefficient of retro reflection, daytime colour and luminance, shrinkage, flexibility, liner removal, adhesion, impact resistance, specular gloss and fungus resistance, 3 years outdoor weathering and its having passed these tests shall be obtained from International/Government Laboratory/Institute by the manufacturer of the sheeting and in case the certificate is obtained from international agency, it should also be obtained from Indian agency within 3 years of launching of product by the manufacture in abroad. Alternatively, a certificate conforming to ASTM Specification (D 4956-09) on artificial accelerated weathering requirements from a reputed laboratory in India can be accepted provisionally. In such a situation, the Employer/Client, if so desires, could seek for a performance guarantee which would be released after receipt of certificate meeting the requirement of three years outdoor weathering of the sheeting.

1.1 Description of sheet:

Type XI Micro prismatic grade sheeting

Retro-reflective sheeting typically manufactured as a cube corner. The reflective sheeting shall be retro-reflective sheeting made of micro prismatic retro-reflective material. The retro-reflective surface, after cleaning with soap and water and in dry condition shall have the minimum co-efficient of retro-reflection (determined in accordance with ASTM D 4956-09) as indicated in **Table**

When totally wet, the sheeting shall show not less than 90 percent of the values, of retro-reflection indicated in above Table. At the end of 10 years, the sheeting shall retain at least 80 percent of its original retro-reflectance.

Table Acceptable Minimum Coefficient of Retro-reflection for Type XI Prismatic Grade Sheeting[A] (Candelas per Lux per Square Metre)

Observation Angle	Entrance Angle	White	Yellow	Orange	Green	Red	Blue	Brown	Florescent yellow-Green	Florescent yellow	Florescent Orange
0.1[B]	-4°	830	620	290	83	125	37	25	660	500	250
0.1[B]	+30°	325	245	115	33	50	15	10	260	200	100
0.2°	-4°	580	435	200	58	87	26	17	460	350	175
0.2°	+30°	220	165	77	22	33	10	7	180	130	66
0.5°	-4°	420	315	150	42	63	19	13	340	250	125
0.5°	+30°	150	110	53	15	23	7	5	120	90	45
1.0°	-4°	120	90	42	12	18	5	4	96	72	36

10°	+30°	45	34	16	5	7	2	1	36	27	14

A Minimum Co-efficient of Retro-reflection (R_A) (cd.lx-^{1} .m-^{2}).

B Values for 0.1° observation angles are supplementary requirements that shall apply only when specified by the purchaser in the contract or order.

1.2 Adhesives

The sheeting shall have a pressure-sensitive adhesive of the aggressive-tack type requiring no heat, solvent or other preparation for adhesion to a smooth clean surface, in a manner recommended by the sheeting manufacturer. The adhesive shall be protected by an easily removable liner (removable by peeling without soaking in water or other solvent) and shall be suitable for the type of material of the base plate used for the sign.

The adhesive shall form a durable bond to smooth, corrosion and weather resistant surface of the base plate such that it shall not be possible to remove the sheeting from the sign base in one piece by use of sharp instrument. The sheeting shall be applied in accordance with the manufacturers' specifications.

1.3 Fabrication

Surface to be reflectorised shall be effectively prepared to receive the retro-reflective sheeting. The aluminum sheeting shall be de-greased either by acid or hot alkaline etching and all scale/dust removed to obtain a smooth plain surface before the application of retro-reflective sheeting. If the surface is rough, approved surface primer may be used. After cleaning, metal shall not be handled, except by suitable device or clean canvas gloves, between all cleaning and preparation operation and application of reflective sheeting/primer. There shall be no opportunity for metal to come in contact with grease, oil or other contaminants prior to the application of retro-reflective sheeting. Complete sheets of the material shall be used on the signs except where it is unavoidable. At splices, sheeting with pressure-sensitive adhesives shall be overlapped not less than 5 mm. Where screen printing with transparent colours is proposed, only butt joint shall be used. The material shall cover the sign surface evenly and shall be free from twists, cracks and folds. Cut-outs to produce legends and borders shall be bonded with the sheeting in the manner specified by the manufacturer.

1.4 Messages/Borders

The messages (legends, letters, numerals, etc.) and borders shall either be screen-printed or of cut out from durable transparent overlay or cut-out from the same type of reflective sheeting for the cautionary and mandatory sign boards. Screen printing shall be processed and finished with materials and in a manner specified by the sheeting manufacturer. For the informatory and other sign boards, the messages (legends, letters, numerals etc.) and borders shall be cut-out from durable transparent overlay film or cut-out from the same reflective sheeting only. Cut-outs shall be from durable transparent overlay materials as specified by the sheeting manufacturer and shall be bonded with the sheeting in the manner specified by the manufacturer. Whenever transparent overlay film is used for making any type of sign, the coloured portion of sign shall have coefficient of reflectivity not less than the reflectivity of type and colour of sheeting normally used, as per table**.** Cut-out messages and borders, wherever used, shall be either made out of retro-reflective sheeting or made out of durable transparent overlay except those in black which shall be of non-reflective sheeting or

opaque in case of durable transparent overlay. Creating coloured areas by means of screen-printing with ink shall not be permitted.

Special Note:

(1) Contractor shall have to submit the manufacture test certificate of retro reflective sheet before Starting the work at no Extra cost

(1) Contractor Shall have to Submit the test report of retro reflective sheet from Govt. approved Laboratory testing of sheeting at no extra cost before producing First R.A bill and then after on end when asked by BSCDCL. The contractor shall not be paid extra for same.
(2) Contractor shall have to submit the filled form as mentioned below in Soft (Signed & Scanned) and two hard copies

SECTION-7

Bhopal Smart City Development Corporation Limited

:: TECHNICAL SPECIFICATIONS (Electrical Work)::

SPECIAL CONDITIONS OF CONTRACT (SCC)

1. INTRODUCTION

These special conditions of contract shall be read in conjunction with BSCDCL General Conditions of Contract for all the systems mentioned above. If there are any provisions in the SCC which are at variance with the provisions of conditions of contract, the provisions in the SCC shall take precedence.

The work shall be carried out as per enclosed specifications and MPMKVVCL /CPWD /BSCDCL specifications and IE rules amended up to date.

2. SCOPE OF WORK

i) Conversion of existing overhead lines of 33KV,11KV, LT, DP etc by dismantling the existing overheads and providing underground cables, SITC of RMUs, PSS with preparation of detailed drawings under the supervision of MPMKVVCL, responsible for the execution and commissioning and Handing over the work to MPMKVVCL. Contractor should submit approved plan of work from MPMKVVCL, Bhopal and handing over the work with installation to MPMKVVCL.

ii) SITC of poles and intelligent street light with associated feeder pillar etc.

iii) Contractor shall obtain working permission time to time from MPMKVVCL, Bhopal.

3. DETAILS OF TENDER

The tender specification consists of the following as shown below:

1. Brief description of work
2. Technical specifications
3. List of approved makes

4. DRAWINGS

On award of work, the successful tenderer shall prepare and furnish the drawings for approval to the MPMKVVCL with Engineer-in-charge of BSCDCL before execution. Such drawings shall be based upon item specifications of MPMKVVCL, local laws and regulations.

The drawings for complete systems shall be submitted within two weeks of placement of work order. The contractor shall not proceed with the installation works until the drawings are approved from MPMKVVCL, Bhopal in respective HT lines.

Approval of drawings shall not absolve the contractor of any of his obligations to meet the requirements of specifications under this contract.

5. COMPLETENESS OF TENDER

All sundry fittings, assemblies, accessories hardware items, foundation bolts, termination legs for electrical connections as required and all other sundry which are useful and necessary for proper assembly and efficient working of the various components of the work shall be deemed to have been included in the tender, whether such items are specifically mentioned in the tender documents or not.

6. CONTRACT DOCUMENTS

The contract document is confidential and must strictly confined to the contractor's own use and for the purpose of the contract.

7. METHOD OF EXECUTION

The work for HT lines and Transformer will be done under the supervision and up to the satisfaction of MPMKVVCL, Bhopal.

8. MATERIALS

All the materials required for this work should conform to relevant IS specifications. The copies of Purchase Vouchers should be produced along with the materials. The type test certificates, routine test certificate and acceptance test certificates are also to be submitted.

9. STORAGE OF MATERIALS

The contractor shall provide proper and adequate storage facilities to protect all materials and equipment against damage from any cause whatsoever. The watch & ward of the stores, equipment & materials shall be the responsibility of the contractor till the completion, commissioning & handing over to MPMKVVCL/ BSCDCL as applicable.

The contractor shall take away the balance of any materials left at the site after commissioning of the system. The cost, if already paid, for such items shall be deducted from the subsequent running bills. BSCDCL shall not be liable to pay for any of the incidental charges connected with the above.

10. CO-ORDINATION

The Contractor shall co-operate and co-ordinate with all other agencies working in the same project, compare plans, specifications and the time schedules and so arrange his work so that there will be no interference during execution of the work. The Contractor shall forward to BSCDCL, all correspondence and drawings exchanged. Failure to do so will render the Contractor responsible for subsequent change found necessary and its cost. However, the Contractor shall arrange necessary facilities to execute the work simultaneously with other agencies. No claim on this account shall be entertained by BSCDCL.

11. PROGRESS REPORTS AND SCHEDULES

The Contractor shall submit to MPMKVVCL and BSCDCL by the third day of every month, three copies of a report duly updated.

The Contractor shall also submit by the end of every month their planning schedule for all items of work for the following month in three copies in an approved proforma to MPMKVVCL and BSCDCL.

12. TESTING AND MEASURNG EQUIPMENTS

The Contractor at their own cost shall procure equipments for measurement of work and testing the installation. The same shall also be made available to BSCDCL without any charge.

13. WATER AND ELECTRIC SUPPLY

BSCDCL will not be responsible for the supply of water and Electric power to the Contractor for execution of work.

14. TESTING / INSPECTION OF MATERIALS

BSCDCL reserves the right to inspect the materials at factory before dispatch. If inspection of equipment at the factory is to be done, 30 days prior intimation should be given in advance. All arrangements for conducting the inspection/testing at the factory shall be the responsibility of the contractor.

The traveling and daily allowance for the 1st inspection at factory will borne by BSCDCL. In case the material/ test is not ready at factory or the test fails during the 1st inspection.

All the materials to be used in and on every part of the works shall be subjected, from time to time, to such tests as BSCDCL may direct. Such tests shall be performed at the expenses of the Contractor. The samples for tests shall be in all cases selected by BSCDCL. If at any time, any material so tested, fails to meet the acceptance criteria, the same shall be removed from the site of works and other materials substituted. But in the absence of any specified test/acceptance criteria, the decision of BSCDCL shall be final and binding as to whether the said material shall be accepted or rejected.

15. PAYMENT TERMS

BSCDCL shall pay to the contractor in the manner specified below for each system of works like Internal/External Electrical system etc.

(A) **FOR SITC ITEMS**

i) 70% of the items on pro rata basis on supply at site, testing and approval by BSCDCL.
ii) 20% of the items on installation and approval by BSCDCL.
iii) 10% of the items on successful commissioning and handing over of the system.

(B) **FOR SUPPLY ITEMS**

i) 80% of the items on pro rata basis on supply at site, testing and approval by BSCDCL
ii) 20% of the items on commissioning of the system and handing over to BSCDCL.

16. CONFORMITY TO IE ACT, IE RULES AND REGULATIOSN

All electrical works shall be carried out under the supervision of MPMKVVCL, Bhopal in accordance with the provisions of Indian Electricity Act-1910, Indian electricity rules – 1956 amended up to date (date of call of tender unless specified otherwise) and th state Electricity Inspectorate.

The works shall also conform to relevant Indian standard Codes of Practice (COP) for the type of work involved.

All materials to be used in work shall be ISI marked.

In all electrical works, relevant safety codes of practices shall be followed.

17. GENRAL REQUIREMENT OF COMPONENTS

Ratings of components

All current carrying components in all installations shall be of appropriate ratings of voltage, current and frequency as required at the respective sections of the electrical installations in which they are used without their respective ratings being exceeded.

Fabrication of panels in a CPRI approved workshop

Unless otherwise specified, PSS/switch boards/LT panels, etc. will be fabricated by a fabricating workshop having CPRI Certificate for short circuit withstand capability and IP. The workshop also should have reasonable quality control, and testing facilities.

Sizing of Equipment based on space available at site.

Notwithstanding the technical specifications and approvals, the contractor has to check, if space available at site for installing the PSS/Electrical Panels etc. is adequate including the maintenance space. The rates for new equipment shall account for shifting of existing equipment as required to create space for the new equipment being installed.
Modification to existing panels/sizing of Equipment based on space available at site.

18. COMPLETION DRAWINGS

On completion of works, the contractor shall submit **four sets** of "As – Built" **Single Line Diagram drawings of the power supply system**, one set reproducible and one set in CAD version in CD to BSCDCL before the submission of the final bill, failing which Rs. 10000.00 recovering shall be made for each system of following works executed as required by BSCDCL.

19. HANDING OVER OF THE SITE

The site will be handed over to MPMKVVCL, Bhopal, contractor should submit the work completion/Handing over certificate form MPMKVVCL before submitting the final bills.

20. DEFECTS LIABILITY PERIOD

Defect liability period for the products supplied & installed at site will be 3 year from the date of completion of the work and Security deposit will be released only after expiry of said defect liability period.

OTHER CONDITIONS-

1. The entire work shall be carried out confirming to relevant Indian standard code of practice and as directed by MPMKVVCL Bhopal/ BSCDCL Engineer-in-Charge as applicable.
2. All material fitting's appliances etc. used in the installation shall confirm to relevant Indian standard specification wherever they exists. in cases where there is not Indian standard available the item shall confirmed to specification approved by Engineer-In- Charge.
3. All Electrical installation shall comply with required Indian electricity Act 1910 as amended and Indian electricity rules 1956 as amended upto date and as per rules and regulation of MP state electricity board and to the requirement of local bodies and electrical inspectorates/ Central electricity Authority.
4. The contractor executing the work will be fully responsible for arranging inspection of the above local authorities as and when required, preparation and submission of drawing as required, getting approval of the work and drawing etc. testing of the installation preparation and submission of test reports with signature of authorized license hold persons, on behalf of BSCDCL No payment of charges will be reimbursed to the contractor for this work. Necessary fees to MP electrical licensing board for getting charging permission shall be paid by contractor for. inspection/ Testing charges/ Supervision Charges/ System strengthening charges shall only be paid by BSCDCL to MP state electricity board.
5. The contractor shall make his own arrangement of site office and store at site for execution of work.

6. The contractor shall finalize the latenderert of work physically at site as per approved drawing and get approved by MP electricity board taking actual measurement for quantities of items before BSCDCL.
7. The contractor should submit the excise gate pass for the equipment / materials supplies at site.
8. All the correspondence with other department like MP electricity board/ central electricity authority/ Mp licensing board etc. will be done by contractor only, though BSCDCL.
9. Payment of the running bill will be made only after rectification of defects if pointed out by any inspecting authority.
10. The contractor will be responsible to hand over the substation/ Lines to MPMKVVCL and submission of charge certificate to BSCDCL.
11. The date of charging of complete installation by MPMKVVCL and handing over of all installation to MPMKVVCL will be treated as date of completion of work.
12. The contractor will be responsible for talking shut down etc. if required, by their own Efforts.
13. The contractor should be responsible for any loss/ theft, if required by their own cost.
14. All the equipments/ accessories/ materials and complete installation shall be guaranteed for the period of two year's from date of charging by MP state electricity board.
15. The contractor shall have to furnish declaration on stamp paper worth Rs. 500/- as per Annexure for related work's.
16. Transformers/ VCBs/ CTs/ PTs and associated item will be inspected/ tested as per IS at works by BSCDCL before dispatch. The above item will be accepted subject to the above specifying.
17. Guarantee against manufacturing defects for 24 months will be given in the name of MPMKVVCL directly by the manufacturer Arranged by the Tenderer.(not in case of fitting)
18. Guarantee/ warrantee offered by the manufacturer shall be given in the name MPMKVVCL be Arranged by the Tenderer.
19. If it found that the contractor has quoted abnormally high rates of the item/ items as compared to the rates as estimated by the BSCDCL, then payment of such items in running bill shall be limited to the rates as estimated by BSCDCL and shall be released at the time of settlement of final bill and also after the execution of necessary item for which contractor has quoted abnormally low rates as compared to the rated as estimated by BSCDCL.

Action and compensation payable in case of Bad work

20. If at any time before the security deposit is refunded to the contractor, it shall appear to the engineer-in-charge or his subordinate in charge of the work that any work has been executed with unsound, imperfect or un skillful workmanship or with material of inferior quality or that any materials or articles provided by him for the execution of the work are unsound or of a quality interior to that contracted four are otherwise not in accordance with the contract, it shall be lawful for the engineer-in-charge to intimate this fact in writing to the contractor and then notwithstanding the fact that the work, materials or articles complained of may have been inadvertently passed, certified and paid for the contractor shall be bound forthwith to rectify, or remove and reconstruct the work so specified in whole or inpart, as the case may require or if so required shall removed the materials or articles so specified and provide other proper and suitable materials or articles at his own proper charge and cost and in the event of his failing to do so within a period to be specified by the engineer-in-charge in written intimation as aforesaid, the contractor shall be liable to pay compensation at the rate of one percent on the amount of the estimate for every day not exceeding ten days, during which the failure so continues and in the case of any such failure the engineer-in-charge may rectify or removed and re-execute the work or removed and replace the materials as described above may be accepted or maybe made use of at reduced rate then in such

cases the engineer-in-charge shall submit detailed proposal for appropriate reduction (preferably supported by an analysis wherever possible) to and obtain this approval expeditiously and accept the same at such reduced rates as approved by the City Engineer.

23 Any sort of accident/fatal/Non fatal to workers or to any person. the entire full liability is on the part of contractor, BSCDCL has not the pay any compensation in this regard.

24 The Contractor should submit completion drawing on tracing cloth and five additional copies of the same showing the position of Metering DP Transformer, panel, earthig stations, cable routes etc. at the time of final bill otherwise deduction of 1/2 percent of total amount of completed contract work will be made from the bill. This condition corresponds to the completion plan of actual work done and the same shall have to be submitted by the contractor after completion of work and before submission of final bill.

25 Rights to increase or decrease work- The competent authority reserves the right to increase or decrease work.

26 The competent authority reserves the right to increase or decrease any item of the work during the currency of the contract and the contractor will be bound to comply with the order of the competent authority without any claim for compensation.

1 .

a) To rescind the contract and in which case the security deposit of the contractor shall stand forfeited and be absolutely at the disposal of BSCDCL.

b) To employee labour paid in the PWD/Irrigation/PHE department or by employing departmental machinery and to supply materials to carry out work or any part of work debiting the contractor with the cost of the labour or hire charge of departmental machinery and the price of the materials and crediting him with the value of the work done in all respects in the same manner and the same rate as if had been carred out by the contractor undr the terms of this contract or the cost of the labour certificate of the divisional officer as to the value of the work done shall be final and conclusive against the contractor. this does not qualify the contractor to any refund if the work is carried out at lower rates than the rates quoted by the contractor saving if any will go to the BSCDCL Bhopal.

c) To measure up the work the contractor and to take such part there of as shall be unexecuted out of his hand and to give it to another contractor to complete in such case any expenses which may by incurred in excess of the sum such would have been paid to the original contractor if the whole work had been executed by him shall be borne and paid by the original or any other contract with BSCDCL or otherwise or from his security deposit or the proceeds of sale thereof or a sufficient part thereof if the work is carried out at lowe rated the contractor shall not be entitled for any refund on the account saving, if any which shall go to the BSCDCL

Alterations in specification and Designs-

1 The engineer-in-charge shall have power to make any alterations in omissions from additions to substitution for the original specification drawings designs and instructions that may appear to him to be necessary or advisable during the progress of the work and the contracted shall be bound to carry out work in accordance with any instructions which may be given to him in writing signed by the engineer-in-charge and such alternations omissions additions or substitutions shall not invalidate the contract and any above specified as part of the work shall be carried out by the contractor on the same condition in all respects on such he afreed to do the main work and at the same rates as are specified in the tender for the main work.

2 Quantities shown in the tender are approximate and no claim shall be enertained for quantities or work executed being either more or less than those entered in the tender or estimate.

27 No compensation shall be allowed for any delay caused in the starting of the owrk on account of acquisition of land or in the case of clearance work on account of any delay in according sanction to estimates.

28 The submission of tender by tenders shall imply that he has read the Tender Notice , each and every word of this tender document, has understood its contents and scope of work within the meaning of technical and legal aspects has seen the site and has made self aware of the standard and procedure to be followed in this work.

29 The tender notice shall mean only an invitation extended to the contractor for making offer. it does not amount to an offer or proposal.

30 All works shall be carried out in strict accordance to the norms, procedure and specifications issued and enforced by BIS in relevant Indian standard specifications and code of practices with up to date amendments and revisions. latest editions of National Building code and National Electric code, In additions the installation shall comply in all respects with the equipments of Indian. Electricity Act 1910 and Indian Electricity rule 1956 with up to date amendments and revisions and special requirement if any of the M.P. Madhya KshetraVidyut Company or chief electrical advisor to Government of Madhya Pradesh cum Chief Electrical Inspector and his subordinate office.

31 For certain items RATES ONLY have called for, in schedule of item, without mentioning their quantities. These items may, or not required for execution, In case, any or all these items are required to be executed under this contract, the same shall have to be executed for the quantities and on the rates to be decided as below:

(a) Rates for any item falling under this category shall be the average, of rates tendered by all tenders for respective individual item. In case, the derived average rate is more than the tendered rate of approved tenders the lesser/lower rate shall be approved and make applicable for payment under this contract.

(b) Quantities of all items falling under this category shall be as per requirement and up to any extent.

32. The successful tenders has to construct at his own cost his site office and store at site on a suitable place and locations as permitted by BSCDCL shall not provide any place or room in the building under constructions for storage of equipments required for work. No amount shall be paid to the contractor in this regard.

33. Proper upkeep, maintenance, security and safety of stores and stocks of materials brought at site installed/laid at site shall be the responsibility of the contractor. The materials got damaged due to negligence for its up keeping at site or due to mishandling at the time of installation/laying. shall have to be replaced by the contractor at his own cost. On discovery of such damages the BSCDCL shall recover the amount paid through the running bills to the contractor which shall only be reimbursed after the replacement of the same. The BSCDCL shall also not be responsible for theft of materials from site and the contractor has to replace all such materials at his own cost, No compensations whatsoever shall be payable to the contractor on above grounds.

34. The successful tenderer shall note that during the execution of works there is likelihood of additions of such items or works which are not included in the schedule of items annexed with this tender document for which the tenderers has not tendered his rates, for such items analysis and proposed rates shall be prepared and submitted by contractor

with all supporting documents which shall be scrutinized and decided by the tender accepting authority and shall be final and binding on the contractor. The quantum of such work will not more than 25% of contract amount shall depend upon the mutual agreement by the contractor and the BSCDCL.

35. The successful tenderer shall not. without the prior approval of the competent authority in writing sublet or assign to any other party, or parties, the whole or any portion of the work under contract. Even if such approval is granted the contractor shall not be relieved of any obligation of duty or responsibility which he undertakes under this contract.

36. All dues regarding taxed, including sales tax, service tax, octroi duties etc, levied by Government or Local Bodies or private individuals on the contractor, in connection with the after said work executed by the BSCDCL will be payable by the contractor, the BSCDCL will grant a certificate for the quantities actually used on the work, but will not entertain any claim on this account.

37. The successful tenderer shall finalize the latenderert of work, physically at site, and get it approved by MPMKVVC before placing orders for material. approval of above latenderert by MPMKVVC shall be general and shall not absolve the contractor with responsibility of its correctness.

38. The successful tenderer shall within 15 (fifteen) days from the date of issue of work order shall prepare and submit all relevant drawing and details for the work to be forwarded to the concerned office of MPMKVVC and to the office of Chief Electrical advisor to Government of Madhya Pradesh cum electrical inspector or its concerned subordinate office or any other competent office for approval. All required sanctions and approvals from the offices shall have to be obtained by the successful tenderer at his own cost and effort within the above stipulated period. the successful tenderer may however procure material at site within the context of clause

39. The decision of City Engineer for specific make of item to be supplied and installed at site from the list of approved make of materials shall be final and binding on the contractor. Before placing the orders for materials the successful tenderer shall get approval of the specific makes of every item by the City Engineer BSCDCL.

40. Rate quoted shall be applicable for works at all height unless otherwise specified in the schedule of quantities.

41. The successful tenderer shall afford all reasonable facilities and cooperation to the various other agencies and contractors working at the site simultaneously, so that the entire work can be preceded smoothly to the successful completion.

42. The successful tenderer shall submit the drawings to BSCDCL for this work duly approved by the office of the chief electrical advisor to the Government of Madhya Pradesh and its concerned subordinate office or concerned offices of MPMKVVC with in 15 days form the date of work order. The approval of theses drawing will be general and will not absolve the contractor of the responsibility of the correctness of these drawings. At least 5 sets/copies of the approved drawing shall be supplied to the City engineer BSCDCL for its distribution to various agencies at site. at no cost.

43. The successful tenderer shall submit manufacturer's test report and drawings of the equipments to be supplied, for approval of the City engineer before supplying the equipment. The successful tenderer shall also submit the purchase bills of major items as required and directed at no cost.

44. (A

45. It shall be the duty of the contractor.

    a. To arrange all clearances form Chief electrical advisor to Govt. of Mp. cum chief electrical inspector or from his subordinate office.Contractor should obtain NOC from MPKVVCL to carry out the work in case if they are not registered contractor of MPKVVCL

b. To coordinate and peruse the offices of MPMKVVC and office of the chief Electrical Advisor to Govt. of M.P. cum chief electrical inspector/VidyutAnugyapanMandal for periodical inspections during the currency of contract.

c. and to arrange final inspection of the work and get the complete installation handover to MPMKVVC and get it electrically charged in presence of MPMKVVCL representative.

d. All the dismantled material (including poles conductor,cables DP structure transrformers etc.) to be deposited in MPMKVVCL store as per MPMKVVCL return schedule and Receipt is to be produced before final payments.

No Extra payment shall be made to the contractor in above account.

1 TECHNICAL SPECIFICATION FOR MAINTENANCE FREE OUTDOOR 11 KV RING MAIN UNIT SWITCHGEAR

1.1 GENERAL:

1.1.1 All equipment and material shall be designed manufactured and tested in accordance with the latest applicable IEC standard.

1.1.2 Equipment and material conforming to any other standard, which ensures equal or better quality, may be accepted. In such case copies of English version of the standard adopted shall be submitted.

1.1.3 The electrical installation shall meet the requirement of Indian Electricity Rules-1956 as amended up to date; relevant IS code of practice and Indian Electricity Act-1910. In addition other rules and regulations applicable to the work shall be followed. In case any discrepancy the most stringent and restrictive one shall be binding.

1.1.4 The high-tension switchgear offered shall in general comply with the latest issues including amendments of the following standards but not restricted to them.

1.2 SCOPE

Design, Engineering, Manufacture, assembly, Stage testing, inspection and testing before supply and delivery at site, Erection, Installation, testing & Commissioning of Ring Main units outdoor type SF6 filled , with various combinations of load break isolators & breakers.

The RMUs should be provided with necessary take off terminal units for future automations and all these units should be shielded in a outdoor metal-body for making them suitable for outdoor use. The insulation/dielectric media inside the stainless steel welded tank should be SF6 gas. The RMUS should be of **extensible type on both sides** with provision of attaching/connecting with SNAP FIT arrangement W/o External Busbars additional load break switches and circuit breakers **in future whenever required.** Alternatively Extension shall be possible by adding trunking chambers and required accessories or by plug-in bushing type arrangement.

Configurations Required:-

a) 2-Way , 11KV Gas (SF6) Insulated RMU with One 630A load break switches and One SF6 Insulated VCB of suitable rating –3-way , 11KV,Gas (SF6) Insulated RMU with 2Nos 630A load break switch and 1No. SF6 insulated VCB of suitable rating –

b) 4-way ,11KV Gas (SF6) Insulated RMU with 2Nos 630A Load break switches and 2Nos , SF6 Insulated VCB of suitable rating –

PLS NOTE : THE NOMINAL CURRENT RATING OF VCB SHALL BE ACCORDING TO LOAD OF THE FEEDER AND ACCORDINGLY SUITABLE RELAY SHALL BE PROVIDED .

1.2.1 This Specification provides for design, manufacture, inspection and testing before dispatch, packing and delivery F.O.R.(Destination) of SF6 insulated RMUs with necessary take off terminal units for future automations, other accessories and auxiliaries equipments and mandatory spares, described herein and required for their satisfactory operation.

1.2.2 The objective of the RMUs is for extremely small construction width, compact, maintenance free, independent of climate, easy installation, operational reliability, Safe and easy to operate, minimum construction cost, minimum site work and minimum space requirement.

1.2.3 The RMUs shall conform in all respects to high standards Of Engineering design, workmanship and latest revisions of relevant standards at the time of offer.

1.2.4 The type of the 11 KV circuit breaker shall be VCB and insulating medium for load break isolators, Earth switch, 11 KV Buses and other associated equipments should be SF6 gas.

1.3 GENERAL

The Ring Main Unit shall be installed at 11 KV junction points to have continuous supply by isolating faulty sections. The RMU shall be extensible on both sides and consists of the following combinations of load break switches and Circuit breakers for a nominal voltage of 12 KV using SF6 gas as insulating and Vacuum as arc quenching medium.

The RMU and combination shall be tropicalised and outdoor metal enclosed type. The RMU metal parts shall be of high thickness, high tensile steel which must be grit/short blasted, thermally sprayed with Zinc alloy, phosphate or should follow the 7 tank pre-treatment process and be subsequently painted with polyurethane based powder paint. The overall paint layer thickness shall be not less than 80 microns.

Relevant IE rules for clearances, safety and operation inside the enclosure shall be applicable. The enclosure shall be IP 54 and type tested for weather proof at EREDA/CPRI.

All live parts except for the cable connections in the cable compartments shall be insulated with SF6 gas. The SF6 gas tank shall be made of TIG or MIG or Laser welded stainless steel, to have the best weld quality or It shall be metallised resin cast construction. The gas cubicle shall be metal enclosed with stainless steel of minimum 2 mm thickness and should be provided with a pressure relief arrangement away from operator.Both the load break switches and the tee off circuit breaker shall be suitable for motorization in future.The cable box of isolators and circuit breakers both should be of front/side/rear access type as per site requirement.

Any accidental over pressure inside the sealed chamber shall be limited by the opening of a pressure-limiting device in the top or rear-bottom part of the tank or enclosure. Gas will be release to the rear of the switchboard away from the operator and should be directed towards the bottom, into the trench to ensure safety of the operating personnel and the pedestrians / civilians. All the manual operations should be carried out on the front of the switchboard.

The Entire units or minimum three functions of RMU shall be enclosed in a single compact metal clad, outdoor enclosure suitable for all weather conditions. The switchgear/steel gas tank shall be filled with SF6 as per IEC/IS Standards relative pressure to ensure the insulation and breaking functions. The steel gas tank must be sealed for life and shall meet the "sealed pressure system" criteria in accordance with the IEC 298 standard. The RMU must be a system for which no handling of gas is required throughout the 20 years of service life.

The RMU shall have a design such that in the event of an internal arc fault, the operator shall be safe. This should be in accordance with IEC 298 and relevant Test certificates shall be submitted with the Tender.

1.3.1 The RMU shall be tested for an internal arc rating of 20 kA for 1 Sec.

Suitable temperature rise test on the RMU shall be carried out & test reports shall be submitted with tender for technical bid evaluation.

Each switchboard shall be identified by an appropriately sized label, which clearly indicates the functional units and their electrical characteristics.

The switchgear and switchboard shall be designed so that the position of the different devices is visible to the operator on the front of the switchboard and operations are visible as well

The entire system shall be totally encapsulated. There shall be no access to exposed conductors. In accordance with the standards in effect, the switchboards shall be designed so as to prevent access to all live parts during operation without the use of tools.

The entire 11 KV RMU are insulated by inert gas (SF6) suitable for operating voltage up to 12 KV respectively. The 11 KV circuit breakers must be VCB breaker. It is necessary to fit an absorption material in the tank to absorb the moisture from the SF6 gas. The SF6 insulating medium shall be constantly monitored via a temperature compensating gas pressure indicator offering a indication at different temperature ranges, having distinctive RED and GREEN zones for safe operation.

All the RMUs must be routine tested for the following at factory in India:-

- Micro-ohm test for the assembly inside the tank.
- Circuit breaker analyzer test so as to ensure the simultaneous closing of all poles for VCB.
- SF6 gas leak test.

- Partial Discharge test on the complete gas tank so as to be assure of the proper insulation level and high product life.
- High voltage withstand.
- Secondary test to ensure the proper functioning of the live line indicators, fault passage indicators and relays.

1.3.2 Sulphur Hexa fluoride Gas (SF6 GAS)

The SF6 gas shall comply with IEC 376,376A,and 376B and shall be suitable in all respects for use in 11 KV RMUs under the operating conditions. The SF6 shall be tested for purity, dew point air hydrolysable fluorides and water content as per IEC 376,376A and 376B and test certificate shall be furnished to the owner indicating all the tests as per IEC 376 for each Lot of SF6 Gas.

1.4 STANDARDS

Unless otherwise specified elsewhere in this Specification, the RMU, Switchboard (Switchgear), Load break isolators, Instrument Transformers and other associated accessories shall conform to the latest revisions and amendments there of to the following standards.

1. IEC 60 298/IEC 62 271-200/IS 12729:1988 - General requirement for Metal Enclosed Switchgear
2. IEC60129/IEC62271-102/IS 9921 - Alternating current disconnector's (Load break isolators) and earthing switch
3. IEC 62 271-100 & 200/IEC 60 056/IS 13118:1991 - Specification for alternating current circuit breaker
4. IEC 62 271-1/IEC 60694 - Panel design, SF6/Vacuum Circuit Breakers
5. IEC 60044-1/IEC 60185/IS 2705:1992 - Current Transformer
6. IEC 60265/IS 9920:1981- High voltage switches.
7. IEC 376 - Filling of SF6 gas in RMU.
8. IEC 60273/IS :2099 - Dimension of Indoor & Outdoor post insulators
   i. with voltage > 1000 Volts.
9. IEC 60529/IS 13947(Part-1) - Degree of protection provided by
   i. enclosures for low voltage switchgear and
   ii. control gear.
10. Indian Electricity Rules/IS Code

Equipment meeting with the requirements of any other authoritative standards, which ensures equal or better quality than the standard mentioned above shall also be acceptable. If the equipments, offered by the Bidder conform to other standards, salient points of difference between the standards adopted and the specific standards shall be clearly brought out in relevant schedule. In case of any difference between provisions of these standards and provisions of this specification, the provisions contained in this specification shall prevail. One copy of such standards with authentic English Translations shall be furnished along with the offer.(Hard copy)

1.5 **THE STANDARDS MENTIONED ABOVE ARE AVAILABLE FROM:**

IEC - (INTERNATIONAL ELECTRO-TECHNICAL COMMISSION, BUREAU CENTRAL DE LA COMMISSION, ELECTRO TECHNIQUE INTERNATIONAL, 1, RUE DE VEREMBE, GENEVA, SWITZERLAND.)

ISO - INTERNATIONAL STANDARD ORGANISATION

1.6 **SPECIFIC REQUIREMENTS IN RMU:-**

1.6.1 CLIMATE CONDITIONS

The climatic conditions under which the equipment should operate satisfactory are as under:

- Maximum ambient air temperature :50 deg. C
- Minimum ambient air temperature :10 deg C
- Maximum humidity :100%
- Average annual rainfall(mm) :925
- Seismic level(Horizontal accn.) :0.3 g
- Iso-ceraunic level(Day per Year) Average thunder storm days per annum :50

1.7 **RMU OUTDOOR METAL CLAD ENCLOSURE.**

The RMU enclosure must be a metallic, it shall follows an industrialized process of manufacturing**.** The RMU and combination shall be tropicalised and outdoor metal enclosed type. The RMU metal parts shall be of high thickness, high tensile steel which must be grit/short blasted, thermally sprayed with Zinc alloy, phosphate or should follow the 7 tank pre-treatment process and be subsequently painted with polyurethane based powder paint. The overall paint layer thickness shall be not less than 80 microns.

The rating of enclosure shall be suitable for operation on three phase, three wire, 11KV, 50 cycles, A.C. System with short-time current rating of 20KA for 3 seconds with RMU Panels.

The enclosure should have two access doors one for the operation and relay monitoring and other for the cable access. Both the doors should have the locking facility to prevent the access to operating mechanism to avoid unauthorized operating of RMU and relay.

1.8 TAKE OFF TERMINAL UNITS FOR AUTOMATION:

The RMU should be provided with necessary take off terminal units for automations, located in the front recesses / LV cubical of the RMU. The connectivity to the FRTU for SCADA purpose shall be provided

1.9 ISOLATORS (LOAD BREAK TYPE)

The load break isolators for Incoming and Outgoing supply must be provided. These should be fully insulated by SF6 gas. The load break isolators shall consist of 630 Amp fault making/load breaking spring assisted ring switches, each with integral fault making earth switches. The switch shall be naturally interlocked to prevent the main and earth switch being switched 'ON' at the same time. The selection of the main and earth switch is made by a lever on the facia, which is allowed to move only if the main or earth switch is in the off position. The load break isolators should have the facility for future remote operation. Each load break switch shall be of the triple pole, simultaneously operated, non automatic type with quick break contacts and with integral earthing arrangement.

The isolating distance between the OFF and the ON position in the isolator should be sufficient to withstand dielectric test as per IS/IEC, so as to have enough isolating distance for ensuring safety during DC injection for Cable testing.

Amp fault making/load breaking spring assisted ring switches, each with integral fault making earth switches. The switch shall be naturally interlocked to prevent the main and earth switch being switched 'ON' at the same time. The selection of the main and earth switch is made by a lever on the facia, which is allowed to move only if the main or earth switch is in the off position. The load break isolators should have the facility for future remote operation. Each load break switch shall be of the triple pole, simultaneously operated, non automatic type with quick break contacts and with integral earthing arrangement.

The isolating distance between the OFF and the ON position in the isolator should be sufficient to withstand dielectric test as per IS/IEC, so as to have enough isolating distance for ensuring safety during DC injection for Cable testing.

1.10 EARTHING OF ISOLATORS AND BREAKERS (EARTH SWITCH)

Necessary arrangements are provided at Load break isolators Breaker for selecting Earth position. Mechanical interlocking systems shall prevent the RMU function from being operated from the 'ON' to 'Earth On' position without going through the 'OFF' position.

1.11 DISTRIBUTION TRANSFORMER/FEEDER BREAKER (VACUUM)

The VCB breaker for the controlling of DT/Feeder Breaker must be provided inside welded stainless steel SF6 gas tank with the outdoor metal clad enclosure.

The VCB circuit breaker must be a spring assisted three positions with integral fault making earth switch. The selection of the main/earth switch lever on the facia, which is allowed to move only if the main or earth switches is in the off position.

The manual operation of the circuit breaker shall not have an effect on the trip spring. This should only be discharged under a fault (electrical) trip; the following manual reset operation should recharge the trip spring and reset the circuit breaker mechanism in the main off position.

The circuit breaker shall be fitted with a mechanical flag, which shall operate in the event of a fault (electrical) trip occurring. The 'tripped' flag should be an unambiguous colour differing from any other flag or mimic.

Both the circuit breaker and ring switches are operated by the same unidirectional handle.

The protection on the circuit breaker shall comprise of the following components:-

- 3 class X protection CT's,
- a low burden trip coil and
- a self powered (No external DC or AC source required) IDMT protection relays (Numeric/Micro processor based) 3 x over current and earth fault element shall be Definite Time type relay . The protection system should be suitable for protecting transformers of rated power from 250 KVA on wards. The relay should be housed within a pilot cable box accessible

1.12 BUSHINGS

The units are fitted with the standardized bushings that comply with IEC standards. All the bushings are the same height from the ground and are protected by a cable cover.

1.13 CABLE BOXES

All the cable boxes shall be air insulated suitable for dry type cable terminations and should have front / rear/side access. The cable boxes at each of the two ring switches should be suitable for accepting HV cables of sizes 3c x 300/3c x

120 sq.mm and circuit breaker cable suitable up to 3c x 120 sq.mm. The cable boxes for an isolator in it's standard design should have sufficient space for connecting two cables per phase. Necessary Right angle Boot should be supplied to the cable terminations .***The type of the Right angle Boot should be cold applied insulating Boot.***

1.14 CABLE TESTING FACILITY

It shall be possible to test the cable after opening the cable boxes. The cable boxes should open only after operation of the earth switch. Thus ensuring the earthing of the cables prior to performing the cable testing with DC injection.

1.15 VOLTAGE INDICATOR LAMPS AND PHASE COMPARATORS

The RMU shall be equipped with a voltage indication to indicate whether or not there is voltage on the cable. There should be a facility to check the synchronization of phases with the use of external device. It shall be possible for the each of the function of the RMU to be equipped with a permanent voltage indication as per IEC 601958 to indicate whether or not there is voltage on the cables.

1.16 EXTENSIBLE

Each combination of RMU shall have the provision for extension by load break isolators / breakers in future, with suitable accessories and necessary Bus Bar. The equipment shall be well designed to provide any kind of extension / trunking chamber for connecting and housing extensible Busbars. Extensible isolators and circuit breakers shall be individually housed in separate SF6 gas enclosures. Multiple devices inside single gas tank / enclosure will not be acceptable. In case of extensible circuit breakers, the Breaker should be capable of necessary short circuit operations as per IEC at 20 KA, and the Breaker should have a rated current carrying capacity of 200 A.

1.17 WIRING & TERMINALS:

The wiring should be of high standard and should be able to withstand the tropical weather conditions. All the wiring and terminals (including take off terminals for future automation, DC, Control wiring), Spare terminals shall be provided by the contractor. The wiring cable must be standard single-core non-sheathed, Core marking (ferrules), stripped with non-notching tools and fitted with end sleeves, marked in accordance with the circuit diagram with printed adhesive marking strips.

The wiring should be of high standard and should be able to withstand the tropical weather conditions. All wiring shall be provided with single core multi-strand copper conductor wires with P.V.C insulation.

The wiring shall be carried out using multi-strand copper conductor super flexible PVC insulated wires of 650/1100V Grade for AC Power, DC Control and CT circuits. Suitable colored wires shall be used for phase identification and interlocking type ferrules shall be provided at both ends of the wires for wire identification. Terminal should be suitably protected to eliminate sulphating. Connections and terminal should be able to withstand vibrations. The terminal blocks should be stud type for controls and disconnecting link type terminals for CT leads with suitable spring washer and lock nuts.

Flexible wires shall be used for wiring of devices on moving parts such as swinging Panels (Switch Gear) or panel doors. Panel wiring shall be securely supported, neatly arranged readily accessible and connected to equipment terminals, terminal blocks and wiring gutters. The cables shall be uniformly bunched and tied by means of PVC belts and carried in a PVC carrying trough.

The position of PVC carrying trough and wires should not give any hindrance for fixing or removing relay casing, switches etc., Wire termination shall be made with solder less crimping type of tinned copper lugs. Core identification plastic ferrules marked to correspond with panel wiring diagram shall be fitted with both ends of each wire. Ferrules shall fit tightly on the wire when disconnected. The wire number shown on the wiring shall be in accordance with the IS.375.

All wires directly connected to trip circuits of breaker or devices shall be distinguished by addition of a red color unlettered ferrule.

Inter-connections to adjacent Panels (Switch Gear) shall be brought out to a separate set of Terminal blocks located near the slots or holes to be provided at the top portion of the panel. Arrangements shall be made for easy connections to adjacent Panels (Switch Gear) at site and wires for this purpose shall be provided and bunched inside the panel. The bus wire shall run at the top of the panel. Terminal block with isolating links should be provided for bus wire. At least 10% of total terminals shall be provided as spare for further connections. Wiring shall be done for all the contacts available in the relay and other equipment and brought

out to the terminal blocks for spare contacts. Color code for wiring is preferable in the following colours.

□	Voltage supply	Red, Yellow, Blue for phase and Black for Neutral
□	CT circuits	similar to the above
□	DC circuits	Grey for both positive and negative
□	250V AC circuits	Black for both phase and neutral
□	Earthing	Green

The wiring shall be in accordance to the wiring diagram for proper functioning of the connected equipment. Terminal blocks shall not be less than 650V grade and shall be piece-molded type with insulation barriers.

The terminal shall hold the wires in the tight position by bolts and nuts with lock washers. The terminal blocks shall be arranged in vertical formation at an inclined angle with sufficient space between terminal blocks for easy wiring.

The terminals are to be marked with the terminal number in accordance with the circuit diagram and terminal diagram. The terminals should not have any function designation and are of the tension spring and plug-in type.

External box in RMU shall be provided for installing FRTU. The Aux supply will be taken through the PT provided for metering in RMU. The PT must have sufficient burden for meeting the aforesaid requirement also for battery charging.

1.18 EARTHING

The RMU outdoor metal clad, Switch Gear, Load break isolators, Vacuum circuit breakers shall be equipped with an earth bus securely fixed along the base of the RMU.

The size of the earth bus shall be made of IEC/IS standards with tinned copper flat for RMU and M.S.Flat for Distribution Transformer, earth spike and

neutral earthing. Necessary terminal clamps and connectors shall be included in the scope of supply.

All metal parts of the switchgear which do not belong to main circuit and which can collect electric charges causing dangerous effect shall be connected to the earthing conductor made of copper having CS area of minimum 75 mm□. Each end of conductor shall be terminated by M12/equivalent quality and type of terminal for connection to earth system installation. Earth conductor location shall not obstruct access to cable terminations.

The following items are to be connected to the main earth conductor by rigid or copper conductors having a minimum cross section of 75 mm□ (a) earthing switches (b) Cable sheath or screen (c) capacitors used in voltage control devices, if any.

The metallic cases of the relays, instruments and other panel mounted

Equipment's shall be connected to the earth bus by independent copper wires of size shall be made of IEC/IS standards. The colour code of earthing wire shall be green. Earthing wires shall be connected on the terminals with suitable clamp connectors and soldering shall not be permitted.

1.19 ACCESSORIES & SPARES:

The following spares and accessories shall be supplied along with the main equipments at free of costs. This shall not be included in the price schedule.

1. Charging lever for operating load break isolators & circuit breaker of each RMU.
2. The pressure gauges indications – 1 numbers

Provision shall be made for padlocking the load break switches/ Circuit breaker, and the earthing switches in either open or closed position with lock & master key.

1.20 TESTING OF EQUIPMENT & ACCESSORIES:

Provision for testing CTs,PTs, Relays, Breakers and Cables shall be made available. Procedure and schedule for Periodical & Annual testings of equipments, relays, etc. shall be provided by the supplier.

1.20.1 TYPE TEST

The Tenderers should, along with the tender documents, submit copies of all Type test certificate of their make in full shape as confirming to relevant ISS/IEC of latest issue obtained from a International/National Govt. Lab/Recognized laboratory.

The above type test certificates should accompany the drawings for the materials duly signed by the institution who has type test certificate. The details of type test certificate as per Schedule F.

1.20.2 ACCEPTANCE AND ROUTINE TESTS

All acceptance and routine tests as stipulated in the latest IEC- shall be carried out by the supplier in the presence of Board's representative. The supplier shall give at least 7 days advance intimation to the Board to enable them to depute their representative for witnessing the tests. The partial discharge shall be carried out as routine test on each and every completely assembled RMU gas tank and not on a sample basis. As this test checks and guarantees for the high insulation level and thus the complete life of switchgear.

1.20.3 ADDITIONAL TESTS

The Board reserves the right for carrying out any other tests of a reasonable nature at the works of the supplier/laboratory or at any other recognized laboratory/research institute in addition to the above mentioned type, acceptance and routine tests at the cost of the Board to satisfy that the material complies with the intent of this specification.

1.20.4 PRE-COMMISSIONING TESTS

All the pre-commissioning tests will be carried out in the presence of the Board testing engineer and necessary drawing manual and periodical test tools shall be arranged to be supplied.

During the above tests the contractor's representative should be present till the RMUs are put in to service.

1.21 INSPECTION:

The inspection may be carried out by the Board at any stage of manufacture. The supplier shall grant free access to Board's representative at a reasonable time when the work is in progress. Inspection and acceptance of any equipment under this specification by the Board shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective.

The supplier shall keep the Board informed in advance, about the manufacturing programme so that arrangement can be made for inspection. The Board reserves the right to insist for witnessing the acceptance/routine testing of the bought out items. The Board has rights to inspect the supplier's premises for each and every consignment for type & routine test.

No material shall be dispatched from its point of manufacture unless the material has been satisfactorily inspected and tested / unless the same is waived by the Board in writing.

1.21.1 QUALITY ASSURANCE PLAN:

The bidder shall invariably furnish following information along with his offer / in case of event of order.

I. Statement giving list of important raw materials including but not limited to a) Contact material

b) Insulation

c) Sealing material

d) Contactor, limit switches, etc. in control cabinet.

Name of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of test normally carried out on raw materials in presence of Bidder's representative, copies of test certificates.

II. Information and copies of test certificates as in (i) above in respect of bought out accessories.

III. List of areas in manufacturing process, where stage inspections are

IV. normally carried out for quality control and details of such tests and inspections.

V. Special features provided in the equipment to make it maintenance free.

VI. List of testing equipment available with the Bidder for final testing of RMUs and associated combinations vis-à-vis the type, special, acceptance and

routine tests specified in the relevant standards. These limitations shall be very clearly brought out in the relevant schedule i.e. schedule of deviations

from specified test requirements. The supplier shall, within 15days from the date of receipt of Purchase Order submit following information to the Board.

a) List of raw materials as well bought out accessories and the names of sub-suppliers selected from those furnished along with offer.

b) Necessary test certificates of the raw material and bought out accessories.

c) Quality Assurance Plan (QAP) with hold points for Board's inspection. The quality assurance plan and hold points shall be discussed between the Board and supplier before the QAP is finalized.

The supplier shall submit the routine test certificates of bought out items and raw material, at the time of routine testing of the fully assembled breaker.

1.22 **TRAINING:**

The supplier shall give rigorous training to the engineers & staff for 2 days in attending trouble shooting and maintenance .

1.23 **SCADA CONNECTIVITY:**

Provision shall be made in all the RMUs with necessary take off terminal units for automations and connectivity with FRTU. Space for motorization wherever required for SCADA operation should be provided

1.24 **DOCUMENTATION and DRAWINGS**

All drawings shall conform to relevant International Standards Organization (ISO) Specification. All drawings shall be in ink and suitable for microfilming.

The tenderer shall submit along with his tender dimensional general arrangement drawings of the equipments, illustrative and descriptive literature in triplicate for various items in the RMUs which are all essentially required for future automation.

I. Schematic diagram of the RMU panel

II. Instruction manuals

III. Catalogues of spares recommended with drawing to indicate each items of spares

IV. List of spares and special tools recommended by the supplier.

V. Copies of Type Test Certificates as per latest IS/IEC.

VI. Drawings of equipments, relays, control wiring circuit, etc.

VII. Foundation drawings of RMU and D.T.Structure.

VIII. Dimensional drawings of each material used for item Vii.

IX. Actual single line diagram of RMU/RMUs with or without Extra combinations shall be made displayed on the front portion of the RMU so as to carry out the operations easily.

The following should be supplied to each consignee circle/town along with the initial supply of the equipments ordered.

a. Copies of printed and bound volumes of operation, maintenance and erection manuals in English along with the copies of approved drawings and type test reports etc.

b. Sets of the manuals as above shall be supplied to the Dy. Chief General Manager (UP). A soft copy of the all Technical and Drawing furnished in a CD.

1.25 **NAME PLATE:**

Each RMU and its associated equipments shall be provided with a nameplate legible and indelibly marked with at least the following information.

a. Name of manufacturer
b. Type, design and serial number
c. Rated voltage and current
d. Rated frequency
e. Rated symmetrical breaking capacity
f. Rated making capacity
g. Rated short time current and its duration
h. Purchase Order number and date
i. Month and Year of supply
j. Rated lighting impulse withstand voltage
k. Feeder name (Incoming and Outgoing), DTs Structure name,

I) THE WORD RATED NEED NOT APPEAR ON THE NAME PLATE. RECOGNIZED ABBREVIATIONS MAY BE USED TO EXPRESS THE ABOVE PARTICULARS.

II) WHETHER THE CIRCUIT B REAKER IS FITTED WITH CLOSING/TRIPPING DEVICES NECESSITATING AN AUX ILIARY

SUPPLY SHALL BE STATED EITHER ON THE CIRCUIT BREAKER NAME PLATE OR ANY OTHER ACCEPTABLE POSITION.

1.26 **FAULT PASSAGE INDICATORS (FPI):**

These shall facilitate quick detection of faulty section of line. The fault

indication may be on the basis of monitoring fault current flow through the device. The unit should be self-contained requiring no auxiliary power supply. The FPI shall be integral part of RMU. The FPI shall have ***LCD/LED display***, automatic reset facility.

The sensors to be bushing mounted. The number of FPI should be put in all the three phases of the outgoing branch of the RMUs

FPI should have suitable connectivity with the FRTUs for the SCADA purpose.

1.27 **TROPICALISATION:**

Due regard should be given to the climatic conditions under which the equipment is to work. Ambient temperature normally vary between 20 □C and 32 □C, although direct sun temperature may reach 50 □C. The climate is humid and rapid variations occur, relative humidity between 60% and 90% being frequently recorded, but these values generally correspond to the lower ambient temperatures. The equipment should also be designed to prevent ingrees of vermin, accidental contact with live parts and to minimize the ingress of dust and dirt. The use of materials which may be liable to attack by termites and other insects should be avoided.

1.28 **Motorisation:**

All the functions within the RMU i.e Isolators/Breakers should be fitted with motor mechanism and closing coil making it suitable to make it on from remote.

Other Accessories (required with RMU) :-

a) Shunt Trip Coil (Coil voltage shall be indicated later on)

b) Battery & Battery Charger.

c) 4NO+4NC auxiliary contacts.

1.29 **Metering:**

Multifunction Energy meter shall be provided with, of accuracy class of 0.5 at incoming isolator of all RMUs. The Metering CTs and PTs of suitable rating shall be provided.

1.30 **TECHNICAL SPECIFICATION FOR RMU**

1.30.1 11KV Bus Bar

I.	Current Carrying Capacity	: *630 Amps.*
II.	*Short time rating current for 3 secs.*	*: 20 KA*
III.	*Insulation of bus bar*	*: SF6*
IV.	*Bus bar connections*	*: Anti-oxide grease*

2 TECHNICAL SPECIFICATIONS FOR 33 kV, 3 WAY RMU

2.1 GENERAL:

2.1.1 All equipment and material shall be designed manufactured and tested in accordance with the latest applicable IEC standard.

2.1.2 Equipment and material conforming to any other standard, which ensures equal or better quality, may be accepted. In such case copies of English version of the standard adopted shall be submitted.

2.1.3 The electrical installation shall meet the requirement of Indian Electricity Rules-1956 as amended up to date; relevant IS code of practice and Indian Electricity Act-1910. In addition other rules and regulations applicable to the work shall be followed. In case any discrepancy the most stringent and restrictive one shall be binding.

2.1.4 The high-tension switchgear offered shall in general comply with the latest issues including amendments of the following standards but not restricted to them.

2.2 IEC IS Description

60694: 12729 Common clauses for high-voltage switchgear and control standards (for voltages exceeding 1000 V).

62271-200: A.C. Metal-enclosed switchgear and control gear

60129: Alternating current disconnectors (isolators) and earthing switches

60529: 13947 Classification of degrees of protection provided by enclosures

-IP 67 for tank with high voltage components

-IP 3X for the front covers of the mechanism

-IP 3X for the cable connection covers

-IP 54 for the outdoor enclosure (kiosk)

60265: High voltages switches Part 1

62271-100: 13118 High Voltage AC Circuit Breakers, General Requirement.

6005:Colour for ready mixed paints and enamels, Code of practice for phosphating of iron and steel,

60044-1: Current Transformers

60044-1 Voltage Transformers

60255: Electrical Relays

60 9135 High Voltage testing techniques.

427 13516 Method of Synthetic Testing of H.V.A.C Circuit Breaker.

IEC 62271-200 MV metal-enclosed switchgear,

(IEC 62271-102) AC disconnections and earthing switches,

2.3 **Design Criteria**

2.3.1 Service conditions

The 33 kV RMU shall be suitable for operations at a height up to 2000 meters above sea level. The RMU shall be capable of operating normally within the following temperature range:

- Maximum ambient temperature : + 50 ° C

- Minimum ambient temperature : - 15 ° C

Manufacturer shall declare whether RMU is able to operate in air temperature higher than + 45 °C and if current de-rating is necessary. The RMU shall be capable of being electrically commanded. And RMU shall be suitable for future motorization. The RMU shall be capable of being exposed to high relative humidity and polluted environments. The RMU shall be suitable for outdoor use.

2.3.2 4. System Parameters

Network	Three phases - Three wires
Rated Voltage	36 kV
Service Voltage	33 kV
System Frequency	50 Hz
Lightning Impulse withstand Voltage Phase to phase, phase to earth	 170 kV
Power Frequency withstand voltage	70 kV rms - 1 mn
Rated Normal Current Line switches	 630 Amps
Rated Short time current withstand (1 sec)	25 kA
Internal Arc 1 sec	16 KA
Rated Short circuit making capacity of line switches & breaker	62.5KA
Number of operations at rated short circuit current on breaker	20 OC operations

Rated load interrupting current	
No load line / cable breaking current capacity	25 A
Number of mechanical operations of line switch	1000 O/C
Number of electrical operations at full rated current	100 O/C at 630 amps
Number of electrical operations at full rated current for breaker	2000 O/C at 630 amps
Number of Mechanical operations at full rated current for breaker	2000 O/C

All of the switchgear shall be capable of withstanding these parameters without any damage

being caused, in accordance with the standards mentioned in this specification

2.3.3 Configuration requirements

Breaker – breaker - Line Switch - Line switch (compact unit Non -Extensible)

2.3.4 General stipulations regarding the design and development of switchgear

2.3.5 Introduction

The RMU shall meet the criteria for compact, metal-enclosed outdoor switchgear in

accordance with IEC 62271-200,IEC 60694:

- Switchgear classification: PM class

- Loss of service continuity class: LSC2A

It shall include, within the same metal enclosure, the number of MV functional units required for connection, power supply, i.e.:switch disconnectors, earthing switches.

2.3.6 Switchboards

The switchgear and busbar shall all be contained in a stainless steel enclosure filled with

SF6 at 0.3 bar relative pressure to ensure the insulation and breaking functions. Sealed for life, the enclosure shall meet the "sealed pressure system" criterion in accordance with the IEC 62271-1 standard (§ 3.6.6.4 and 5.15.3) : "a volume for which no further gas processing is required during its entire expected life. In addition, manufacturer shall confirm that maximum leakage rate is lower than 0,1 % / year. It shall provide full insulation, making the switchgear insensitive to the environment (temporary flooding, high humidity...), IP67 degrees of protection in accordance with recommendation IEC 60529 § 14.2.7. It shall provide full insulation, making the switchgear insensitive to the environment conditions such as pollution, humidity, dust, etc…

The active parts of the switchgear shall be maintenance-free and the switchboard shall be low-maintenance. The switchgear shall provide IP3X degree protection with the exception of the MV cable entrance and earthing plug where entrance is admissible. The tank shall be made of 3 mm ANSI 304 unpainted stainless steel. The colour shall be RAL 9002 for the enclosure. The switchboards shall be suitable for mounting on a trench, utilities space or base. Each switchboard shall be identified by an appropriately sized label which clearly indicates the functional units and their electrical characteristics. The switchgear shall be designed so that the positions of the different devices are visible in its front panel; in addition the cubicle must have voltage indicators that allow check if any income or outcome is energized.

In accordance with the standards in effect, the switchboards shall be designed so as to prevent access to all live parts during operation without the use of tools.

2.3.7 Dielectric medium

SF6 gas is the preferred dielectric medium for MV RMUs. Oil filled / Air insulated switchgear will not be considered. SF6 gas used for the filling of the RMU shall be in accordance with IEC 60376.

2.3.8 Earthing of metallic parts

There shall be continuity between the metallic parts of the switchboard and cables so that there is no electric field pattern in the surrounding air, thereby ensuring the safety of people. The substation frames shall be connected to the main earth busbar without dismantling any busbars.

2.3.9 Earthing of the main circuit

The cables shall be earthed by an earthing switch with short-circuit making capacity; the earthing switch can only be operated when the switch is open. in compliance with IEC standard 62271-102. The earthing switch shall be fitted with its own operating mechanism. The speed of the manual closing, driven by a fast-acting mechanism, is independent of the operator. Mechanical interlocking systems shall prevent access to the operating shaft to avoid all operator errors such as closing the earthing switch when the switch is closed and the earthing switch operating shaft shall have a padlocking facility.

2.3.10 "network" disconnectors:

They shall be maintenance-free, with breaking in low pressure SF6 gas.

The position indicator shall provide positive contact indication and reliability of indication in accordance with IEC 62271-102 standard. The switches shall be of the type E3 "increased operating frequency" in accordance with IEC 60265-1 § 3.104 standard. They shall have 3 positions with individual operating mechanism for network disconnector and earth switch , open-disconnected, closed and earthed, and will be constructed in such a way that natural interlocking prevents unauthorized operations. The switches shall be fully mounted and inspected in the manufacturer's factory. Manual opening and closing will be driven by a fast- acting mechanism, independent of operator action. Each load break switch shall be suitable for an electrical operation in future in a specially reserved location, without any modification of the operating mechanism and without de-energizing the switchboard. The load break switch and earthing switch operating mechanism shall have a mechanical endurance of at least 1000 mechanical operations. The switches shall be fully mounted and inspected in the factory. An operating mechanism can be used to manually close the switch and charge the mechanism.

2.4 **Circuit Breaker:**

The circuit breaker inside SF6 chamber shall be consist of Vacuum circuit breaker confirming to latest IEC standards. The CB shall be maintenance free. The breaker shall be capable of performing a full cycle O-3min-CO-3min CO. The CB shall be three position independent operation. The disconnector operation is only possible when circuit breaker is open. The CB shall be suitable for up gradation for electrical operation in future. The CB shall be equipped with a self powered protection relay for over current and earth fault. The circuit breaker mechanism shall have mechanical endurance of at least 2000 mechanical operation. It shall be fitted with a local system for manual tripping by an integrated push button.

2.5 **RMU bushings and Cable terminations**

2.5.1 Bushing

The bushing should be conveniently located for working with 2 runs of 3 core 400 Sq mm 33 kV cables specified and allow for the termination of these cables in accordance with the instructions supplied for the 630A M16 bolted connectors on line switches. The profiles of the cable connection bushings shall be in compliance with EN-50181 standards.

2.5.2 Cable clamps

A non ferro-magnetic cable clamp arrangement must be provided for all network cables terminated on the RMU.

2.5.3 Padlocking facilities

Live load break switches and earthing switches can be locked in the open or closed position by means of padlocks introduced in holes of 8 mm diameter.

2.5.4 Voltage indicator lamps and phase comparators Each function shall be equipped with a voltage indicator box on the front of the device to indicate whether or not there is voltage in the cables. The capacitive dividers will supply low voltage power to the lamps. Three inlets can be used to check the synchronization of phases.

This device shall be in compliance with IEC 61 958 standard.

2.5.5 Safety of people

Any accidental over pressure inside the sealed chamber shall be limited by the opening of a pressure-limiting device in the top or rear-bottom part of the tank or enclosure. Gas will be release to the rear of the switchboard away from the operator and should be directed towards the bottom, into the trench to ensure safety of the operating personnel and the pedestrians / civilians. All the manual operations should be carried out on the front of the switchboard.

2.5.6 Front plate

The front plate shall have an IP 3X degree of protection. The front shall include a clear mimic diagram which indicates the different functions. The position indicators shall give a true reflection of the position of the main contacts. They shall be clearly visible to the operator. The lever operating direction shall be clearly indicated in the mimic diagram. The manufacturer's plate shall include the switchboard's main electrical characteristics.

2.5.7 Cable insulation testing

The Cable testing is possible without disconnecting the cables from the bushing. It shall be preferable to carry out the phase by phase testing. The maximum test voltage shall be less than 50 kV DC for 15 minutes.

2.5.8 Dimensions

The overall dimensions shall not be greater than the followings :

Width (mm) :1200

Height (mm) :2200

Depth (mm) :1000

2.5.9 Finishing

The device shall be fully designed for use in a hot, humid atmosphere and shall be low-maintenance. At least two lifting rings shall be installed on the top of the switchboards for handling.

2.6 **Type and routine tests**

According to this specification and IEC recommendations, the following type test certificates shall be supplied:

- Impulse withstand test,

- Temperature-rise test,

- Short-time withstand current test,

- Mechanical operation test,

- Checking of degree of protection,

- Switch, earthing switch making capacity.

- Switch, breaking capacity.

- Internal arc withstand

- Checking of partial discharge on complete unit

In addition, for switches, test reports on rated breaking and making capacity shall be supplied. For earthing switches, test reports on making capacity, short-time withstand current and peak short-circuit current shall be supplied.

The routine tests carried out by the manufacturer shall be backed by test reports signed by the factory's quality control department. They shall include the following:

- Conformity with drawings and diagrams,

- Measurement of closing and opening speeds,

- Checking of filling pressure,

- Checking of gas-tightness,

- Dielectric testing.

- Main circuit resistance measurement.

- Fuse combination mechanical checking.

2.7 **Quality**

When requested by the customer, the supplier shall provide proof that he applies a quality procedure in compliance with the standard, namely:

- Use of a quality manual approved and signed by a top management representative,

- Periodic updating of the manual so that it reflects the quality control procedures in effect,

- ISO 9001and ISO 14001 certification.

2.8 **ADDITIONAL REQUIRMENTS (GENERAL):**

2.8.1 The following shall be provided in the SCADA for monitoring:

a. Alarm points from protective relays (individual alarm points for each protection operation shall be provided) lockout relays, supervision relay & auxiliary relays.

b. Status point of switchgear equipments (CB,Isolator & Earth switchs), Selector switch (Local/remote, Busbar Protection-In/Out,Synchronisation-In/out etc.)

c. Analog Points:

Necessary number of transducers shall be provided in the switchyard control panel for Analog output to SCADA system (Voltage, Current, kW, kVAR for Lines; current kW, kVAR, kWH, kVARH and Voltage & frequency for main buses).

2.8.2 All i/o points shall be wired up to a separate terminal block and the same shall be labeled SCADA-TB.

The RMUs should be provided with necessary take off terminal units for future automations and all these units should be shielded in a outdoor metal-body for making them suitable for outdoor use. The insulation/dielectric media inside the stainless steel welded tank should be SF6 gas. The RMUS should be of **extensible type on both sides** with provision of attaching/connecting with SNAP FIT arrangement W/o External Busbars additional load break switches and circuit breakers **in future whenever required.** Alternatively Extension shall be possible by adding trunking chambers and required accessories or by plug-in bushing type arrangement.

All live parts except for the cable connections in the cable compartments shall be insulated with SF6 gas. The SF6 gas tank shall be made of TIG or MIG or Laser welded stainless steel, to have the best weld quality or It shall be metallised resin cast construction. The gas cubicle shall be metal enclosed with stainless steel of minimum 2 mm thickness and should be provided with a pressure relief arrangement away from operator.

External box in RMU shall be provided for installing FRTU. The Aux supply will be taken through the PT provided for metering in RMU. The PT must have sufficient burden for meeting the aforesaid requirement also for battery charging.

2.9 **Metering:**

Multifunction Energy meter shall be provided with, of accuracy class of 0.5 at incoming isolator of all RMUs. The Metering CTs and PTs of suitable rating shall be provided.

2.10 TESTS

Each type of H.V. Switchgear shall be completely assembled, wired, adjusted and tested at the factory as per the relevant standards and during manufacture and on completion.

2.11 Routine Test

The tests shall be carried out in accordance with relevant standards but not necessarily limited to the following:

a) Withstand voltage at Power Frequency for all current carrying parts including wiring

b) Measurement of resistance of the main circuit Non-Extensible / extensible RMU

c) Leakage test

d) Withstand power frequency voltage on auxiliary circuits

e) Operation of functional locks, interlocks, signaling devices and auxiliary devices

f) Suitability and correct operation of protections, control instruments and electrical connections of the circuit breaker operating mechanism (primary & secondary injection)

g) Verification of wiring

h) Visual Inspection Routine test shall be carried out on all equipment such as circuit breakers,current transformers, relays, etc. as per relevant standards.

2.12 Acceptance Tests

The acceptance tests shall include all the routine tests mentioned above and also demonstration of tripping through the relay by secondary injection tests.

Type Test

The Type Test reports, for following tests conducted in an accredited lab shall be submitted. The type tests shall be in accordance with relevant IS 9920/IEC 265/IEC 420.

The type Tests shall include but not limited to the following-

a. Impulse test

b. Temperature rise test c. Short Circuit test

d. Dielectric Tests

e. Operation and mechanical endurance

2.13 TECHNICAL SPECIFICATION OF RMU INSTALLATION

1. RMU shall be installed out door locations. The support structure shall be supplied and installed with the RMU.

2. RMU units shall be installed on platform at 50 Cm above ground level.

3. Earthing of RMU shall be made by utilising existing earth pit and risers to the extent possible. A total of 2 earth pits would be needed for the RMU and other equipment bodies. Earthing to be done as per general technical requirement

3 Technical Specification 11kV Cable jointing Kit

3.1 Scope

3.1.1 As cable termination kit shall be suitable for termination of the cable on indoor switchgear or outdoor installation as per requirement. The type of cable will be XLPE insulated. The cable termination jointing kits shall be as per defined in I.S.I.-13573.

3.1.2 Proper stress control, stress grading and non-tracking arrangement in the termination and joint shall be offered by means of proven methods, details of which shall be elaborated in the offer. Detailed sectional views of the assemblies shall be submitted alongwith the offer.

3.1.3 In case of heat shrinkable cable accessories, stress control tubing, shall have volume resistively of minimum 1,00,00,000 Ohms- meter for both termination and straight through joints. Also relative permittivity shall be minimum 15.

3.1.4 Tenderer shall furnish documentary evidence conforming adherence to these alongwith the offer. Further, impedance of stress control tubing shall not change over a range of temperature from O degree C to 125 Degree C.

3.1.5 The impedance also remains constant in spite of the difference in stress, which will exist within the sleeve due to hearting effect within the conductors and the temperature of the environment. Tenderer must submit graph-showing effect on the impedance value of stress control humbling due to temperature variations and thermal ageing, with his offer. In case of tapex cast resin type straight through joints, encapsulation of joints is done by specially developed resin system, which is compatible with the material used for bonding. The jointing kit shall be with aluminum crimping type ferrules, semi-conductor self bonding tape, the self amalgamating tape [or EPR or equivalent] stress grading pad etc.

3.1.6 The straight through joints should be absolutely impervious to the entry or water.

The manufacturer shall use the proven technologies and design to ensure a construction, which will prevent entry of water or any other liquid inside the straight

through joint and cable. Proven technologies such as resin injection, hydrophobic

sealants etc. shall be deployed in the critical areas.

3.1.7 In all type of kits offered, the external leakage insulation between high voltage conductor and ground as specified in I.E.E.E. –48 / 1975 amended up to time to time shall be of non-tracking erosion resistant and weather resistant flexible sleeve.

3.1.8 For 3-core cable, the gripping tubing [termination boot] for the cable where the trifurcation takes place shall be considered as a part of the kit.

3.1.9 The kit offered shall provide for total environmental sealing of the cable crutch and at the lug end.

3.1.10 Termination and jointing system shall be suitable for use with standard aluminum conductor fittings [cable lugs and ferrules] of compressed crimping type.

3.1.11 The termination of straight through jointing kit of heat shrinkable type kit, the joint shall heat shrinkable duel wall tubing, which shall be insulating from inside and semi conductor from outside. Tenderer shall specifically give compliance to this alongwith the offer.

3.1.12 For straight through joint the kit shall also include tubular Sleeve in line connectors for solder less crimping of cable connector. The connector shall be of aluminum alloy A 6 drop forged type or other equivalent or better material.

3.1.13 Material used for construction of a joint/termination shall perfectly match with the dielectric, chemical and physical characteristics of the associated cable. The material and design concepts shall incorporate a high degree of operating compatibility between the cable and the joints.

3.1.14 The kit offered shall be suitable for the following sizes of three core cables.

3.2 **CABLE – X L P E/PILC**

o 95 sq.mm.

o 120 sq.mm. o 150 sq.mm. o 185 sq.mm. o 240 sq.mm. o 300 sq.mm. o 400 sq.mm.

3.3 The tenderer shall quote unit rates for insulating tape, lugs, nuts and bolts of various sizes and special tools required for erection and commissioning, if any, in the offer. These prices shall be kept valid for at least of one year after placement of order/s. These rates shall not be considered for evaluation of the offer.

3.4 The tenderer shall indicate the required net dimensions of the indoor cable, joints for various cable sizes, in the form of Length X Breadth X Depth in m.m.

3.5 The tenderer shall specifically bring out the precautions to be observed in execution of the jointing / termination work to avoid any loss or damage to the cable, the kit, the personnel or the installation.

An instruction booklet shall be supplied with each kit. Detailed instructions with suitable illustrative drawings shall be included in the instruction booklet to enable proper jointing work.

3.6 The kit which requires lesser skill for the cable jointing which can be done in shorter time and guarantee a reliable and long operating life and reduced or no waiting time for erection shall be given preference.

3.7 **Type Test:**

3.7.1 The jointing kits offered, shall be fully type tested at CPRI as per the relevant standards. The tenderer shall furnish four sets of the type test reports alongwith the offer. Offers without type test reports will not be considered. For any change in the Design/type already type tested and the design/type offered against this specification, the purchaser reserve the right to demand repetition of type tests without any extra cost in presence of purchaser's representative.

3.7.2 Type tests shall be carried out as per the test sequence given in I.S.: 13573 or VDE-0278 at C.P.R.I. Laboratory as amended from time to time. The test report will have to be submitted for the test carried out.

3.8 **ACCEPTANCE & ROUTING TESTS:**

3.8.1 The supplier shall carry out all acceptance and routing tests as stipulated in the

relevant standards in presence of purchaser's representative.

3.8.2 The purchaser reserves the right to insist for witnessing the acceptance/routing testing of the brought out items.

4 TECHNICAL SPECIFICATION FOR `ISI' MARKED XLPE INSULATED AND PVC SHEATH 33 KV XLPE CABLE

4.1 SCOPE:-

The specification covers the design, manufacture, testing and delivery at places anywhere in Central Zone Discom listed in Annexure-IV of General Terms and Conditions of Tender Specification of 'ISI' marked 33 KV grade, weather proof 33 KV XLPE Cable of size 3cx300

Sq.mm. The conductor shall be compacted circular aluminium stranded, provided with extruded semi-conducting screening layer, XLPE Insulation provided with screening Comprising of non metallic extruded Semi Conducting Compound & copper tape screening, extruded PVC sheath, suitable for 33 KV effectively earthed system conforming to IS:7098(Pt-2)1985 with latest amendment. The cable should be suitable for laying underground.

4.2 APPLICABLE STANDARD:-

All the cables shall conform to the requirements of following standards with latest amendments, if any

(i)	IS:7098(Part-2) 1985 with latest amendments.	Cross linked Polyethylene insulated Sheathed Cables for working voltage from 3.3 KV up to and including 33KV
(ii)	IS:8130-1984	Specification for conductors for Insulated electric cables.
(iii)	IS:5831-1984	Specification for PVC Insulation and sheath of electric cables.
(iv)	IS: 3975-1979	Specification for mild steel wires, strips and taps for armouring
(v)	IS:10810-1984	Methods of test for cables.
(vi)	IS:4905-1968	Methods for random sampling.
(vii)	IS:10418-1982	Wooden drum for electric cables.

4.3 GENERAL TECHNICAL REQUIREMENT:-

4.3.1 CONDUCTOR:

The nominal cross section area of aluminium conductor used in XLPE cable shall be 300 Sq.mm and shall be of stranded wire construction and compacted circular wires complying

to the requirement to IS:8130-1984, with latest amendments and shall be in accordance with clause-9 of IS: 7098(Part-2)1985.

4.3.2 CONDUCTOR SCREENING:-

Conductor screening shall be non-metallic and shall consists of extruded semi conducting compound and comply to the requirement of caluse-10 of IS:7098(Pt-2). The semi conducting compound shall be suitable for the operating temperature of the cable and

compatible with the insulating material.

4.3.1 INSULATION:-

The conductor (with protective screen) shall be provided with cross linked polyethylene(XLPE) insulation applied by extrusion conforming to the requirements given in Table-1 of IS:7098(Pt-2)1985. The XLPE insulation shall be suitable for specified 33 KV System voltage. The manufacturing process shall ensure that insulation shall be free from voids. The insulation shall withstand mechanical and thermal stresses under steady state and transient operating conditions. The insulation shall be so applied that it fits closely on the conductor screening and it shall be possible to remove it without damaging the conductor. XLPE insulation shall be suitable for continuous conductor temperature of 90ºC under normal operation and 250ºC under short circuit condition.

The average thickness of insulation in respect of each Size of cable shall not be less than the nominal value(ti) specified in Table-2 of(IS:7098)Part-2/1985 IE 8.8 MM. The smallest of measured value of thickness of insulation shall not fall below the nominal value (ti) specified in Table-2 by more than 0.1 mm+ 0.1 ti.

4.3.4 INSULATION SCREENING:-

Cable shall be provided with the insulation screening complying to Clause-12 of IS:7098(Pt-

2)1985. The insulation screening shall consist of two parts, namely metallic and non- metallic.

Non metallic part shall be applied directly over the insulation of each core and shall consists of either a semi-conducting tape or extruded semi conducting compound or a combination of the two or either material with semi conducting coating.

Metallic part shall consist of copper tape and shall be applied over the non-metallic part.

4.3.5 CORE IDENTIFICATION:-

Identification of cores shall be by using coloured strips of Red, Yellow and Blue Colours respectively and shall conform to Clause-13 of IS-7098(Part-2)1985 to identify phase conductors.

4.3.6 OUTER SHEATH:-

The outer sheath shall be applied by extrusion. It shall be applied over the non-magnetic metallic part of insulation screening. The outer sheath shall of PVC Compound type ST2 (conforming to the requirement of IS:5831-1984, with latest amendments) and shall be black in colour. The thickness of outer sheath shall be as specified in Table-5 of IS:7098(Pt-

2)1985. Minimum thickness of PVC outer sheath shall not fall below the nominal value (ts)

specified in Table-5 of IS:7098(Pt-2) by more than 0.2 mm+0.2ts.

4.3.7 IDENTIFICATION, PACKING & MARKING :-

4.3.7.1 Identification:-

Following marking shall be embossed over the sheath.

1. Cable size and Voltage Grade.
2. Word `MPMKVVCL' & Name of Manufacturer at every three meters.

The embossing shall be increasive, automatic in line throughout the length of the cable and shall be legible and indelible.

4.3.7.2 PACKING & MARKING:-

1. The cable shall be wound on a drum (refer-IS:10418-1982) of suitable size and packed. The packing shall be robust enough for rough handling that is occasioned during transportation by Rail/Road. The ends of the cable shall be sealed by means of non-hygroscopic sealing material.
2. The Cable should carry the following information stenciled on the drum:-
    i. Reference to Indian Standard IS:7098(Pt-2),
    ii. Manufacturer's name, brand name or trade mark,
    iii. Type of cable and voltage grade,
    iv. Number of cores,
    v. Nominal cross-sectional area of the conductor, vi. Cable Code,
    vii. Length of cable on the drum,

viii. Number of lengths on drum(if more than one),

ix. Direction of rotation of drum by means of an arrow,

x. Gross Mass,

xi. Country of Manufacturer, xii. Year of manufacture,

xiii. Name of purchaser

4.3.7.3 'ISI' Certification Mark:-

The Cable (Drum) must bear `ISI' certification Mark. In this connection, a certified photo copy of valid `ISI' Marking License rights duly attested must be submitted along with the tender as documentary evidence. In absence of this, offer is liable for rejection.

4.3.7.4 Standard Length:-

The standard length of cable shall be 250/500 Mtrs. with ±5% tolerance. However to complete the supply of ordered quantity, last drum of non standard length may also be accepted.

4.4 **TESTS:-**

Following type tests, acceptance tests and routine tests are to be carried out in accordance with clause-18 of IS 7098(Part-2)1985, with its latest amendments as indicated below:-

4.4.1 **TYPE TESTS**:-

The following shall constitute type tests:-

Sl. No.	Tests	For requirement Ref. to	For Test method Ref. to Part No. of
(A)	**TEST ON CONDUCTOR** (whichever applicable)		
(i)	Tensile Test	IS:8130-1984	2
(ii)	Wrapping Test	IS:8130-1984	3
(iii)	Conductor resistance Test	IS:8130-1984	5
(B)	TEST FOR THICKNESS OF	Clause 11&17	6
(C)	PHYSICAL TEST FOR INSULATION:		
(i)	Tensile Strength and elongation at	Table-1 of IS:7098(Pt-2)	7
(ii)	Ageing in Air Oven	---do---	11
(iii)	Hot set Test	---do---	30

(iv)	Shrinkage Test	---do---	12
(v)	Water absorption test	---do---	33
(D)	PHYSICAL TEST FOR OUTER SHEATH		
(i)	Tensile Strength and elongation at break	IS:5831-1984	7
(ii)	Ageing in Air oven	---do---	11
(iii)	Shrinkage Test	---do---	12
(iv)	Hot deformation	---do---	15
(E)	BLEEDING & BLOOMING	---do---	19
(F)	PARTIAL DISCHARGE TEST	Clause 19.2	46
(G)	BENDING TEST	Clause 19.3 of	50
(H)	DIELECTRIC POWER FACTOR	clause 19.4 of	48
(i)	as a function of voltage		
Sl. No	Tests	For requirement Ref. to	For Test method Ref. to Part No. of
(ii)	as a function of temperature		
(I)	HEATING CYCLE TEST	Clause 19.5 of IS:7098(Pt-2)	49
(J)	IMPULSE WITHSTAND TEST	Clause 19.6 of IS:7098(Pt-2)	47
(K)	INSULATION RESISTANCE (VOLUME RESISTIVITY TEST)	Table-1 of IS:7098 (Part-2) Clause 19.7 of	43
(L)	HIGH VOLTAGE TEST	Clause 19.7 of IS:7098(Pt-2)	45
(M	FLAMMABILITY TEST	Clause 19.8 of IS:7098(Pt-2)	53

4.4.1.1 The following test on the Aerial bunched cable shall be performed successively on the same test sample of completed cable, not less than 10 mtrs. in length between the test accessories as per clause

18.1.2 of IS:7098(Pt-2):-

a. Partial discharge test,

b. Bending test followed by partial discharge test, c. Dielectric Power factor as a function of voltage,

d. Dielectric Power factor as a function of temperature, e. Heating cycle test followed by dielectric power factor f. as a function of voltage and partial discharge tests, g. Impulse withstand test and

h. High voltage test.

The bidders are advised to submit certified photo copy of type test certificate for type tests indicated in para 4.1.1 and 4.1.2 of the quoted sizes of Cable tested from the Govt. National Test House, ERDA, CPRI or any other NABL accredited laboratory along with the tender. The above type test certificate should not be more than five years old from the due date of opening of tender.

4.4.2 Acceptance test:

The following shall constitute acceptance tests:- a. Tensile Test (for aluminium if applicable),

b. Wrapping Test(for aluminium if applicable), c. Conductor resistance test,

d. Test for thickness of insulation and sheath,

e. Tensile strength and elongation at break of insulation and sheath, f. Insulation resistance (volume resistivity) test,

g. High voltage test,

h. Hot set test for insulation and

i. Partial discharge test (on full drum length)

All the above acceptance tests will be carried out by Company's representative as per relevant ISS at the time of material inspection for the purpose of clearing the lot offered by the bidder. Acceptance test shall be carried out in each type and size of cable, on cable drum selected at random as per sampling plan given in relevant ISS.

4.4.3 Routine Test:

The following shall constitute routine test:-

a. Conductor Resistance test,

b. Partial discharge test (on full drum length)

c. High voltage test.

The above routine test shall be conducted by the bidders in accordance with relevant ISS and test certificate in proof of this shall be submitted to this office along with each inspection offer. In absence of routine test certificate the inspection offer shall be considered as fake and all complication arising out of this shall be to the supplier's account.

4.5 **Inspection:**

All the tests and inspection shall be made at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall offer all reasonable facilities to the purchaser, without charges to satisfy him that the material is being furnished in accordance with the specification.

On receipt of Cables at our consignee Area Store, the purchaser has the right to have any or all Type/Acceptance test carried out by an independent NABL accredited lab like ERDA, CPRI etc. to ascertain the quality of supply. In case the material fails to pass the test as per specification, the entire lot shall be rejected and the testing charges along with the other charges which may likely to be incurred for arranging the testing through independent agency shall be recovered from the supplier. In addition to this, action as deemed fit, may be taken against the supplier.

SCHEDULE-III

GUARANTEED TECHNICAL PARTICULARS OF XLPE CABLES

1	Name of Manufacturers	
2	Standard applicable	
3	Whether material offered is having ISI mark. Give ISI	

A. AERIAL BUNCHED CABLES

4	Rated Voltage	
5	No of cores	
i	Power cores (no.)	
ii	Bare messenger (no)	
6	Suitable for effectively earthed or unearthed system	
7	Permissible voltage and frequency variation for satisfactory operation.	
a.	voltage	
b.	Frequency	
8	Continuous current rating corresponding temp when laying	
9	Short Circuit Current carrying capacity	
a.	Current in amps(rms)	
b.	duration of short circuit	
c.	Conductor temperature allowed for the short circuit duty	
10	**Conductor**	
a.	Material	
b.	Nominal cross sectional area	
c.	Flexibility class as per IS:8130:1984	
d.	Form of conductor	
e.	Whether stranded or solid core	
f.	Max. degree centigrade resistance of conductor	
g.	Weight (Kg/Km)	
11	**Conductor screening**	
A	Type	
B	Material	
C	Minimum thickness	
12	**Insulation**	
a.	Composition of insulation	
b.	Source of receipt (Supplier's Name)	
c.	Average Thickness of insulation (mm)	
d.	Tolerance of thickness of insulation	
e.	Diameter of core over insulation (mm)	
f.	Specific insulation resistance: at 90°C	
g.	Colour Scheme for identification of cable	

13	**Insulation screening**	
a.	Material	
b.	Minimum Thickness	
i.	Semiconducting Part(mm)	
ii.	Metallic part(copper tape)(mm)	
iii.	Size of copper tape (width x thickness)	
iv.	Whether overlapping provided	
v.	Diameter of cable over screening	
vi.	Whether insulation screen is removable without	
14	**Sheath**	
a.	Material/Type of sheath	
b.	Source of receipt	
c.	Extruded or wrapped	
d.	Calcualted diameter undr the sheath (mm)	
e.	Nominal thickness of sheath (mm)	
f.	Diameter of cable over sheath	
	Weight of sheath (Kg/Km)	
15	**Messenger wire**	
i.	Material	
ii.	Nominal cross sectional area	
iii.	Form of conductor	
iv.	Whether galvanised	
v.	Approximate breaking load	
16	Laying up	
17	Over all diameter of cable	
18	Loss tangent a normal frequency	
19	Dielectric constant at normal frequency	
20	Thermal stability	
21	Oxygen index	
22	D.C.resistance per core at 20°C (Ohm/Km)	
23	Reactance per core at 50 HZ (Ohm/Km)	
24	Capacitance per core at 50HZ micro fad/Km	
25	Insulation resistance (volume resistivity) at 27ºC	
26	High Voltage Test:	
A	for acceptance test	
i.	voltage	
ii.	Duration	
B	for routine test	
i	voltage	
ii	duration	
27	Recommended minimum bending radius	
28	Safe pulling force when pulled by pulling eye	
29	Net weight of Cable (Kg/Km)	
30	Cable drums:-	
a.	Net weight (Kg.)	
b.	Drum Weight(Kg.)	
c.	Cable Weight(Kg)	
d.	Maximum length per drum (Mtrs.)	
31	Whether the cable is type tested from NABL accredited Laboratory for all the tests as per IS:7098(P	
32	Whether copy of type test certificates pertaining to all tests as indicated in para 4.1 of technical specificatio	

B. GENERAL

Whether following documents have been submitted with the offer:-

i	Manufacturer's leaflets giving details dimensions and	
ii	Whether curves and tables relating to current rating of cab furnished	
iii	Whether write up with sketches, manufacturer's recommendations for splitting, jointing an	

SIGNATURE OF TENDERER NAME:

DESIGNATION:

5 TECHNICAL SPECIFICATION FOR ISI' MARKED XLPE INSULATED AND PVC SHEATH 11 KV XLPE CABLE

5.1 **SCOPE:-**

The specification covers the design, manufacture, testing and delivery at places anywhere in Central Zone Discom of 'ISI' marked 11 KV grade, weather proof 11 KV XLPE Cable of size 3cx185 Sq.mm. The conductor shall be compacted circular aluminium stranded, provided with extruded semi-conducting screening layer, XLPE Insulation provided with screening Comprising of non metallic extruded Semi Conducting Compound & copper tape screening, extruded PVC sheath, suitable for 11 KV effectively earthed system conforming to IS:7098(Pt-2)1985 with latest amendment.. The cable should be suitable for laying underground.

5.2 **APPLICABLE STANDARD:-**

All the cables shall conform to the requirements of following standards with latest amendments, if any

(i)	IS:7098(Part-2) 1985 with late	Cross linked Polyethylene insulated Sheathed Cables for working voltage from 3.3 KV up to and including 33KV
(ii)	IS:8130-1984	Specification for conductors for Insulated electric cables.
(iii)	IS:5831-1984	Specification for PVC Insulation and sheath of electric cables.
(iv)	IS: 3975-1979	Specification for mild steel wires, strips and taps for armouring
(v)	IS:10810-1984	Methods of test for cables.
(vi)	IS:4905-1968	Methods for random sampling.
(vii)	IS:10418-1982	Wooden drum for electric cables.

5.3 **GENERAL TECHNICAL REQUIREMENT:-**

5.3.1 CONDUCTOR

The nominal cross section area of aluminium conductor used in XLPE cable shall be 185

Sq.mm and shall be of stranded wire construction and compacted circular wires complying to the requirement to IS:8130-1984, with latest amendments and shall be in accordance with clause-9 of IS: 7098(Part-2)1985.

5.3.2 CONDUCTOR SCREENING:-

Conductor screening shall be non-metallic and shall consists of extruded semi conducting compound and comply to the requirement of caluse-10 of IS:7098(Pt-2). The semi conducting compound shall be suitable for the operating temperature of the cable and compatible with the insulating material.

5.3.3 INSULATION:-

The conductor (with protective screen) shall be provided with cross linked polyethylene (XLPE) insulation applied by extrusion conforming to the requirements given in Table-1 of IS:7098(Pt-2)1985. The XLPE insulation shall be suitable for specified 11 KV System voltage. The manufacturing process shall ensure that insulation shall be free from voids. The insulation shall withstand mechanical and thermal stresses under steady state and transient operating conditions. The insulation shall be so applied that it fits closely on the conductor screening and it shall be possible to remove it without damaging the conductor. XLPE insulation shall be suitable for continuous conductor temperature of 90ºC under normal operation and 250ºC under short circuit condition.

The average thickness of insulation in respect of each Size of cable shall not be less than the nominal value(ti) specified in Table-2 of(IS:7098)Part-2/1985 IE 5.5 MM. The smallest of measured value of thickness of insulation shall not fall below the nominal value (ti) specified in Table-2 by more than 0.1 mm+ 0.1 ti.

5.3.4 INSULATION SCREENING:-

Cable shall be provided with the insulation screening complying to Clause-12 of IS:7098(Pt-2)1985. The insulation screening shall consist of two parts, namely metallic and non-metallic.

Non metallic part shall be applied directly over the insulation of each core and shall consists of either a semi-conducting tape or extruded semi conducting compound or a combination of the two or either material with semi conducting coating.

Metallic part shall consist of copper tape and shall be applied over the non-metallic part.

5.3.5 CORE IDENTIFICATION:-

Identification of cores shall be by using coloured strips of Red, Yellow and Blue Colours respectively and shall conform to Clause-13 of IS-7098(Part-2)1985 to identify phase conductors.

5.3.6 OUTER SHEATH:-

The outer sheath shall be applied by extrusion. It shall be applied over the non-magnetic metallic part of insulation screening. The outer sheath shall of PVC Compound type ST2 (conforming to the requirement of IS:5831-1984, with latest amendments) and shall be black in colour. The thickness of outer sheath shall be as specified in Table-5 of IS:7098(Pt- 2)1985. Minimum thickness of PVC outer sheath shall not fall below the nominal value (ts) specified in Table-5 of IS:7098(Pt-2) by more than 0.2 mm+0.2ts.

5.3.7 IDENTIFICATION, PACKING & MARKING :-

5.3.7.1 Identification:-

Following marking shall be embossed over the sheath.

1. Cable size and Voltage Grade.
2. Word `MPMKVVCL' & Name of Manufacturer at every three meters.

The embossing shall be increasive, automatic in line throughout the length of the cable and shall be legible and indelible.

5.3.7.2 PACKING & MARKING:-

1. The cable shall be wound on a drum (refer-IS:10418-1982) of suitable size and packed.

   The packing shall be robust enough for rough handling that is occasioned during transportation by Rail/Road. The ends of the cable shall be sealed by means of non- hygroscopic sealing material.

2. The Cable should carry the following information stenciled on the drum:- i. Reference to Indian Standard IS:7098(Pt-2),

   ii. Manufacturer's name, brand name or trade mark, iii. Type of cable and voltage grade,

   iv. Number of cores,

   v. Nominal cross-sectional area of the conductor, vi. Cable Code,

   vii. Length of cable on the drum,

   viii. Number of lengths on drum(if more than one),

   ix. Direction of rotation of drum by means of an arrow,

   x. Gross Mass,

   xi. Country of Manufacturer, xii. Year of manufacture,

   xiii. Name of purchaser

3. ISI' Certification Mark:- The Cable (Drum) must bear `ISI' certification Mark. In this connection, a certified photo copy of valid `ISI' Marking License rights duly attested must be submitted along with the tender as documentary evidence. In absence of this, offer is liable for rejection.

21.3.7.3 Standard Length:- The standard length of cable shall be 250/500 Mtrs. with ±5% tolerance. However to complete the supply of ordered quantity, last drum of non standard length may also be accepted.

5.4 **TESTS:-**

Following type tests, acceptance tests and routine tests are to be carried out in accordance with clause-18 of IS 7098(Part-2)1985, with its latest amendments as indicated below:-

5.4.1 **TYPE TESTS**:-

The following shall constitute type tests:-

Sl. No.	Tests	For requirement Ref. to	For Test method Ref. to Part No. of
(A)	**TEST ON CONDUCTOR** (whichever applicable)		
(i)	Tensile Test	IS:8130-1984	2
(ii)	Wrapping Test	IS:8130-1984	3
(iii)	Conductor resistance Test	IS:8130-1984	5
(B)	**TEST FOR THICKNESS OF**	Clause 11&17	6
(C)	**PHYSICAL TEST FOR INSULATION:**		
(i)	Tensile Strength and elongation at	Table-1 of	7
(ii)	Ageing in Air Oven	---do---	11
(iii)	Hot set Test	---do---	30
(iv)	Shrinkage Test	---do---	12
(v)	Water absorption test	---do---	33
(D)	**PHYSICAL TEST FOR OUTER SHEATH**		
(i)	Tensile Strength and elongation at	IS:5831-1984	7
(ii)	Ageing in Air oven	---do---	11
(iii)	Shrinkage Test	---do---	12
(iv)	Hot deformation	---do---	15
(E)	**BLEEDING & BLOOMIN TEST(FOR OTHER SHEATH)**	---do---	19
(F)	**PARTIAL DISCHARGE TEST**	Clause 19.2	46
(G)	**BENDING TEST**	Clause 19.3 of	50
(H)	**DIELECTRIC POWER FACTOR**	clause 19.4 of	48
(i)	as a function of voltage		
(ii)	as a function of temperature		

Sl. No.	Tests	For requirement Ref. to	For Test method Ref. to Part No. of
(I)	**HEATING CYCLE TEST**	Clause 19.5 of IS:7098(Pt-2)	49
(J)	**IMPULSE WITHSTAND TEST**	Clause 19.6 of	47
(K)	**INSULATION RESISTANCE (VOLUME RESISTIVITY TEST)**	Table-1 of IS:7098 (Part-2) Clause 19.7 of	43
(L)	**HIGH VOLTAGE TEST**	Clause 19.7 of	45
(M)	**FLAMMABILITY TEST**	Clause 19.8 of	53

The following test on the Aerial bunched cable shall be performed successively on the same test sample of completed cable, not less than 10 mtrs. in length between the test accessories as per clause 18.1.2 of IS:7098(Pt-2):-

a. Partial discharge test,

b. Bending test followed by partial discharge test, c. Dielectric Power factor as a function of voltage,

d. Dielectric Power factor as a function of temperature, e. Heating cycle test followed by dielectric power factor f. as a function of voltage and partial discharge tests, g. Impulse withstand test and

h. High voltage test.

The bidders are advised to submit certified photo copy of type test certificate for type tests indicated in para 4.1.1 and 4.1.2 of the quoted sizes of Cable tested from the Govt. National Test House, ERDA, CPRI or any other NABL accredited laboratory along with the tender. The above type test certificate should not be more than five years old from the due date of opening of tender.

5.4.2 Acceptance test:

The following shall constitute acceptance tests:-

a. Tensile Test (for aluminium if applicable),

b. Wrapping Test(for aluminium if applicable),

c. Conductor resistance test,

d. Test for thickness of insulation and sheath,

e. Tensile strength and elongation at break of insulation and sheath, f. Insulation resistance (volume resistivity) test,

g. High voltage test,

h. Hot set test for insulation and

i. Partial discharge test (on full drum length)

All the above acceptance tests will be carried out by Company's representative as per relevant ISS at the time of material inspection for the purpose of clearing the lot offered by the bidder. Acceptance test shall be carried out in each type and size of cable, on cable drum selected at random as per sampling plan given in relevant ISS.

5.4.3 Routine Test:

The following shall constitute routine test:-

a. Conductor Resistance test,

b. Partial discharge test (on full drum length)

c. High voltage test.

The above routine test shall be conducted by the bidders in accordance with relevant ISS and test certificate in proof of this shall be submitted to this office along with each inspection offer. In absence of routine test certificate the inspection offer shall be considered as fake and all complication arising out of this shall be to the supplier's account.

5.5 **Inspection:**

All the tests and inspection shall be made at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall offer all reasonable facilities to the purchaser, without charges to satisfy him that the material is being furnished in accordance with the specification.

On receipt of Cables at our consignee Area Store, the purchaser has the right to have any or all Type/Acceptance test carried out by an independent NABL accredited lab like ERDA, CPRI etc. to ascertain the quality of supply. In case the material fails to pass the test as per specification, the entire lot shall be rejected and the testing charges along with the other charges which may likely to be incurred for arranging the testing through independent agency shall be recovered from the supplier. In addition to this, action as deemed fit, may be taken against the supplier.

SCHEDULE-III

GUARANTEED TECHNICAL PARTICULARS OF XLPE CABLES

1	Name of Manufacturers	
2	Standard applicable	
3	Whether material offered is having ISI mark. Give ISI	

A. AERIAL BUNCHED CABLES

4	Rated Voltage	
5	No of cores	
i	Power cores (no.)	
ii	Bare messenger (no)	
6	Suitable for effectively earthed or unearthed system	
7	Permissible voltage and frequency variation for satisfactory operation.	
a.	voltage	
b.	Frequency	
8	Continuous current rating corresponding temp when	
9	Short Circuit Current carrying capacity	
a.	Current in amps(rms)	
b.	duration of short circuit	
c.	Conductor temperature allowed for the short circuit duty	
10	**Conductor**	
a.	Material	
b.	Nominal cross sectional area	
c.	Flexibility class as per IS:8130:1984	
d.	Form of conductor	
e.	Whether stranded or solid core	
f.	Max. degree centigrade resistance of conductor	
g.	Weight (Kg/Km)	
11	**Conductor screening**	
A	Type	
B	Material	
C	Minimum thickness	
12	**Insulation**	
a.	Composition of insulation	
b.	Source of receipt (Supplier's Name)	
c.	Average Thickness of insulation (mm)	
d.	Tolerance of thickness of insulation	
e.	Diameter of core over insulation (mm)	
f.	Specific insulation resistance: at 90°C	
g.	Colour Scheme for identification of cable	

13	**Insulation screening**	
a.	Material	
b.	Minimum Thickness	
i.	Semiconducting Part(mm)	
ii.	Metallic part(copper tape)(mm)	
iii.	Size of copper tape (width x thickness)	

iv.	Whether overlapping provided	
v.	Diameter of cable over screening	
vi.	Whether insulation screen is removable without	
14	**Sheath**	
a.	Material/Type of sheath	
b.	Source of receipt (supplier's name)	
c.	Extruded or wrapped	
d.	Calcualted diameter undr the sheath (mm)	
e.	Nominal thickness of sheath (mm)	
f.	Diameter of cable over sheath	
	Weight of sheath (Kg/Km)	
15	**Messenger wire**	
i.	Material	
ii.	Nominal cross sectional area	
iii.	Form of conductor	
iv.	Whether galvanised	
v.	Approximate breaking load	
16	Laying up	
17	Over all diameter of cable	
18	Loss tangent a normal frequency	
19	Dielectric constant at normal frequency	
20	Thermal stability	
21	Oxygen index	
22	D.C. resistance per core at 20°C (Ohm/Km)	
23	Reactance per core at 50 HZ (Ohm/Km)	
24	Capacitance per core at 50HZ micro fad/Km	
25	Insulation resistance (volume resistivity) at 27ºC	
26	High Voltage Test:	
A	for acceptance test	
i.	Voltage	
ii.	Duration	
B	for routine test	
i	Voltage	
ii	Duration	
27	Recommended minimum bending radius	
28	Safe pulling force when pulled by pulling eye	
29	Net weight of Cable (Kg/Km)	
30	Cable drums:-	
a.	Net weight (Kg.)	
b.	Drum Weight(Kg.)	
c.	Cable Weight(Kg)	
d.	Maximum length per drum (Mtrs.)	
31	Whether the cable is type tested from NABL accredited Laboratory for all the tests as per IS:7098(Pt-II)/198	
32	Whether copy of type test certificates pertaining to all tests as indicated in para 4.1 of technical specification ha	

B. GENERAL

Whether following documents have been submitted with the offer:-

i	Manufacturer's leaflets giving details dimensions and	
ii	Whether curves and tables relating to current rating c cable furnished	
iii	Whether write up with sketches, manufacturer's recommendations for splitting, jointing and termination c	

SIGNATURE OF TENDERER NAME:

DESIGNATION:

6.1 TECHNICAL SPECIFICATION OF 500KVA PSS-

1.0.0 CODE & STANDARDS:

1.1.0 All equipment and material shall be designed manufactured and tested in accordance with the latest applicable Indian Standard / IEC standard.

1.2.0 Equipment and material confirming to any other standard which ensures equal or better quality may be accepted. In such case copies of English version of the standard adopted shall be submitted.

1.3.0 The electrical installation shall met the requirement of Indian Electricity Rules as amended upto date relevant IS code of practice and Indian electricity act.

1.4.0 The Unitized Sub-station offered shall in general comply with the latest issues including amendments of the following standards but not restricted to it.

	Title	Indian & IEC Standards
	High Voltage Low Voltage Pre-Fabricated Substation	IEC:62271-202
	11 kV, Switchgear cubicles	IS: 13118, IS: 3427, IEC:60694. IEC:60298
	Ring main unit 11 kv grade,	IS:9920, IEC:60265
	Code of practice for selection, installation and maintenance of Switchgear	IS:10118
	Distribution Transformer	IS: 1180
	Indian Electricity Rules	1956
	Indian Electricity Act	1910

2.0.0 DESIGN CRITERIA

2.1.0 Compact Sub-station shall consist of **11KV SF6 Insulated compact switchgear with SF6 / Vacuum Circuit Breaker as protection to transformer + Transformer + L.T. Switchgear** with all connection accessories, fitting & auxiliary equipment in an pre-fabricated Enclosure to supply Low-voltage energy from high-voltage system as detailed in this specification. The complete unit shall be installed on a substation plinth (base) as **Outdoor substation**. 11KV Load Break Cable Switches controls incoming-outgoing feeder cables of the 11KV ring distribution system. The SF6 / Vacuum Circuit Breaker shall be used to control and isolate the 11kV/433V Distribution transformer. The transformer's L.T. side shall be connected to L.T. switchgear by means of Aluminum busbar. The connection cables to consumer shall be taken out from the L.T. switchgear.

2.2.0 The pre-fabricated unitized substation shall be designed for :

a) Compactness,
b) Fast installation,
c) Maintenance free operation,
d) Safety for worker/operator & public.

2.3.0 The Switchgear and component thereof shall be capable of withstanding the mechanical and thermal stresses of short circuit listed in ratings and requirements clause without any damage or deterioration of the materials.

2.4.0 For continues operation at specified ratings temperature rise of the various switchgear components shall be limited to permissible values stipulated in the relevant standard and / or this specification.

2.5.0 Service Conditions:

2.5.1 The equipment offered shall be suitable for continuous satisfactory operation in tropical area of Installation.

The Enclosure consisting of High Voltage switchgear-control gear, Low Voltage switchgear-control gear & Transformer of the Unitized substation shall be designed to be used under **normal outdoor service condition**. The enclosure should take minimum space for the installation including the space required for approaching various doors & equipment inside. The enclosure construction shall be such that it fully protects ingress of rain water, dust & rusting.

3.0.0 SPECIFIC REQUIREMENT

3.1.0 The main components of a prefabricated-unitized substation are Transformer, High-voltage switchgear-control gear, Low-voltage switchgear-control gear, corresponding interconnections (cable, busbars) & auxiliary equipment. The components shall be enclosed, by either common enclosure or by an assembly of enclosure. All the components shall comply with their relevant IS/IEC standards.

3.1.1 Ratings:

Description	Unit	Value
Rated Voltage / Operating Voltage	kV rms	11

Rated frequency & Number of phases	Hz & nos.	50 & 3
Rated maximum power of substation	Kva	**500 KVA, (Oil Type Hermeatically sealed Transformer)**
Rated Ingress protection class of Enclosure	IP:	IP: 54 for LT Switchgear & HT Switchgear compartments and IP-34 for Transformer compartment.
		3 WAY (2Nos.Isolators+1No. Breaker)
	Amp	630A for 11kV
thstand current	kA rms / 3secs	21 for 11 kV,
LV Incomer: 4P ACB 800 Amp rating and fault withstand capacity of 50kA. Outgoings TPN MCCB 250 Amp rating and fault withstand capacity of 35KA 4Nos of each rating.		

3.2.0 OUTDOOR ENCLOSURE:

3.2.1 The enclosure shall be made of 2.0 mm thickness Galvanized Sheet Steel tropicalised to meet Indian weather conditions including all the partition sheets & doors.

3.2.2 The base of the enclosure shall be of 4.0 mm thickness Hot Dip Galvanized Sheet Steel to ensure rigidity for easy transport & installation. The entire Package Substation shall be Factory Assemble & Factory Fitted.

3.2.3 The structure of the substation shall be capable of supporting the gross weight of all the equipment & the roof of the substation compartment shall be designed to support adequate loads. Incase of relocation of the Package Substation, the entire substation should be capable of getting lifted and placed as a Single Unit without dismantling of any of the major equipments inside. The lifting arrangement should be from the bottom of the enclosure & not from the top.

3.2.4 There shall be proper / adequate ventilation inside the enclosure so that hot air inside enclosure are directed out by help of duct. Louvers apertures shall be provided so that there is circulation of natural air inside the enclosure. The Package Substation should be designed & engineering to have natural cooling & ventilation instead of forced cooling /

ventilation as the same would derate the Transformer further and shall be an additional load on the Transformer.

3.2.5 The complete design shall be compartmentalized.

3.2.6 **Interconnection:** The connection of HT switchgear to Transformer shall be with the help of suitable size of cables from Transformer to LT switchgear with the help of suitable size of Aluminum busbars.

3.2.7 **Internal Fault**: Failure within the unitized substation due either to a defect, an exceptional service condition or mal-operation may initiate an internal arc. Such an event may lead to the risk of injury, if persons are present. It is desirable that the unit shall be tested for Internal Arc fault test to the tune of atleast 20KA for 1 second adhering to as per latest IEC 62271-202.

3.2.8 **Covers & Doors**: Covers & doors are part of the enclosure. When they are closed, they shall provide the degree of protection specified for the enclosure. All covers, doors or roof shall be provided with locking facility or it shall not be possible to open or remove them before doors used for normal operation have been opened. The doors shall open outward at an angle of at least 90degrees & be equipped with a device able to maintain them in an open position. Proper padlocking facility shall be provided for doors of each compartment. Transformer compartment doors must be open from both the sides & should not have access from outside.

3.2.9 **Earthing**: All metallic components shall be earthed to a common earthing point. It shall be terminated by an adequate terminal intended for connection to the earth system of the installation, by way of flexible jumpers/strips & Lug arrangement. The continuity of the earth system shall be ensured taking into account the thermal & mechanical stresses caused by the current it may have to carry. The components to be connected to the earth system shall include :

a) The enclosure of Unitized / prefabricated substation,
b) The enclosure of High voltage switchgear & control gear from the terminal provided for the purpose.
c) The metal screen & the high voltage cable earth conductor,
d) The transformer tank or metal frame of transformer,
e) The frame &/or enclosure of low voltage switchgear,

3.2.10 **Internal Illumination**: There shall be arrangement for internal lighting activated by associated switch on doors for HV & LV compartments separately.

3.2.11 **Labels:** Labels for warning, manufacturer's operating instructions etc. & those according to local standards & regulations shall be pasted / provided inside and shall be durable & clearly legible.

3.2.12 **Painting and Fabrication process :**

a) The paints shall be carefully selected to withstand tropical heat rain. The paint shall not scale off or crinkle or be removed by abrasion due to normal handling. For this purpose powder coating shall be used.
b) Special care shall be taken by the manufacturer to ensure against rusting of nuts, bolts and fittings during operation. All bushings and current carrying parts shall be cleaned properly after final painting.
c) The fabrication process shall ensure that there are no sharp edges on the GI sheets used.

3.2.14 Enclosure GTP:

1)	**Ambient Temperature**	40° C
2)	Type of Ventilation for a) Normal Condition b) Hot Condition	 - Natural - Natural
3)	Compartmentalized	Yes
4)	Rated temperature enclosure class	10
5)	Degree of protection for external enclosure	IP34 Transformer Compartment. IP54 MV & LV Compartment
6)	Applicable Standard	IEC 62271 / 61330
7)	Enclosure material	Galvanized sheet Steel/CRCA
8)	Thickness of sheet (GI only)	2mm for enclosure. 4mm for PSS Base.

Note: No capacity de-ration of equipment / components upto 40°C ambient temperature.

3.3.0 11kV Switchgear

3.3.1 Non-extensible SF6 Insulated Compact Switchgear as required shall consist of following items:

3.3.2 Load Break Cable Switch with integral earth switch having full making capacity shall be used for Incoming cables.

3.3.3 SF6 / Vacuum Circuit Breaker shall be used for distribution network of HT switchgear. Circuit Breaker complete with operating mechanism, self powered, static type O/C,E/F protection relay with associated Current Transformers shall be used for control and protection of Transformer. An integral cable earthing switch with full making capacity shall be provided.

3.3.4 The above Load Break Cable Switch, SF6 / Vacuum circuit breaker, Bus bars should be mounted inside a sealed for life, cast resin / stainless steel tank. The operating mechanism of the switches and breakers shall be outside the SF6 tank and accessible from front. The tank should be filled with SF6 gas at an adequate pressure. The degree of protection for gas tank should be IP67**.** There shall be provision for filling the SF6 gas at site. Moreover the Cast Resin / Stainless Steel Gas Tank shall confirm to the sealed pressure system as per IEC and ensure the gas leakage to 0.1 % per year as per IEC.

3.3.5 The Circuit Breaker is required to control 11 kV/433 volts distribution Transformer of rating upto 990KVA and relay settings and Current Transformers shall be selected accordingly.

3.3.6 **General Finish:** Totally enclosed, metal enclosed, vermin and dust proof suitable for tropical climate use as detailed in the specification.

3.3.7 **Ratings**: The bus bars shall have continuous rating of 630 Amps. The isolator shall have a continuous rating of 630 Amps. SF6 Circuit Breaker or Vacuum Circuit Breaker shall have a continuous rating of 200 Amps. in accordance with relevant IS / IEC standard

3.3.8 **Breaking & Making Capacity**: The Load Break Cable Switches shall be capable for breaking rated full load current. The same along with its earthing switch shall also be suitable for full making capacity of the system as specified. The complete switchgear shall be suitable for breaking capacity of 21kA symmetrical at 11000 volts three phase for 11kV system for 3 sec

3.3.9 **Busbar**: Switchgear shall be complete with all connection, bus-bars etc. Copper busbars continuous rating shall be 630 Amps. The busbars should be fully encapsulated by SF6 gas inside the tank.

3.3.10 **Remote Operation**: Provision shall be there for remote operation of the switchgear's Isolator & Breaker shall be possible using Motors fitted to the operating mechanism at a latter date. It shall be possible to fit the motors either directly in manufacturing plant or on site as & when required. Installation on site shall be possible

3.3.11 **Protection**: The circuit breaker shall be fitted with static type self powered relay inside the front cover to avoid any tampering. The same shall be used in conjunction with suitable CT's and Tripping Coil for fault tripping of the Circuit Breakers. CT's shall be mounted on bushing of breaker. CT's mounted on cable inside cable compartment are also acceptable.

3.3.12 **Cable Termination**: Each Cable compartment shall be provided with three bushings of adequate sizes to terminate the incoming outgoing 11kV, 3 Core cables as the case may be. There shall be enough height from the base of the mounted switchgear so that the cables can be bent and taken vertically up to the bushings. The Cable termination shall be done by Heat shrinkable Termination method so that adequate clearances shall be maintained between phases for Termination. Cable Termination boots shall be supplied by the switchgear manufacturer.

3.3.13 Earthing of the main circuit : The moving contacts of the earthing switch shall be visible in the closed position through transparent covers.

Locking Arrangement: Suitable padlocking arrangements shall be provided as stated below:

a) Circuit Breaker manual operating handle in the "OFF" position.
b) Each feeder Panel operating handle in 'Closed' 'Open" or 'Earth' position.
c) Each isolator operating handle in 'Closed', ' Open', or 'Earth' position.

Ratings :

		Non-Extensible ring compact switchgear with SF6 / Vacuum breaker / Vacuum Circuit Breaker

3.4.1		
a)	Service	Indoor
b)	Type	Metal clad

c)	Number of phases	3
d)	Voltage	1100V
e)	Rated Frequency	50 Hz
f)	Rated Current	630 Amp (isolator)
g)	Short Circuit rating	
	i) Breaking	21kA rms for Breaker
	ii) Short time withstand for 3 Sec.	21 kA rms
	iii) Rated S/c making	52.5 kA peak for Breaker
h)	Rated insulation level kV rms	28 kV
i)	Rated Level kV impulse	75 kV
j)	System earthing	Solidly earthed at substation

7.1 Technical Specifications Smart LED Lights -

Energy efficient LED based luminaires unit for street lighting

I. SCOPE

The scope includes design, development, manufacturing, testing and supply of energy efficient luminaire complete with all accessories, LED lamps with suitable current control driver circuit including mounting bracket for street light and High mast light. The luminaire shall be suitable for rugged service under the operational and environmental conditions encountered during service.

II. PRINCIPLES DECIDING FACTORS FOR SELECTION/ PROCUREMENT OF LED LIGHTS

- Height of luminaire fitting as specified in table below
- Minimum Lux level required as specified in table below
- Minimum working hours (50000 hrs) of LEDs
- Minimum warranty shall not be less than 5 years for LED & Driver
- LED make as specified in document, and complete street light fitting can be of any manufacturer
- Additional cost towards high price of the LED light to be compensated by energy saving and zero maintenance.
- No specific make shall be criteria for selection and procurement of LED luminaires during any tender.

CONSTRUCTION

a. Extrudedaluminium and pressure die castaluminium(sand/gravity casting not to be considered). Aluminium grade LM 6063 or LM 6 as applicable or above high conductivity heat sink material. Heat sink must be made of extruded Al or pressure die cast Al only. Efforts shall be made to keep the overall outer dimensions and weight as minimum as possible.
b. All light fittings shall be provided with toughened glass of sufficient strength under the LED chamber to protect the LED and luminaires.
c. Suitable number of LED Lamps shall be used in the luminaires.
d. Suitable reflector/lenses shall be provided to modify the illumination angle.
e. The connecting wires used inside the luminaires, shall be low smoke halogen free, tire retardant e-beam/PTFE cable and fuse protection shall be provided in input side.
f. The control gear shall be designed in such a way that the junction temperature of LED should not be more than 25 ºC with respect to ambient temperature.
g. The luminaires shall be such that the glare from individual LED is restricted and shall not cause inconvenience to the public.
h. All the material used in the (luminaires) shall be halogen free and fire retardant confirming to UL 94.
i. The fixture should be impact resistant with suitable protection by cover for driver and LED's.
j. The fixture should have designed for IP65 ingress protection or above.

k.

VI. HIGH POWER AND HIGH LUMEN EFFICIENT LEDS SUITABLE FOR FOLLOWING FEATURES SHALL BE USED:

a. LED Chips of Cree/ Osram/ Philips/ Nichia make shall be used for the purpose. No other make shall be accepted. The manufacturer shall submit the proof of procurement of LEDs from above OMMs at the time of supply.
b. The efficiency of the LED lamps at 110ºC junction temperature shall be more than 80%
c. LED junction temperature should not cross more than 90 ºC for longevity of luminaries
d. Solder point temp should not cross 75ºC
e. The working life of the lamp at junction temperature of 90ºC for 350mA current shall be more than 50,000 hours of accumulative operation and shall be suitable for continuous operation of 24 hours per day these shall be supported with the suitable section of the LM80 report from the manufacturer of LED.
f. Colour temperature of the proposed white colour LED shall be 5000K-6500K.
g. The output of LED shall be more than110 lumen (+-5%) per watt at 350mA operating current
h. The colour rendering index (CRI) shall be of nominal 65 with cool white light output.

VII. ILLUMINATION LEVEL (Lux Measurement):

Lux measurement with the help of lux meter shall be done at distance as shown in table below. Value obtained shall not be less than the lux specified in the table there in considering 10% lumen is absorbed by the reflector.

The fitting shall be so designed that the illumination level shall be evenly distributed and shall be free from glare.

VIII. ELECTRICAL/TECHNICAL SPECIFICATIONS

Supply of LED streetlight luminaire complete with pressure die cast/extruded aluminum housing and adhering to the following specifications and lighting design requirements will be as per the actual application:

i. The driver card shall cut off at 270V and shall resume normal working when nominal voltage is applied again. This is to ensure protection of luminaires from neutral faults and error in connection at sites.
ii. Efficiency of driver electronics shall be more than 85%.
iii. The LEDs should be driven at the suitable current and within the permissible limits specified by the LED chip/lamp manufacturer.
iv. The fixture shall be designed so as to have lumen maintenance of at least 70% at the end of 50,000 hours.
v. The luminaire should be operable with auto adjustable 100-270V supply Voltage using the same driver.
vi. Power Factor of the electronic driver should be at least > 0.95 with THD < 10%.

vii. The luminaire should throw the perfect amount of uniform light with exactly the desired intensity, and offer best pole spacing, along with better light control. For this purpose, spacing to height ratio calculations must be attached for all installations were the poles are to be newly installed. The Luminaire shall employ individual optical lens for the each of the LED to ensure better uniformity of light distribution.

IX. ABSTRACT OF KEY SPECIFICATIONS

	Electrical specifications	18W/25W/35W/45W	60W/75W	120W/150W/200W
i)	Voltage range or rating: [130 volt – 270volt AC] on single phase	100-270V	100-270V	100-270V
ii)	LED Output (lumen per watt)	>115 (+5%)	>115 (+5%)	>115 (+5%)
iii)	Frequency range (+/-5)	50Hz	50Hz	50Hz
iv)	Power factor:	>/=0.95	>/= 0.95	>/= 0.95
vi)	Colour temperature	5000K-6500K	5000K-6500K	5000K-6500K
vii)	CRI (Colour Rendering Index)	>=65	>=65	>=65
viii)	LED Life Exp ectancy	50,000 hrs with 70% Lumens	50,000 hrs with 70% Lumens	50,000 hrs with 70% Lumens
x)	Protection level	IP65 minimum	IP65 min	IP65 minimum
Xi)	Total Harmonic Distortion (THD)	<10%	< 10%	< 10%

X. CONFORMANCE STANDARDS:

Product Certification should be obtained from UL or CPRI or any other NABL certified lab. The following test reports should be provided:

LM-79	Luminaire efficacy (Photometry data)
LM-80	LED chip data
IP 67	Luminaire Ingress Protection
Luminaire Endurance Test	Practical testing of luminaire through 20,000 cycles
EN 60929	Performance
IEC 60598-1	General requirement and tests
IEC 61000-3-2	Limits for Harmonic current emission - THD < 10%

Feeder Pillars

;The design and operation of feeder panels shall comply with SP 72 Part 8 of National Lighting Code 2010.

The typical specifications for the power conditioning panels shall be as follows:

- Principle equipment should be designed on the basis of `Lossless Series Reactance with Secondary Compensation' technology (Auto-transformer)
- The efficiency of such principle equipment should not be less than 99.4% between 50% - 110% of loading
- Other than basic switching components, no other moving parts are allowed to be installed in the feeder panel
- 240 VAC 50 Hz Single Phase Two Wire / 415 VAC 50 Hz Three Phase Four Wire Input
- Three Taps of Single / Three Phase Four Wire Outputs
- Standard Output Taps in each Phase at 200/205/210 VAC @ 240 VAC Nominal Input
- Feeder panels should have GPRS/GSM based remote streetlight monitoring system with capacity for self-protection from short-circuit, over voltage and anti-theft alert
- The rating of the Streetlight controller should be at least 1.3 times the lighting load as measured during the initial studies
- Energy Meters to be installed in separately sealable and open able compartment within the Feeder Panels as per the following specifications:
    - Energy Meters should have Accuracy class of Class 1 or better;
    - Meters could be either three phase whole current or CT operated for LT as may be required based on the load connected to the feeder panel. The space to be created in the feeder panel for housing the meters should consider the same.
    - Energy Meters should be capable of logging parameters for each 15 minute time block with stamping of date and time. Such data logs should be retained in the energy meters for a period of 60 days or more.
    - Such Energy Meters should record the following minimum parameters:
        - Phase to neutral voltages
        - Phase-wise current
        - Phase-wise power factor and frequency
        - Total active power
        - Total reactive power
        - Total active energy
        - Total reactive energy
        - Total KVAH energy
    - Meters should have requisite port (Serial port communication – RS232 or RS485) for enabling remote reading and for connection of Modem for the same;
        - Energy Meter specifications should meet the minimum specifications specified by DISCOM and a sign-off on the same shall be obtained from DISCOM prior to finalizing the specifications;
        - Energy Meters shall be tested, installed and sealed in accordance with procedures specified by DISCOM;
        - A signoff from DISCOM on the design and specifications of the compartment in the Feeder Panel where the meters are to be housed is also recommended;
- Bidder has to install appropriate power conditioning devices to protect the new EE technologies and components of feeder panels from damage. Poor power quality is not allowed as an excuse for non-functioning of the new technologies installed under the project

- Fixed capacitor with appropriate capacity shall be introduced in each feeder panel to always maintain a power factor above 0.90
- In case of Single phase controller unit, 1 pole contactor or multiple parallel pole contactors should be used and in case of 3 phases, appropriate duty 3 pole contactor should be used. The number of contactors used should be suitable for ON/OFF and for changeover between full voltage to various voltage taps and interchanging between taps.The panels should be equipped with a microprocessor based Dual Channel Almanac Timer controller which should be user programmable to enable setting of ON/OFF times and also switching over to savings mode/bypass mode when required
- All the principle equipment's along with input output switchgears, metering, switches (bye pass and tap changers), contactors, fuses, auto transformer coils etc. should be of reputed manufacturers and should meet best engineering practices and norms as applicable in relevant standards
    - Auto transformer coil should have full current operating efficiency of better than 99%
    - The total heat dissipation from single coil should not exceed 6 watts-sec/kVA under fully loaded condition
    - The rated current of the auto transformer should be for continuous 120% that of input rated current
    - The switched fuse units should be of 32 Amp continuous AC current capacities. Fuses used should be of 20 Amp. Rating of high rupturing capacity (S/c current at least 50 kA)
- The bidders should always ensure that the System is capable to capture live data and record it at variable time-intervals. Following parameters should be recorded for every 60-120 minutes time interval:
    - Voltages
    - Current
    - Power Factor
    - Active Power (kW)
    - Apparent Power (kVA)
    - Metering kWh cumulative
    - Metering kVAh cumulative
    - Number of hours the lamps were glowing
    - Special emergency on/off facility with wireless control.
    - Benchmarking capacity so as to generate alert SMS for:
        - Phase-wise currents on crossing threshold values
        - Phase-wise voltages on crossing threshold values
        - BSCDCLB trips
        - Theft alerts
        - Group failure of lights
        - Contactor failure
        - No output supply
    - Alert SMS shall be forwarded to five (5) phone numbers.
    - GPRS/GSM modem should be used

- Enclosure Box of feeder panels shall be IP-56 compliant and should be fabricated out of MS sheet SWG 16 / 14 duly powder coated for corrosion resistance and long life.
    - It should have Single Phase power socket for connecting utility tools like drill machine etc. (capacity 1phase 240Vac / 5Amp socket)
    - Utility Service Lamp inside Panel for use during maintenance work
    - Gland Plates for Cable Entry at Incomer and Outgoing
    - Auto Bypass / Tap Changing in lieu of Manual. The tap changing should be automatic between the full voltage and lower voltage for minimum two numbers selected taps.
- The bidder shall have to get the control panels fabricated from the vendor having type test certificate from CPRI for 31 MVA short-circuit rating up to 400 amp for cubical panels. The copy of the type test certificate shall also have to be produced failing which feeder panels shall not be accepted
- Design life of the control panel should be mentioned in form of MTBF (mean time between failures) and it should be minimum 10 years.

Remotely Controlled Power conditioning requirement for Feeder Panels

Voltage Control:

- 240 VAC 50 Hz Single Phase Two Wire / 415 VAC 50 Hz Three Phase Four Wire Input
- Three Taps of Single / Three Phase Four Wire Outputs
- Standard Output Taps In Each Phase at 200/205/210 VAC @ 240 VAC Nominal Input
- Real time clock
- Three independent channels / output relays (desirable up to 4) with independent ON and OFF programming possibility remotely (User settable)
- System losses should be less than 1% so as to achieve high efficiency.
- Should not introduce any harmonics into the system but should reduce it.
- Other than basic switching components, no other moving parts should be there.
- During voltage tap changing, lights should not be momentarily disconnected which will lead to re-ignition of lights. It is mandatory for supplier to make gapless changeover arrangement when changing from by-pass mode to & from lower voltage energy saving mode and interchanging between the taps. This should be achieved by supplier by any specialized arrangements. The user is expected to produce the Performance assessment certificate for minimum continuous 100 such changeover operations without any lamps going off in any of the three phases at minimum and Maximum supply voltage conditions. This certificate should be received from reputed Laboratory organisations like CPRI, ETDC, ERTL, IDEMI, SAMEER etc.
- Voltage Rating: 170V to 290V.
- Over-ride for local operation time settings from the central PC on every individual device for user definable time frame with a specific display on the particular device where such override is implemented
- Almanac sunrise and sunset table operation (User selectable option)
- User settable selection between GSM / GPRS operation and manual local operation
- Control of operation times settings from the central PC (in case of GSM)

- Specific data request whenever user desires from control PC
- Fault reporting to central PC and user definable Cell Phone number
- 3 No's Auxiliary Output NO/NC contacts with 5 Amp rating at 240 VAC and 2 no's Auxiliary input terminals (12Vdc or 240Vac) should be provided

Data monitoring:

- Class I (Minimum) accuracy of measurement of data
- All load parameters like Individual phase voltage, current, power factor, VA, Watts. In addition, WH (energy) also should be logged on a continual basis
- Data monitoring interval – One hour (desirable programmable from 1 min to 120 min)
- Serial port communication (RS232) AND (RS485- Desirable)
- Minimum data storage for 12 months (if data logged at 1 hour intervals)
- All data stored in the device regardless of whether the data has been transmitted to the central PC via GSM or not. Such data can then be later downloaded by the user on to a HHU

Other:

- Individual device ID user settable
- Password protected access to control functions
- Operating temperatures up to 55 deg. centigrade continuous
- Humidity up to 98% (Non condensing)
- Software for data monitoring, control, communication and analysis
- GPRS software for live viewing & controlling of functions of every individual unit on a static IP address
- Providing automatic controller compatible with GPRS / GSM or suitable protocol at individual panel level. Controller would perform meter reading, switching, data logging, communication and control.
- Individual meters / controllers operating in given protocol to communicate with individual unaccounted lamps in a given area
- Control cabinet fault monitoring

Central Control Unit (BSCDCLU – Master) should provide additional features and daily user defined report. These features should include:

- Support to export reports on website to other application formats like MS Access, DB, SQL, Oracle etc.
- Printout facility available on web pages
- Inbuilt scalability to support large lighting network. Upton 250 no's of RTUs should be possible to be controlled from one Central Control Unit
- High up-time and immediate fault rectification through SMS intimation to maintenance team.
- Simplified maintenance
- Real-time control

Faults Monitoring:

- Under/over voltage detection
- Main breaker error

- Contactor fault
- Circuit breaker off
- Circuit phase errors (fuse, breaker, etc.)
- Main power failure
- Leakage to ground
- Manual switch activated
- Phase current out of range
- Control cabinet door open
- Lamp failures

Complete monitoring on image of the entire geographic area at the screen and with projector attachment – on back wall, where the operators monitor the streetlight and dispatch maintenance teams. Any alarms and their exact location should be shown on the map for easy and fast overview. System should incorporate hardware modules in the control cabinets and enable communication from the central server location to the control cabinets via wireless (e.g. GSM/GPRS).

#.	Clause	Criticality	Compliance (Non-Compliance/ Compliant or Customization/ Fully Compliance	Remarks
1	Certification CE • Metering: EN 61326-1 • Safety: EN 60950-1 • Lighting: EN 61000 • EMC: ETSI EN 301 489-3 • Radio & RF Spectrum Efficiency: ETSI EN 300 220-1 • RoHS • R&TTE 1999/5/EC • Applicable FCC Title 47 part 15 classes The wireless transmission system needs to comply with the European maximum transmission power of 10mW (+10dBm) or 500mW (+27dBm), and a receive sensibility of -110dBm IP 55 (integrated controller, IP68 for external enclosure) and RoHS approved. The system needs to be based on the IETF open standard.	Vital		
2	Power: 110-256 VAC 50/60Hz.	Essential		
3	Optional backup power for external mounting: NiMh 600mAh battery (with an average 10 years expected life).	Desirable		
4	Low power consumption: The Luminaire Controller should consume less than 2watts.	Essential		
5	Integrated in the fixture: The Luminaire Controller should be Internal mounting in the fixture. Node dimensions (Max) 110 x 77 x 36 mm (for internal mounting). For the non-integrated option for ad-hoc basis. Dimensions (Max) would then be: 150 x 108 x 55 mm. Operating temperature: -	Vital		

#.	Clause	Criticality	Compliance (Non-Compliance/ Compliant or Customization/ Fully Compliance	Remarks
	30°C et +70°C. The antenna could be integrated in the fixture (which would reduce the transmission/reception power) or external (TNC/SMA or via an RF coax cable)			
6	Autonomous clock: The Luminaire Controller must store scheduled ON, OFF and stepless dimming command that it received from the Central Management Software and execute them with the light point. The Luminaire Controller should have an astronomical clock to define lighting schedules based on seasons. Those schedules could be defined from relative and absolute commands. The Luminaire Controller should manage the luminaire even in case of a network outage (i.e. the stored lighting schedule should apply even if the controller can't communicate with the Central Management System).	Vital		
7	Control of the luminaire and Manual override: The Luminaire Controller must be able to receive and execute real time ON/OFF (via mechanical 8A relay) and stepless dimming commands that it receives from the Central Management Software. The controller's schedule table should support up to 16 programmable commands, in an integrated non-volatile method. A local override port on the controller should be available for future use.	Vital		
8	Any type of Dimming is not allowed.	Vital		
9	Communicate using a wireless mesh protocol: The Luminaire Controllers must communicate using a wireless mesh protocol. This protocol should be open, based on the 6LoWPAN standard (802.15.4), with an IPv6 addressing scheme, on the ISM band	Essential		

#.	Clause	Criticality	Compliance (Non-Compliance/ Compliant or Customization/ Fully Compliance	Remarks
	(433MHz, 868MHz and 915MHz) or any other free band			
10	Broadcast communication: The wireless mesh protocol shall support broadcast (one command to target a group of Luminaire Controllers) and unicast (one command sent to a single Luminaire Controller).	Essential		
11	Integrated in a Smart City environment: The Luminaire Controllers must integrated seamlessly in a Smart City wireless meshed network (a dedicated city-wide network to manage urban connected devices such as meters, waste bins, parking sensors, traffic lights, pollution sensors).	Vital		
12	Communication specifications: 128bit AES encryption Transmission power < 27dBM Full duplex communication. Radio modulation: GFSK / GMSK/ 2FSK/ MSK/ OOK/ ASK. Fully meshed wireless, self-configuration and self-healing network.	Desirable		
13	Remote management: The Luminaire Controllers must be controlled and managed remotely.	Essential		
14	Seamless installation and commissioning: The Luminaire Controllers must integratedseamlessly and automatically to an existing Luminaire Controllers network. The Luminaire Controllers must communicate seamlessly and automatically with an existing gateway. The Luminaire Controllers must be able to roam between gateways for redundancy and seamless installation purposes.	Essential		
15	Communication performance: The fully meshed wireless network should support a bandwidth of up to 200Kbps.	Desirable		
16	Detect and report failures: The Luminaire Controllers must be able to detect and report	Desirable		

#.	Clause	Criticality	Compliance (Non-Compliance/ Compliant or Customization/ Fully Compliance	Remarks
	alarms such as: lamp failures, ballast failure, low/high voltage, low/high current, low capacitor, flickering lamps, etc.			
17	Measuring electrical values: The Luminaire Controllers must be able to measure mains voltage (RMS), current (RMS), frequency, power factor, active and reactive power, active and reactive energy; in real-time or not, with an accuracy equal or better than 2%.Integrated temperature meter. The load's electrical consumption measurement is up to 1,5kVA	Desirable		
18	Measure cumulated energy consumption: The Luminaire Controller must measure and store the cumulated energy consumption.	Desirable		
19	Measure number of burning hours: The Luminaire Controllers must measure and store the number of lamp burning hours	Desirable		
20	Additional I/O port for future use: The Luminaire Controllers must have at least 2 local I/O programmable ports for future use	Desirable		
Gateway				
1	Certification CE • Metering: EN 61326-1, • Health: EN 50385 • Safety: EN 60950-1 • Lighting: EN 61000 • EMC EN 301 489-1, ETSI EN 301 489-3, ETSI EN 301 489-17 • Radio & RF Spectrum Efficiency: ETSI EN 300 220-2 v2.3.1, ETSI EN 300 328, ETSI EN 301 893 • RoHS • R&TTE 1999/5/EC • Applicable FCC Title 47 part 15 classes	Vital		

#.	Clause	Criticality	Compliance (Non-Compliance/ Compliant or Customization/ Fully Compliance	Remarks
	The narrowband wireless transmission system needs to comply with the European maximum transmission power of 10mW (+10dBm) or 500mW (+27dBm) and a receive sensibility of -98dBm (for the 6LoWPAN 802.15.4 communication standard), as well as 500mW (+27dBm) and a receive sensibility of -119/-115/-107 dBm (for the EN 13757-4 – Wireless M-Bus). The broadband Wi-Fi transmission system needs to comply with the Wi-Fi power transmissions standards: 200mW (+23dBm) – 802.11 a/n/s and 100mW (+20dBm) – 802.11 b/g The system needs to be based on the IETF open standard. IP 40 (integrated gateway) or IP67 (for external enclosure) and RoHS approved.			
2	Power: 85-256 VAC 50/60Hz.12/24 DC POE – IEEE 802.3at – 48VDC. Power consumption: 5W max.	Desirable		
3	Number of LED Lights to be considered 60% of light are 250W and 40% of lights are 150W. Total number of poles for housing LED lights are 20,000.			
4	Environmental Dimension: 269 x 239 x 82 mm (rugged metal case) or 330 x 204 x 55 mm (anodized metal case) Operating temperature: -30°C et +60°C. Case: 1) External mounting: IP 67, rugged metal, resistant to oils/greases/fuels, diesel, paraffin/ozone and RoHS approved. 2) Internal mounting: IP40 anodized metal.	Desirable		

#.	Clause	Criticality	Compliance (Non-Compliance/ Compliant or Customization/ Fully Compliance	Remarks
5	Wireless fully meshed communication protocol The gateway should be able to communicate in broadband and narrow band networks: 1) Narrowband networks (IPv6): The open standard 6LoWPAN (802.15.4) IPv6 should be supported on the ISM frequency band (433MHz, 868 MHz and 915MHz). 2) Broadband network (IPv4): The following standards should be supported: a) Wi-Fi 802.11 a/b/g/n/s standard on the 2.4GHz, 5.4GHz or 5.8GHz frequency bands b) GSM/GPRS/EDGE/UMTS/3G on the 850/900/1800/1900 MHz frequency bands c) RJ-45 10/100Mb base-TX Ethernet port The gateway needs to communicate and route traffic between the different networks automatically and in real-time.	Vital		
6	Communication performance 1) Narrowband network: The fully meshed wireless network should support a bandwidth of up to 200Kbps 2) Broadband network: The fully meshed wireless network should support a bandwidth of up to 300Mbps.	Essential		
7	Broadcast communication: The wireless mesh protocol shall support broadcast (one command to target a group of Controllers/Nodes) and unicast (one	Essential		

#.	Clause	Criticality	Compliance (Non-Compliance/ Compliant or Customization/ Fully Compliance	Remarks
	command sent to a single Controller/Nodes).			
8	Integrated in a Smart City environment: The gateway must integrated seamlessly in a Smart City wireless meshed network (a dedicated city-wide network to manage urban connected devices such as meters, waste bins, parking sensors, traffic lights, pollution sensors).	Vital		
9	Remote management: The gateway must be controlled and managed remotely	Essential		
10	Seamless installation and commissioning: The gateway must integrated seamlessly and automatically to an existing network. The gateway must communicate seamlessly and automatically with an existing gateway. The gateway should support the controllers/nodes roaming feature for redundancy and seamless installation purposes.	Essential		
11	Maximum number of nodes supported by the gateway: The gateway should be able to at least manage 200 nodes/controllers.	Essential		
12	Communication specifications: • 256bit AES encryption for the broadband communication • 128bit AES encryption for the narrowband communication • Radio modulation: BPSK, DBPSK, QPSK, DQPSK, 16-QAM, 64-QAM, GFSK, FHSS • Full duplex communication. Fully meshed wireless, self-configuration and self-healing features on the narrowband and	Essential		

#.	Clause	Criticality	Compliance (Non-Compliance/ Compliant or Customization/ Fully Compliance	Remarks
	the broadband networks			
Central Management Software				
1	Multi-User Web Application Server The CMS shall be based on an open Web Application Server. Its user interface shall be 100% Web-based and accessible from any computer on the network through a Microsoft Internet Explorer, SAFARI or Chrome web browser	Vital		
2	Enterprise server The CMS shall be installed on a server that belongs to the organization/customer or to one of our local service or IT sub-contractor. Cloud-based, SaaS model or any server that is web-hosted by a Bidder of a part of the solution is not accepted.	Vital		
3	100% Web Interface Web user interfaces shall run and be supported on Microsoft Internet Explorer, SAFARI and Chrome on WINDOWS-based PC and MAC OS.	Desirable		
4	Based on open technologies The CMS must be developed with open and standardized languages including Java, XML configuration files and SQL database. It shall enable the development of additional features without the need to acquire any development software license.	Vital		
5	Open database engine The CMS shall record all the data in a centralized SQL database and shall be compatible with MYSQL to avoid being obliged to purchase additional software license for database engine.	Vital		
6	User authentication system The CMS shall enable administrator to create, modify and delete users, passwords, groups and access controls. The CMS shall automatically close connections after X mns (configurable) of	Desirable		

#.	Clause	Criticality	Compliance (Non-Compliance/ Compliant or Customization/ Fully Compliance	Remarks
	inactivity. Tiered level access and management.			
7	Integrated CMS The CMS shall be an integrated and ready-to-use application that does not require any specific development before being deployed. The CMS should be a flexible and modular application, supporting the management of any type of Smart City services: a dedicated city-wide central management system to manage all types of urban connected devices such as meters, waste bins, parking sensors, traffic lights, pollution sensors.	Essential		
8	Support multiple types of Control Systems, i.e. Gateways The CMS shall manage and communicate with different types of network devices as listed in the previous sections (gateways, nodes) It should also support different heterogeneous Control Systems, including power line systems and wireless systems.	Desirable		
9	Network management The CMS should support and enable: • The management of the narrowband networks • The management of the broadband networks • The management of the applications • The management of the networks configurations • The management of the data generated by the nodes and gateways (network data and user data) • The Monitoring and configuration of network objects • The management of the network links and provide link status, link quality and link reporting	Vital		

#.	Clause	Criticality	Compliance (Non-Compliance/ Compliant or Customization/ Fully Compliance	Remarks
	• Detailed broadband network reporting: wireless transmission power, TCP/IP usage, link utilization, • The management of the network as a whole, with network status and network quality The CMS should provide automatically or on request, the status and the related critical events of each managed objects. Those critical events could be: wireless link quality, usage of the objects, outages, battery life-time,			
10	CMS shall provide a user and object management system The CMS shall provide ways to create user profiles, users and access rights to web applications as well as to groups of objects. The CMS shall manage the objects individually or by groups of objects.	Essential		
11	CMS shall log all actions The CMS shall log all the actions from all the users. Recording Node and device history (linking network Nodes, lamps/meters, customer accounts) and keeping track of adds, moves or changes	Desirable		
12	CMS shall provide map-based inventory features The CMS shall enable users to group objects per geographical zone, to move objects, to delete objects and to duplicate objects on the maps. The CMS should display the network topology (objects, links, status) on a map, in a tree format, and other graphical views to ease the management of the network	Essential		
13	CMS shall support multiple types of objects, enable new attributes to be created and provide inventory import/export features. The CMS shall support Light Points, Segment	Vital		

#.	Clause	Criticality	Compliance (Non-Compliance/ Compliant or Customization/ Fully Compliance	Remarks
	Controllers, Sensors, Electrical Vehicle Charging Stations, Weather Stations, Energy Meters and other types of objects. It shall enable the import/export of the inventory in a the following formats: • standardized CSV formatted file • ODBC and text export • Via the XML server • Via SQL queries into the database.			
14	Configuration of all the parameters of the Gateway and the nodes The CMS shall enable end-users to configure all the parameters of the Gateway and the nodes, including the IP communication parameters, astronomical clock, real time clock, schedulers, Gateway's inputs/outputs and associated scenario, etc. Auto-discovery of the networks' objects.	Vital		
15	Management and configuration of the services The CMS shall enable the management and configuration of the Smart City services, such as the street lighting, parking spaces, meters	Essential		
16	Automatic installation process The CMS shall provide end-users with processes and tools to automatically process the installation and configuration of the Nodes.	Essential		
17	Gateways shall "PUSH" data to CMS The data logs (all data read by the Gateway on the Nodes) generated on the Gateway shall be pushed by Gateways to the CMS rather than pulled by the CMS to provide a higher scalability. The data collect process shall not require any manual operation. The data presented by the CMS (related to the network or the services) should be updated dynamically.	Vital		
18	Ready-to-use Web Reports The CMS shall provide ready-to-use web reports to analyze	Desirable		

#.	Clause	Criticality	Compliance (Non-Compliance/ Compliant or Customization/ Fully Compliance	Remarks
	failures, energy consumption and lamp age. It shall provide a way to display historical values for any measured attribute of any device in the database.			
19	Customized desktop of Web Reports and Applications The CMS shall manage access control depending on the user profile and provide the according list of web reports and applications on a web desktop. Each application shall display only the geographical zone, devices and data that the user is authorized to access.	Essential		
20	Alarm management The CMS shall enable the administrator to create complex alarm scenario based on the data collected from the Nodes through the Gateways. Such alarms aim at sending only effective alarms to the right end-user. The CMS shall perform and support the following alarm features: • Receiving/capturing successful/unsuccessful readings from any node-connected devices, at scheduled timings/intervals or on demand; • Reporting about alarms and status indicators, tamper/thefts, consumption / usage trends from node-connected devices • Identifying and reporting critical events from Nodes and devices (failures, memory capacity issues, communication link or network failures, power failures,) • Notify of events via	Essential		

#.	Clause	Criticality	Compliance (Non-Compliance/ Compliant or Customization/ Fully Compliance	Remarks
	o Email and distribution lists o SMS o The execution of a process An alarm warning on the CMS			
21	Real-time control on maps The CMS shall enable authorized users to control, command and monitor each objects in real-time. It shall provide instantaneous (less than 20 seconds in average) communication (sending commands and/or receiving data) between the nodes/controllers, the gateways and the CMS. Multi-level network topology hierarchy and map visualization to ease the management of the network and the services,	Vital		
22	Provide web service interface for 3rd party software to leverage the CMS features The CMS shall provide with XML, API and SQL access as well as a set of web service interface to enable third party authorized software to use the CMS features.	Vital		
23	Maximum number of managed objects The CMS should be able to support and manage an unlimited number of objects.	Essential		
24	Backup server and server farms The CMS should have a backup function with a live standby server and automated failover The CMS application and the SQL database should be able to run on different servers, if needed, to manage growth. The CMS application and the SQL database should be able to run on their respective server farms, if needed, to manage growth.	Essential		

SECTION-8

List of Approved Make

Electrical Material

1. **Cables HT (11KV& 33KV)** - Universal cables(Satna), Ravin, Nicco, CCI(Banglore), Torrent/ Approved by MPMKVVCo Ltd and BSCDCL.
2. **Cables LT** - Universal cables(Satna), Ravin, Nicco, CCI(Banglore), Torrent Approved by MPMKVVCo Ltd and BSCDCL.
3. **RMU (11KV & 33KV)** - BHEL, ABB, Schneider, Siemens/ Approved by MPMKVVCo Ltd and BSCDCL.
4. **HT Termination jointing kit** - Raychem, M-seal, Cabseal, Mahindra/ Approved by MPMKVVCo Ltd and BSCDCL.
5. **PSS** - ABB, Schneider, Siemens, Kirloskar/ Approved by MPMKVVCo Ltd and BSCDCL.

Civil Material

1. **Plastic Track** - Kataline or Equivalent

Section A- Civil SOR Bill of Quantities						
Bill of Quantities As per UADD ISSR 2012 for Road Work						
Sr. No.	**SOR Item No.**	**Item**	**Unit**	**Quantity**	**Rate (Rs.)**	**Amount**
1	2.3	Dismantling of existing structures like culverts, bridges, retaining walls and other structure comprising of masonry, cement concrete, wood work, steel work, including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of unserviceable material and stacking the serviceable material with all lifts and lead 1000 meter.				
(a)		Prestressed / Reinforced cement concrete grade M-20 & above	Cum	72.45	655.00	47,454.75
(b)		Rubble stone masonry in cement mortar.	Cum	1,524.90	150.00	2,28,735.00
(c)		Removing all type of hume pipes and stacking within a lead of 1000 metres including earthwork and dismantling of masonry works.				
		i) Diameter up to 600 mm	Meter	6.90	109.00	752.10
2	3.1	Excavation for roadway in soil including loading in truck for carrying of cut earth to embankment site with all lifts and lead upto 1000 meters and as per relevant clauses of section-300.	Cum	9,604.40	98.00	9,41,231.46
3	3.2	Excavation for road way in ordinary rock including loading in a truck and carrying of excavated material to embankment site with in all lifts and leads upto 1000 meters and as per relevant clauses of section-300.	Cum	11,738.71	142.00	16,66,897.44
4	3.8	Scarifying the existing bituminous road surface by mechanical means to a depth of 50 mm and disposal of scarified material with in all lifts and lead upto 1000 meters.	sqm	17,685.00	15.00	2,65,275.00
5	3.10	Construction of Embankment/Sub grade/ earth shoulders, as per clause 305.1.1 inclusive of operation necessary as per clause 305 & its sub-clauses, Where required but with approved materials obtained from excavation for road construction (vide clause 301.3.11) i/c consolidating the original ground by rolling as directed by the Engineer-in-charge but with	Cum	7,683.52	234.00	17,97,944.18
6	3.11	Construction of Embankment/Sub grade/ earth shoulders, as per clause 305 & its sub-clauses, Where required but with approved materials/soil like morrum CBR value not less then 7% i/c all lead & lifts i/c excavation, cost of watering, compaction and maintenance of surface during construction to ensure shedding & preventing ponding of water (clause	Cum	29,892.84	272.00	81,30,851.63
7	3.18	Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement: 2 fine sand) including testing of joints etc. complete.	meter			

	a)	Size 300 mm dia meter		5,085.00	445.00	22,62,825.00

Sr. No.	SOR Item No.	Item	Unit	Quantity	Rate (Rs.)	Amount
8	4.1	Construction of granular sub-base by providing coarse graded material, spreading in uniform layers with on prepared surface, mixing by mix in place method at OMC, and compacting with vibratory roller to achieve the desired density, complete in all respect and as per relevant clauses of section-400.				
	i)	for grading- II Material	Cum	11,580.66	614.00	71,10,525.24
9	4.5	Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density and as per relevant clauses of section-400.	Cum	12,499.59	951.00	118,87,113.66
10	4.7	Filling of existing median and Island above road level with approved material brought from borrow pits including excavation and all leads, spread, sloped and compacted and as per relevant clauses of section-400.	Cum	3,512.13	151.00	5,30,331.63
11	5.1	Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer at the rate of 0.75 kg/sqm using mechanical/Manual means and as per relevant clauses of section-502.	sqm	49,998.38	26.00	12,99,957.75
12	5.2	Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor on the prepared bituminous/granular surface cleaned with mechanical broom and as per relevant clauses of section-503.				
	i)	.@ 0.25 kg per sqm (normal bituminous surfaces)	sqm	49,998.38	9.00	4,49,985.38
	ii)	.@ 0.30 kg per sqm (dry & hungry bituminous surfaces/granular surfaces treated with primer)	sqm	49,998.38	11.00	5,49,982.13
13	5.6	Providing and laying dense bituminous macadam with hot mix plant batch using crushed aggregates of specified grading, premixed with bituminous binder, transporting the hot mix to work site, laying with mechanical paver finisher to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction complete in all respects and as per relevant clauses of section-507. (Only cement will be used as filler)				

	i)	for Grading I (80-100mm thickness)	Cum	2,889.65	7161.00	206,92,801.55

Sr. No	SOR Item No.	Item	Unit	Quantity	Rate Rs.	Amount
14	5.8	Providing and laying bituminous concrete with hot mix plant using crushed aggregates of specified grading, premixed with bituminous binder, transporting the hot mix to work site,laying with a mechanical paver finisher to the required grade,level and alignment,rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction in all respects and as per relevant clauses of section-509.(Only cement will be used as filler).				
	i)	for Grading I (50-65 mm thickness) with 60/70 bitumen	Cum	1899.69	8223	15538879.76
15	8.1	Construction of cement concrete kerb with top and bottom width 115 and 165 mm respectively, 250 mm high in M 20 grade PCC on M-10 grade foundation 150 mm thick, foundation having 50 mm projection beyond kerb stone, kerb stone laid with kerb laying machine, foundation concrete laid manually, all complete and as per clause 408 of specifications.				
	i)	Using Concrete Batching and Mixing Plant	Meter	16253.20	189	3071854.80
16	8.3	Providing and fixing of retro-reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm (height from crown level of the road and bottom of the sign board shall not be less than 1.5 m.) firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing including painting of vertical post as per specification.				

	i	90 cm equilateral triangle	Each	6.00	3715	22290
	ii	80 cm x 60 cm rectangular	Each	10.00	4537	45370
17	8.4	Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorized sign asper IRC:67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminum sheeting, 2 mm thick with area not exceeding 0.9 sq.m supported on a mild steel single angle iron post 75x75x6 mm (height from crown level of the road and bottom of the sign board shall not be less than 1.5 m.) firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing including painting of vertical post as per specification.	Sqm	4.50	7983	35923.50

Sr. No.	SOR Item No.	Item	Unit	Quantity	Rate (Rs.)	Amount
18	8.6	Painting two coats after filling the surface with synthetic enamel paint in all shades on new plastered concrete surfaces and as per relevant clauses of section-800 & I.R.C.-67 including cost of paint etc. complete.	Sqm	5,308.64	44.00	2,33,580.16
19	8.10	Road Marking with Hot Applied Thermoplastic Compound with Reflectorising Glass Beads on Bituminous Surface (Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes and as per relevant clauses of section-800.	Sqm	3,562.50	900.00	32,06,250.00
20	13.1	Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material etc. and as per relevant clauses of section 300 & 2100 in				
	i)	Ordinary rock/ Large boulder each more than 0.03 cum. Volume (Depth upto 3 m from av. Ground level)	Cum	11,950.12	371.00	44,33,496.00

21	13.5	Providing Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification and as per relevant clauses of sections 1400 with .				
	i)	Coursed rubble masonry(first sort)	Cum	514.80	2895.00	14,90,346.00

Sr. No.	SOR Item No.	Item	Unit	Quantity	Rate (Rs.)	Amount
22	13.6	Providing and laying Plain/Reinforced cement concrete (mixed in concrete mixture) in open foundation including form work shuttering etc. complete as per drawing and technical specifications and as per relevant clauses of sections 1500, 1700 & 2100 with .				
	i)	PCC Grade M15 with 40 mm maximum size of aggregate	Cum	1,748.00	3692.00	64,53,619.69
	ii)	PCC Grade M20 with 20 mm maximum size of aggregate	Cum	1,593.08	4259.00	67,84,919.20
	iii)	RCC Grade M25 with 20 mm maximum size of aggregate	Cum	7,315.13	4300.00	314,55,037.50
23	13.26	Supplying, fitting and placing un-coated HYSD bar reinforcement in foundation complete as per drawing and technical specifications and as per relevant clauses of sections 1600.	MT	489.97	56994.00	279,25,521.16
24	14.3	Providing Plastering with cement mortar (1:3) on brick work in sub-structure as per Technical specifications and as per relevant clauses of sections 1300.	sqm	3,432.00	84.00	2,88,288.00
25	14.4	Providing Stone masonry work in cement mortar 1:3 for substructure complete as per drawing and Technical Specifications and as per relevant clauses of sections 1400 in.	Cum			
	i)	Coursed rubble masonry(first sort)	Cum	374.40	2702.00	10,11,628.80
26	14.5	Providing and laying Plain/Reinforced cement concrete (mixed in concrete mixture) in sub-structure or complete RCC Box section as per drawing and technical specifications and as per relevant clauses of sections 1500, 1700 & 2200 in (Height above average ground level)	Cum			
	i)	PCC Grade M20 with 20 mm maximum size of aggregate		1,305.43	4317.00	56,35,524.04
	ii)	RCC Grade M25 with 20 mm maximum size of aggregate		1,975.95	4371.00	86,36,877.45
27	14.6	Supplying, fitting and placing HYSD bar reinforcement in sub-structure complete as per drawing and technical specifications and as per relevant clauses of sections 1600.	MT	166.63	57086.00	95,12,468.52
28	14.8	Providing weep holes in Brick masonry/Plain/Reinforced concrete abutment, wing wall/return wall with 100 mm dia AC pipe, extending through the full width of the structure with slope of 1V :20H towards drawing foce. Complete as per drawing and Technical specifications and as per	Meter	2,050.45	131.00	2,68,608.95

		clause 2706 of specifications.				
29	14.9	Providing Back filling behind abutment, wing wall & return wall with Granular Material complete as per drawing and Technical specification and as per relevant clauses 305 of specifications & as per appendix 6 of IRC-78	Cum	2,511.44	529.00	1328550.70

Sr. No.	SOR Item No.	Item	Unit	Quantity	Rate (Rs.)	Amount
30	14.10	Providing and laying of Filter media with granular materials/stone crushed aggregates satisfying the requirements laid down in clause 2504.2.2. of MORTH specifications to a thickness of not less than 600 mm with smaller size towards the soil and bigger size towards the wall and provided over the entire surface behind abutment, wing wall and return wall to the full height compacted to a firm condition complete as per drawing and technical specification.	Cum	215.27	753.00	162095.30
31	14.14	Providing and Laying Reinforced cement concrete pipe NP4/prestressed concrete pipe for culverts on first class bedding of granular material in single row including fixing collar with cement mortar 1:2 but excluding excavation, protection works, backfilling, concrete and masonry works in head walls and parapets and as per relevant clauses of section-2900.				
i)		600 mm dia	meter	30.00	1604.00	48120.00
ii)		1000 mm dia	meter	60.00	2448.00	146880.00
32	15.1	Providing and laying Reinforced/Prestressed cement concrete (mixed in concrete mixture) in super-structure as per drawing and Technical Specification and as per relevant clauses of sections 1500, 1700 and 2300 in				
	i)	RCC Grade M25 with 20 mm maximum size of aggregate (For solid slab super-structure)	Cum	158.15	4883.00	772222.04
33	15.2	Supplying, fitting and placing HYSD bar reinforcement in super-structure complete as per drawing and technical specifications as per relevant clauses of section 1600 of specifications.	MT	12.56	57776.00	725377.68
34	15.4	Providing and laying Cement concrete (mixed in concrete mixture) wearing coat M-30 grade including reinforcement complete as per drawing and Technical Specifications and as per relevant clauses of sections 1500, 1700 and Clause 2702 of specifications.	Cum	29.32	8324.00	244043.03
35	15.7	Construction of RCC railing of M30 Grade (mixed in concrete mixture) in-situ with 12 mm nominal size aggregate, true to line and grade, tolurence of vertical RCC post not to exceed 1 in 500, centre to centre	RM	38.00	1393.00	52934.00

		spacing between vertical post not to exceed 2000 mm, leaving adequate space between vertical post for expansion, complete as per approved drawings and technical specifications and as per relevant clauses of sections 1500, 1600, 1700 and clause 2703 of specifications (as per MoST specification drawing SD/201 or SD/304)				

Sr. No.	SOR Item No.	Item	Unit	Quantity	Rate (Rs.)	Amount
36	15.9	Providing Drainage Spouts complete as per drawing and Technical specification and as per clause 2705 of specifications.	No	10.00	979.00	9790.00
37	15.10	Providing PCC M15 (with 40 mm maximum size of aggregate) Grade leveling course below approach slab complete as per drawing and Technical specification and as per relevant clauses of section 1700.	Cum	126.00	3418.00	430668.00
38	15.11	Providing and laying Reinforced cement concrete approach slab in M-25 grade concrete including reinforcement and formwork complete as per drawing and Technical specification and as per relevant clauses of section 1500, 1600, 1700 and clause 2704 of specifications.	Cum	252.00	7244.00	1825488.00
39	15.14	Filler joint				
		Providing and fixing in position 20 mm thick & 300mm deep premoulded joint filler in expansion joint for fixed ends of simply supported spans not exceeding 10 m to cater for a horizontal movement upto 20 mm, covered with sealant complete as per drawing and technical specifications and as per relevant clauses of section 2600.	meter	42.08	177.00	7448.51
		TOTAL AMOUNT OF ROAD SOR				**1896,66,764.68**

Section B Civil SOR Bill of Quantities						
Bill of Quantities As per UADD Volume 2 Building Works SOR 2012						
Sr. No.	**SOR Item No.**	**Item**	**Unit**	**Quantity**	**Rate (Rs.)**	**Amount**
1	11.20 of	Chequerred precast cement concrete tiles 18-20mm				
	Building	thick in footpath & courtyard jointed with neat				
	SOR	cement slurry mixed with pigment to match the				
		shade of tiles including rubbing and cleaning etc.				
		complete on 20 mm thick bed of cement mortar 1:4 (1				
		cement: 4 coarse sand).				
	11.20.3	Dark shade using ordinary cement.	sqm	8,820.00	616.00	54,33,120.00
		TOTAL AMOUNT OF BUILDING SOR				**54,33,120.00**

Section C- Civil Bill Of Quantities
Non-SOR Items

Sr. No.	SOR Item No.	Item	Unit	Quantity	Rate (Rs.)	Amount
1	Non SOR	Providing and Laying of PLASTITRAK, Roll-on Surfacing Material :A Solvent Free, High Build, Two pack, Seamless, Tough, skid resistant 1.0-1.5 mm thick red (or as required) based on Gloss and color retaining Acrylic Cross Linking Resin System for Cycle track and similar applications including surface cleaning and cost of all material etc. complete.	Sqm	11,025.00		
2	Non SOR	Pavement marking for showing symbol of CYCLE on White/ yellow/ Blue or Suitable colored as directed by engineer in charge for cycle track , at junctions with hot applied thermoplastic paints of 2.5 mm thickness including reflectorizing glass beads @ 250 gms per sqm area as per IRC:35 .				
	Non SOR	a. At junction (cycle symbols 2500mm X 2000mm @ cycle box)	Each	6.00		
	Non SOR	b. At 50m center to center distance (cycle symbols 1500mm X 1200mm @ cycle box)	Each	88.00		
3	Non SOR	Supplying and fixing at site retroreflectorised CYCLE TRACK / ONLY FOR CYCLE type sign boards/signs made of encapsulated lens type of reflective sheeting fixed over aluminum sheeting 2.0 mm thick complete including vertical pipes/ angles/ posts etc. all complete as per drawing as per direction of Engineer in Charge .	Each	18.00		
4	Non SOR	Providing and fixing Bollard (Swiss Type) at cycle track entry point to prevent other vehicles at distance of 0.50 m c/c/, made out of 1.5mm CRC sheet ,height 140cms,bottom dia 23cm,top dia 12cm with direction plate of 30 cm dia fabricated necessary anchors as directed and also provide throughout length pipe of 25 NB for the strengthening of bollard and reflectorised Micro Prismatic Grade Sheet (Type XI)and three yellow strip 6 Inches wide of Type XI Retro reflective Sheeting, fixing with P.C.C M25 grade concrete(Foundation size 30cm×30cm×35cm)	Each	60.00		
		TOTAL AMOUNT OF NON SOR				

Bhopal Smart City Development Corporation

Bill of Quantities

Electrical

Bill of Quantities- Electrical UADD SOR 1

S.no	Items/particulars	Unit	Qty	Rate	Amount
1	Supply of XLPE Insulated power cable (conforming IS- 7098) 1100 Volt grade/Heavy duty power cable conforming to IS 1554-1100 Volts grade , 2 core /3½ core/4 coreISI MARKED with Alu. Stranded /solid conductor				0
2	ARMOURED 3½ CORE				0
3	50 Sq.mm(XLPE) V4_14.1.6.3	M	500	452.00	226000
4	70 Sq.mm(XLPE) V4_14.1.6.4	M	1500	597.00	895500
5	150 Sq.mm.(XLPE) V4_14.1.7.10	M	2000	1084.00	2168000
6	300 Sq.mm.(XLPE) V4_14.1.6.10	M	1000	2097.00	2097000
7	ARMOURED 4 CORE				0
8	16 Sq.mm.(XLPE) V4_14.1.8.3	M	4000	229.00	916000
9	Supply of support for overhead line RS joist / H-beam of I.S. standard including welding, drilling of required hole etc. complete as required. H-Beam 152x152mm , Std weight 37.1 kg per meter V4_13.2.6(13M X 20 Nos	M	260	1977.00	514020
10	Erection of steel tubular or steel rail pole or H-Beam of length exceeding 10 meters but not exceeding 13 meters in cement concrete 1:3:6 (1 cement :3 coarse sand: 6 graded stone aggregate 40mm nominal size) foundation , base padding & muffing including excavation and refilling etc. as required.(4.55 bags of cement/cmt.) V4_13.14	EA	110	2563.00	281930
11	Supplying and drawing All Aluminium Alloy conductor (AAAC) of approved make confirming to IS 398-1979 Pt. IV, including binding at existing insulator, jointing, jumpering, tearing off, connecting etc. as required including clearing of obstacles (if any) 0.075 sq.inch / 48 sq.mm Alloy Aluminium Conductor V4_13.5.4	Km.	0.5	59138.00	29569

12	Supplying of angle/channel flat iron fitting for overhead lines such as cross arms, clamps, brackets, welding and other necessary materials as per specifications. V4_13.58	Kg.	5000	54.00	270000
13	Supplying and erection of stay set complete (Galvanized) with 19mm.dia 1.8 meter long stay rod, ancher plate of size 300mm x 300mm x 6.4mm thimble stay clamps, bow tightener, 7/4.00 dia G.I. stay wire and strain insulator etc. in cement concrete 1:3:6 (1 Cement : 3 Coarse and : 6 granded stone aggregate 40mm nominal size) foundation including excavation and refilling etc. as required. V4_13.23	EA	10.00	2818.00	28180
14	Providing and fixing earthing arrangement with 38.1mm dia 2.5 meter long galvanized iron pipe electrode including packing of charcoal powder and salt as per specification watering pipe 19mm dia G.I. Connection etc. complete with refilling the pit as required, but excluding the excavation of earth pit. V4_11.35	EA	60	1002.00	60120
15	Supplying and laying 25mm X 5mm G.I. strip at 0.5 meter below ground level as strip earth electrode including soldering etc. as required. V4_11.8	M	400	65.00	26000
16	Supplying, installing, testing of earth Coil (coil of 115 turns of 50mm dia, and 2.5 Mtrs. Lead of 4 mm G.I wire.	EA	108	219.00	23652
17	Supplying and fixing heavy duty cable gland for P.V.C. insulated armoured cable with brass washer, Rubber ring complete erected with cable and lead connection etc. as per specification complete.				0
18	Gland Size 22mm suitable for cable 2,3, 3½, 4 x 10 Sq.mm or 2x 16 Sq.mm	EA	50	44.00	2200
19	Gland size 28mm for 3,4 x 16 Sq.mm	EA	100	66.00	6600
20	Gland size 32mm for 2,3, 3½, 4 x 25 Sq.mm OR 2,3, 3½ x 35 Sq.mm OR 2,3 x 50 Sq.mm.	EA	100	76.00	7600
21	Gland Size 45mm 3/3½ x 120 Sq.mm 3½ x 95 Sq.mm 3 x 150 Sq.mm.	EA	50	149.00	7450
22	Gland Size 50 mm 3½ x 150 Sq.mm 3 x 185 Sq.mm	EA	100	191.00	19100

23	Gland Size 57mm 3 x 225 Sq.mm 3 ½ x 185 Sq.mm	EA	50	248.00	12400
24	Gland Size 70mm 3 x 240 Sq.mm 3½ x 300 Sq.mm	EA	50	353.00	17650
25	Gland Size 82mm 3½ x 400 Sq.mm	EA	50	501.00	25050
26	LUGS:- Supplying and fixing cramping type Alum. lugs as per I.S.S. Specification suitable for following size of cable with Alu. /Copper solid/stranded conductor evently cramped with high/pressure tool and connected to switch gear/Bus/M.C.C.B./ M.C.B. etc. as required complete.For Conductor Size-				0
27	6mm to 16 Sq.mm	EA	1000.00	5.00	5000
28	35 Sq.mm	EA	100.00	9.00	900
29	50 Sq.mm	EA	500.00	14.00	7000
30	70 Sq.mm	EA	500.00	22.00	11000
31	150 Sq.mm.	EA	500.00	44.00	22000
32	300 Sq.mm.	EA	500.00	129.00	64500
33	Erection of steel tubular or steel rail pole or H-Beam of length exceeding 10 meters but not exceeding 13 meters in cement concrete 1:3:6 (1 cement :3 coarse sand: 6 graded stone aggregate 40mm nominal size) foundation , base padding & muffing including excavation and refilling etc. as required.(4.55 bags of cement/cmt.)	EA	10.00	2563.00	25630
34	Supply of steel tubular pole swaged type as per IS:2713- 1980 Complete with baseplate and top Canopy 410 SP-65 - 12.00 meter	EA	90.00	26824.00	2414160
35	Laying of underground cable armoured./ unarmoured as per specification in air with approved type of iron clamps complete. 2 / 3 / 4 Core cable upto 16 Sq.mm V4_14.12.1	M	3000	20.00	60000
36	3 / 3½ / 4 Core cable 25 Sq.mm to 120 Sq.mm V4_14.12.2	M	3000	28.00	84000
37	3 / 3½ / 4 Core cable 150 Sq.mm and above V4_14.12.3	M	3000	36.00	108000
					10436211

Bill of Quantities- PWD SOR					
S.No	**Items/particulars**	**Unit**	**Qty**	**Rate**	**Amount**
1	Suppling and laying G I pipe 150 mm dia B Class	meter	2000	1425	2850000
2	Suppling and laying G I pipe 150 mm dia A Class	meter	1000	1197	1197000
3	Suppling and laying G I pipe 100 mm dia B Class	meter	1000	800	800000
4	Suppling and laying G I pipe 100 mm dia A Class	meter	1000	750	750000
5	Providing and fixing for feeder pillers for telephone/electrical cablels as per design fixing over on concrete base (750x450x100) using nut and bolts. With all leads and lifts under the supervision of engineer in charge	nos	10	15000	150000
6	providing and laying of 3 core 2.5 sqmm flexible coper cable	km	2.4	50000	120000
7	Supplying and drawing All Aluminium Alloy conductor (AAAC) of approved make confirming to IS 398-1979 Pt. IV, including binding at existing insulator, jointing, jumpering, tearing off, connecting etc. as required including clearing of obstacles (if any)				
8	0.1 sq.inch / 100 sq.mm Alloy Aluminium Conductor (Dog)	Km.	0.5	77891	38945.5
9	Supplying and laying 50mm X 5mm G.I. strip at 0.5 meter below ground level as strip earth electrode including soldering etc. as required.	M	400	110	44000
10	Suppling and installtion of GSM modem	nos	5	6518	32590
11	Suppling and installtion of LTCT operated 3 phase 4 W static energy meter with ct and modem	nos	5	25000	125000
12	Designing & casting with M-20 cement concrete foundation suitable for 12 mtrs. Octagonal/tubular poles considering the safe soil bearing capacity at site as 10 T/sqm at 2 mtrs. Depth including excavation, foundation nut bolts in an approved manner.	EA	90	14000	1260000
13	supply and installation of disk insulators polymer type 11 kv	EA	12	458	5496
14	supply and installation of pin insulators polymer type 33 kv	EA	3	1374	4122
15	supply and installation of AB switch polymer type 11 kv	EA	2	6500	13000
16	supply and installation of AB switch polymer type 33 kv	EA	2	28000	56000
17	Supply and installation of 150 watt LED street light complete with accesaries such as suitable bracket with technical specification enclosed with tender docment	nos	200	16200	3240000

NON SOR –Bill of Quantities-Electrical					
S.no	**Items/particulars**	**Unit**	**Qty**	**Rate**	**Amount**
1	Providing laying and testing of 11 KV Under-Ground XLPE Cable : (insulation level shall be in Delta format) 3x120 Sqmm	Km	3		
2	Providing laying and testing of 11 KV Under-Ground XLPE Cable : (insulation level shall be in Delta format) 3x240 Sqmm	Km	2		
3	Providing laying and testing of 11 KV Under-Ground XLPE Cable : (insulation level shall be in Delta format) 3x300 Sqmm	Km	3		
4	Providing laying and testing of 33 KV under ground XLPE Cable (insulation level shall be in Delta format) 3x240Sqmm	Km	3		
5	Providing laying and testing of 33 KV under ground XLPE Cable (insulation level shall be in Delta format) 3x300Sqmm	Km	6		
6	Providing laying and testing of 33 KV under ground XLPE Cable (insulation level shall be in Delta format) 3x400 Sqmm	Km	3		
7	Supply and erecting 11 KV heat shrinkable cable END jointing kit (A) Indoor Type Indoor heat shrinkable cable jointing kit with lugs for 11 kV grade XLPE cable for 3 core 120 sq mm	Set	9		
8	Indoor heat shrinkable cable jointing kit with lugs for 11 kV grade XLPE cable for 3 core 240 sq mm	Set	4		
9	Indoor heat shrinkable cable jointing kit with lugs for 11 kV grade XLPE cable for 3 core 300 sq mm Set 4310	Set	4		
10	Outdoor heat shrinkable cable jointing kit with lugs for 11 kV grade XLPE cable for 3 core 120 sq mm	Set	6		
11	Outdoor heat shrinkable cable jointing kit with lugs for 11 kV grade XLPE cable for 3 core 240 sq mm	Set	3		
12	Outdoor heat shrinkable cable jointing kit with lugs for 11 kV grade XLPE cable for 3 core 300 sq mm	Set	2		
13	Supply and erecting 11 KV heat shrinkable cable STRAIGHT THROUGH jointing kit i) 3x120 Sqmm	Set	1		
15	ii)3x240 Sqmm	Set	1		
16	iii) 3x300 Sqmm	Set	1		

17	Supply and erecting 33 KV heat shrinkable cable END jointing kit (a) Indoor type i) 3x240 Sqmm	Set	6		
18	ii)3x300 Sqmm	Set	4		
19	iii) 3x400 Sqmm	Set	4		
20	Outdoor type i) 3x240 Sqmm	Set	6		
21	ii)3x300 Sqmm	Set	3		
22	iii) 3x400 Sqmm	Set	2		
23	Supply and erecting 33 KV heat shrinkable cable STRAIGHT THROUGH jointing kit				
24	(i) Straight through heat shrinkable cable jointing kit with lugs for 33 kV grade XLPE cable for 3 core 240 sq mm	Set	1		
25	(ii) Straight through heat shrinkable cable jointing kit with lugs for 33 kV grade XLPE cable for 3 core 300 sq mm	Set	1		
26	(iii) Straight through heat shrinkable cable jointing kit with lugs for 33 kV grade XLPE cable for 3 core 400Sqmm	Set	1		
27	Suppling installation testing and commissioning of SCADA competable Ring Main Unit(RMU) 11 KV				
28	11 KV Ring main unit(RMU) SF-6 type 1 ckt breaker 3isolator	Each	5		
29	11 KV Ring main unit(RMU) SF-6 type 2 ckt breaker 3isolator	Each	1		
30	Suppling installation testing and commissioning of SCADA competable Ring Main Unit(RMU) 33 KV 33 KV Ring main unit(RMU) with 3isolator	Each	5		
31	33 KV Ring main unit(RMU) with 4isolator	Each	1		
32	Suppling installation testing and commissioning of FEEDER PILLERS (a) Out door type cubical feeder pillar (i) 1 no.-125 amp,16 kA b.c at 415 volts TP MCCB with copper neutral link 1 set-200 amp,rating TPN aluminium busbar,8 no 32 amp,10 kA b.c. TP MCB complete	Each	10		
33	(ii)1 no.-160 amp,16 kA b.c at 415 volts TP MCCB with copper neutral link 1 set-250 amp,rating TPN aluminium busbar,8 no 63 amp,10 kA b.c. TP MCB complete	Each	10		
34	(iii) 1 no.-125 amp,16 kA b.c at 415 volts TP MCCB with copper neutral link 1 set-200 amp,rating TPN aluminium busbar,24 no 32 amp,500 V Porcelain/DMC/bakelite rewirable type fuse carrier and base complete	Each	10		

35	Suppling installation testing and commissioning of SCADA competable surface transformer PSS 11/0.4 kv, 500 KVA complete in all respect with civil work	each	4		

10. PRELIMINARY PROJECT REPORT BY CONSULTANT

0.1 INTRODUCTION

Bhopal Municipal Corporation (**BMC**) has decided to implement the Four Lane Road With Cycle Track & Footpath according to Bhopal Master Plan 2005 of existing 2/4 Lane road for safe and efficient movement of traffic. To meet the requirement, **BMC** has appointed **Enarco Engineering & Architectural Consultants** as consultant to prepare the Detailed Project Report for the proposed improvement of the roads.

0.2 PROJECT DESCRIPTION

a) Project Road

The Project Road is starting at the **Polytechnic Square** and terminates at the **Depot Square**.
The Design length of the road is 2.205 Km.

b) Terrain

The project road in the entire stretch traverses through rolling terrain and accordingly, geometric standards as per IRC: 86-1983.

c) Land use The land use pattern adjoining the project road corridor is predominantly Built-Up & barren land.

d) Right of Way

Existing ROW observed along the project road 30m. Some encroachment observed along the project road in the existing ROW.

e) Road Geometrics

Existing carriageway width generally varies from 7.00 to 2 x 7.00 with about 2.20m to 2.50m Footpath / earthen shoulder on either side. The carriageway is much below the basic width requirement which is also confirmed from the Traffic Analysis. Crossing of wheel loads on unpaved shoulders has been too frequent. Detailed topographic survey reveals that horizontal alignment needs improvement at places. Deficient horizontal curves have been revised to ruling IRC standards for 80 Kmph speed.

Vertical profile has been proposed keeping the formation level above the HFL as per codal provision. Deficient vertical curves have been smoothened out at the intersection of different grades to ease off the changes in gradients for the fast moving vehicles.

f) Pavement Type and Composition

Bituminous pavement surface exists all along entire project road. The thickness of existing pavement varies along the project road and physical verification reveals almost uniform pavement thickness of

290mm to 400mm. The pavement composition construes stage construction, over the years, and falls short of adequacy to cater to the traffic. Damages to the pavement owe to plying of abnormally loaded vehicles, poor drainage adding woe to the sorrow.

g) Drainage

No existing road side drainage facilities observed along the project road. Appropriate roadside drainage has been provided.

h) Culverts

There are total 8 culverts existing on the project road out of which 7 RCC Slab Culvert, 1 HP Culvert. The existing Hume Pipe Culvert is NP2 type and required reconstruction. 4 Slab culverts is very poor condition proposed reconstruction & remaining culvert are widening.

0.3 DEFICIENCIES AND ISSUES

The following major deficiencies have been identified and addressed in terms of traffic operation and safety, road conditions and maintenance. A few other issues which contribute to operational deficiencies and safety concerns and which prevent the optimum utilization of the Road capacity to a desirable level of service, e.g. driving discipline and compliance, traffic surveillance, corridor security and management, level of regular road maintenance and its road worthiness etc. are beyond the scope of this study.

a) Operation

- *Road capacity augmentation*
- *Fast Moving Vehicles competing with slow moving vehicles for pavement space*
- *Deficient road surface conditions (roughness)*
- *No pavement edge markings*
- *Uncontrolled roadside developments and encroachments*
- *CD structures requiring rehabilitation and reconstruction*

b) Safety

- *Too many sub-standard curves with inadequate sight distances.*
- *Shoulder drop-off at places*
- *Exposed roadside hazards.*
- *No pavement markings*
- *Inadequate traffic signs*

c) Road

- *Poor pavement condition and structurally inadequate*
- *Shoulder functionally and structurally inadequate*
- *Cross drainage - poor condition and inadequate*
- *Curve radii less than what is required for the Design speed*
- *Deficient curves and reverse curves in roads without transition length for safe reversal of elevation.*

0.4 INVESTIGATIONS & EVALUATIONS

This relates to the most suitable alignment for the project road sections and for optimum upgrading of existing road based on field data and detail study involving traffic, topographic, pavement and road condition. Special attention has been given for augmentation of capacity for intended level of service in design period. A few appropriate design applications have been considered for operational efficiency and road safety.Pavement design options includes flexible pavement for strengthening existing pavement and for new construction have been considered as per guidelines of IRC.

Alignment options have been developed for the Road sections eccentric to existing alignment minimizing dismantling the structure on capitalisation of existing ROW. Road side religious structures have been mostly avoided by adjusting the alignment suitably and/or by eccentric widening. All major and minor junctions/intersections have been analysed with respect to vehicular movements. Realignment has been fixed in providing the requisite geometrics to cater to the design speed.

0.5 TRAFFIC SURVEY

a) Traffic surveys were conducted in the road corridor to extend the study elaborately, which is summarised in the table below.

Table: Traffic Survey Summary

Sl. No.	Type of Survey and	Location of Survey	Duration
1	Classified Traffic Volume	Km 1+800	7 days 24 hrs
2	Axle Load Survey	Km 1+800	1 day 24 hrs

b) Average Daily Traffic

The traffic volumes counted in 15 minute intervals have been aggregated to one-hour volumes. The hourly volumes have been aggregated into daily volumes for the entire survey period (7-days). The daily volumes are then averaged for ADT. To express the classified vehicular count in terms of PCUs, the PCU factors as given in IRC-86: 1983 have been considered. For ready reference, the PCU

Factors considered in the analysis are given in the table below.

Table: PCU Factors Considered for the Study

Source: IRC 86-1983

Sr. No.	Vehicle Type	PCU Factor
1	Passenger car, Tempo, Auto-rickshaw, Jeep, Van or Agricultural Tractor,	1.0
2	Truck, Bus or Agricultural Tractor - Trailer	3.0
3	Motor Cycle or Scooter and Cycle	0.5
4	Cycle-rickshaw	1.5
5	Horse drawn vehicle	4.0
6	Bullock Cart (Small)	6.0
7	Hand Cart	6.0

c) Design Traffic

The base year AADT value at the traffic survey location is as follows:

Table: Base Year ADT (Yr. 2016)

Vehicle Category	At Km 1+800	
	AADT	**PCU**
Two Wheeler	1358	679
Three Wheeler	69	69
Car / Jeep / Van / Taxi	536	536
Mini Bus	7	7
Full Bus	19	57
LCV	136	136
2 - Axle Truck	0	0
3 - Axle Truck	6	19
Multi Axle Truck	0	0
Tractor with Trailer	0	0
Tractor without Trailer	0	0
Total Motorized Vehicles	**2131**	**1503**
Cycles	57	28
Cycle Rickshaw	0	0
Bullock Cart	0	0
Horse Drawn	0	0
Hand Cart	0	0
Total Non-Motorized Vehicles	**57**	**28**
TOTA	**2188**	**1531**
CVP	**168**	**—**

d) Traffic Growth Rate

The entire length of the project road passes through urban areas and the traffic growth rate is likely to be impacted predominantly by economic activities of areas. It is envisaged there would be a considerable increase in the traffic movement due to improvement in the road conditions, and resulting in development activities. In absence of any relevant data of economic development of the area, an average annual traffic growth rate of 5% has been considered for the project period as mentioned in clause 4.2.2 of IRC-37-2012.

e) **Traffic Demand Forecast**

Applying the suggested traffic growth rates of 5.0% to the ADT, traffic Projections is presented as:

Table: Projected Traffic

Year	FAST MOVING VEHICLES											SLOW MOVING VEHICLES					Total (No)	Total (PCU)
	Two Wheeler	Three Wheeler/ Auto	Car/ Jeep/ Van/ Taxi	Mini Bus	Bus	LCV	2-Axle Truck	3-Axle Truck	M-Axle Truck	Tractor with Trailer	Tractor without Trailer	Cycle	Cycle Rickshaw	Hand Cart	Bullock Cart	Horse Cart		
2016	1358	69	536	7	19	136	0	6	0	0	0	57	0	0	0	0	2188	1531
2017	1426	72	563	8	20	143	0	7	0	0	0	60	0	0	0	0	2298	1608
2018	1497	76	591	8	21	150	0	7	0	0	0	63	0	0	0	0	**2412**	**1688**
2019	1572	79	621	8	22	157	0	7	0	0	0	66	0	0	0	0	2533	1773
2020	1651	83	652	9	23	165	0	8	0	0	0	69	0	0	0	0	2660	1861
2021	1733	88	685	9	24	174	0	8	0	0	0	72	0	0	0	0	2793	1954
2022	1820	92	719	10	25	182	0	9	0	0	0	76	0	0	0	0	2932	2052
2023	1911	96	755	10	27	191	0	9	0	0	0	80	0	0	0	0	**3079**	**2155**
2024	2006	101	793	11	28	201	0	9	0	0	0	84	0	0	0	0	3233	2263
2025	2107	106	832	11	29	211	0	10	0	0	0	88	0	0	0	0	3395	2376
2026	2212	112	874	12	31	222	0	10	0	0	0	92	0	0	0	0	3564	2494
2027	2323	117	917	12	32	233	0	11	0	0	0	97	0	0	0	0	3742	2619
2028	2439	123	963	13	34	244	0	12	0	0	0	102	0	0	0	0	**3930**	**2750**
2029	2561	129	1012	13	36	256	0	12	0	0	0	107	0	0	0	0	4126	2888
2030	2689	136	1062	14	37	269	0	13	0	0	0	112	0	0	0	0	4332	3032
2031	2823	143	1115	15	39	283	0	13	0	0	0	118	0	0	0	0	4549	3184
2032	2964	150	1171	16	41	297	0	14	0	0	0	124	0	0	0	0	4776	3343
2033	3113	157	1230	16	43	312	0	15	0	0	0	130	0	0	0	0	**5015**	**3510**
2034	3268	165	1291	17	45	327	0	15	0	0	0	136	0	0	0	0	5266	3685
2035	3432	173	1356	18	48	344	0	16	0	0	0	143	0	0	0	0	5529	3870
2036	3603	182	1423	19	50	361	0	17	0	0	0	150	0	0	0	0	5806	4063
2037	3783	191	1494	20	53	379	0	18	0	0	0	158	0	0	0	0	6096	4266
2038	3973	201	1569	21	55	398	0	19	0	0	0	166	0	0	0	0	**6401**	**4480**

f) Axle Load Survey

The equivalent standard Axle Loads has been determined by the IRC: 37 -2012 equivalency factors. Axle Load Survey was conducted on a random sample(s) basis to cover at least 20% of the total traffic. The axle load of only heavy (Axle load more than 3 tons) commercial vehicles (Bus & Trucks) were measured from up & down direction. The weighted average vehicle damage factor (VDF) for the project road is given below.

Table: VDF Summary

TYPE OF	VD		
	UP	DOWN	MAX
Multi Axle	0.000	0.000	**0.000**
3-Axle Truck	4.626	4.935	**4.935**
2-Axle Truck	0.000	0.000	**0.000**
Bus	2.639	2.645	**2.645**
LCV	0.648	0.858	**0.858**

g) **GUIDELINES FOR CAPACITY OF ROADS** IRC: 86-1983 – Guidelines for Capacity of Roads in Urban Areas 'recommends capacity values for different lane widths considering as per IRC: 86-1983.

Table: Lane Capacity (IRC: 86-1983)

Type of Lane	PCUs
Two Lane	1500
Four Lane	4000
Six Lane	6000

h) LANE REQUIREMENTS

Lane requirements considering above recommendations are –

Table: Lane Requirement

At Km		
Year	**ADT (PCU)**	**Lane Requirement (IRC86-1983)**
2016	1531	Four Lane
2017	1608	Four Lane
2018	1688	Four Lane
2019	1773	Four Lane
2020	1861	Four Lane
2021	1954	Four Lane
2022	2052	Four Lane
2023	2155	Four Lane
2024	2263	Four Lane
2025	2376	Four Lane
2026	2494	Four Lane
2027	2619	Four Lane
2028	2750	Four Lane
2029	2888	Four Lane
2030	3032	Four Lane
2031	3184	Four Lane
2032	3343	Four Lane

2033	3510	Four Lane
2034	3685	Four Lane
2035	3870	Four Lane
2036	4063	Six Lane
2037	4266	Six Lane
2038	4480	Six Lane

Present traffic has been projected up to horizon year **2032** (**15 year after completion of construction**). Traffic forecast data reveals that lane requirement as per present traffic is four lane. The Master Plan (2005) shows provision of Four Lane Road with Cycle Track. Hence, 4-lane carriageway has been proposed for the project road of design period.

0.6 IMPROVEMENT PROPOSAL

a) Proposed Cross-Sectional Elements

The proposed cross-sectional elements as per Bhopal Master Plan 2005 for proposed are: **Four Lane carriageways with Drain Cum Duct under Footpath & Cycle Track**

Width of Carriageway : 2 x 7.00 m Width of Paved Shoulder : 2 x 1.50 m Width of Green Verge : 2 x 1.00 m Width of Cycle Track : 2 x 2.50 m Width of Footpath/Drain : 2 x 2.00 m Width of Median : 1 x 2.00 m i.e. Total width of the road is 30.00 m

b) Geometric design standard

Geometric standards in plain & rolling terrain, corresponding to ruling speed of 80 Km / Hr as per IRC: 86-1983 have been adopted.

Horizontal Alignment:

i) Fluent alignment, blending well with the surrounding topography.

ii) Providing largest practical radius, but, in no case, less than ruling value corresponding to ruling design speed, sufficiently long with transitions to provide pleasing appearance.

iii) Providing sufficient length between reverse curves to accommodate requisite transition curves and required super-elevation.

iv) Avoiding hazardous sharp curves at the end of long tangents.

v) Avoiding broken back curves and providing such portions with longer single curve instead.

vi) Careful coordination of horizontal alignment with the longitudinal profile.

vii) Providing horizontal curves consisting of circular portion flanked by spiral transitions at both ends as per IRC: 86.

Vertical Alignment:

i) Smooth grade changes to directions given in IRC: 86 shall be kept in view.

ii) Coordination between horizontal alignment and vertical profile of the Project Road as per guidelines given in IRC: 86.

iii) Gradients up to the value corresponding to ruling gradient as per IRC: 86.

iv) Long sweeping vertical curves at all grade changes designed as square parabolas.

v) Ensuing the aspect of efficient drainage in the design of vertical profile and cross-sections of the Road as stipulated in IRC: SP:42-1994 and IRC:SP:50-2013.

Camber / Cross fall

Camber / unidirectional cross fall of 2.5% for Pavement provided in accordance with stipulations of IRC: 86.

Super Elevation

Super elevation provided on curves as per details given in IRC: 86 corresponding to the design speed and radius of horizontal curve adopted.

Sight Distance

Intermediate sight distance as per details given in IRC: 86 corresponding to the design speed adopted. In case of site constraints, a minimum of stopping sight distance. The requisite site distance made available across the inside of horizontal curves. Where horizontal and summit curves overlap, the design provides for the required sight distance both in the vertical direction along the pavement and in the horizontal direction on the inside of curve

c) At Grade Intersection:

At-grade intersections shall be designed as per IRC SP: 41 and layout as per MOST Type Design for intersections on Roads modified to provide for right turning lanes in the median, dropped kerbs and gap in channels to facilitate pedestrian crossing. There are 1 number of at grade intersections are on the project road. These junctions have been developed.

d) Embankment

General

The height of the embankment based on the final road levels. The following principles shall be followed for fixing the road level:

i) The top of sub-grade is at least 1.0m above the high flood level/high water table/pond level and in exceptional circumstances a minimum difference of 0.6 m between the top of sub-grade and HFL/high water table.

ii) The road level of the new six-lane carriageway not lower than the existing carriageway unless it improves vertical profile and also satisfies all other requirements set out in the Manual.

iii) To fulfill the minimum free board requirement and provide smooth vertical profile for portions forming approaches to structures.

iv) To raise the level of stretches of the existing road from drainage considerations.

Structural features and design of embankment

i) Embankment designed to ensure the stability of the roadway incorporating only those materials, which are suitable for embankment construction as per Section 5 of the Manual.

ii) Side slopes not be steeper than 2H: 1V unless duly designed slope protection measures are provided. In cutting has been taken 1.5H: 1V.

iii) Where the embankment is supported on a weak stratum necessary special design of the embankment done and also adopts appropriate remedial / ground improvement measures.

iv) High embankments (height 6 m or above) in all soils designed from stability considerations as per IRC: 75 and MOSRTH – Guidelines for Design of High Embankments.

v) The side slopes protected against erosion by providing turfing/vegetative cover, stone/Cement Concrete block pitching, geo-synthetics, gabion walls or any other measures depending on the height of the embankment, type of soil involved and susceptibility of soil to erosion as per IRC: 56. Pitching works on slopes shall be as per MOST Specifications.

e) Pavement Design

The design traffic in terms of cumulative number of standard axles in MSA (million standard axles) for different design life periods of 10 years and 15 years were obtained as per IRC 37 and Growth rate is 5.0%.

The pavement layers are designed for sub grade CBR value of 8% as the borrow area soil/moorum test results shows CBR value more than 8%.

The method of design followed is a modification of the CBR method incorporating mechanistic approach. The empirical pavement design presented in IRC-37-2012. "GUIDELINES FOR THE DESIGN OF FLEXIBLE PAVEMENTS" (Second Revision) has been followed for this project.

The traffic used in design is in terms of the cumulative number of standard axles to be carried during the design life of the road. Use of the CBR method for pavement design, the sub grade strength of the new two lanes and widening were assessed in terms of the CBR value as per the procedure prescribed in the standards. Traffic volume and Axle Load Surveys were conducted. Millions of standard axles for the new pavement design are tabulated below.

Table: Millions of Standard Axle Load

MSA for UP Direction

Lane Distribution Factor : 0.75

Year	Mini Bus	Bus	LCV	2 Axle	3 Axle	MAV	Total yearly	Cummulative yearly CVs (nos.)	Yearly Design ESA	Cumulative	MSA	Design year
VDF	**2.645**	**2.645**	**0.858**	**0.000**	**4.935**	**0.000**						
2016	4	10	68	0	3	0						
2017	4	11	71	0	3	0	**Construction**					
2018	4	11	75	0	3	0	34205	**34205**	33253	33253	**0.03**	1
2019	5	12	79	0	3	0	35915	**70120**	34916	68169	**0.07**	2
2020	5	12	83	0	4	0	37711	**107831**	36661	104830	**0.10**	3
2021	5	13	87	0	4	0	39597	**147428**	38495	143325	**0.14**	4
2022	5	13	91	0	4	0	41576	**189005**	40419	183744	**0.18**	5
2023	6	14	96	0	4	0	43655	**232660**	42440	226184	**0.23**	6
2024	6	15	100	0	4	0	45838	**278498**	44562	270747	**0.27**	7
2025	6	16	105	0	5	0	48130	**326628**	46790	317537	**0.32**	8
2026	7	16	111	0	5	0	50536	**377164**	49130	366667	**0.37**	9
2027	7	17	116	0	5	0	53063	**430228**	51586	418253	**0.42**	10
2028	7	18	122	0	5	0	55716	**485944**	54166	472419	**0.47**	11
2029	8	19	128	0	6	0	58502	**544446**	56874	529293	**0.53**	12
2030	8	20	135	0	6	0	61427	**605874**	59718	589011	**0.59**	13
2031	8	21	141	0	6	0	64499	**670372**	62704	651714	**0.65**	14

2032	9	22	148	0	7	0	67724	**738096**	65839	717553	**0.72**	15

MSA for DN Direction

Lane Distribution Factor : 0.75

Year	Mini Bus	Bus	LCV	2 Axle	3 Axle	MAV	Total yearly	Cumulative yearly CVs (nos.)	Yearly Design ESA	Cumulative	MSA	Design year
VDF	**2.645**	**2.645**	**0.858**	**0.000**	**4.935**	**0.000**						
2016	4	9	68	0	3	0	**Construction**					
2017	4	9	71	0	3	0						
2018	4	10	75	0	3	0	33803	**33803**	32455	32455	**0.03**	1
2019	5	10	79	0	3	0	35493	**69295**	34078	66532	**0.07**	2
2020	5	11	83	0	4	0	37267	**106563**	35781	102314	**0.10**	3
2021	5	11	87	0	4	0	39131	**145694**	37570	139884	**0.14**	4
2022	5	12	91	0	4	0	41087	**186781**	39449	179333	**0.18**	5
2023	6	13	96	0	4	0	43142	**229923**	41421	220755	**0.22**	6
2024	6	13	100	0	4	0	45299	**275221**	43492	264247	**0.26**	7
2025	6	14	105	0	5	0	47564	**322785**	45667	309914	**0.31**	8
2026	7	15	111	0	5	0	49942	**372727**	47950	357865	**0.36**	9
2027	7	15	116	0	5	0	52439	**425166**	50348	408213	**0.41**	10
2028	7	16	122	0	5	0	55061	**480227**	52865	461078	**0.46**	11
2029	8	17	128	0	6	0	57814	**538041**	55509	516587	**0.52**	12
2030	8	18	135	0	6	0	60705	**598746**	58284	574871	**0.57**	13
2031	8	19	141	0	6	0	63740	**662486**	61198	636069	**0.64**	14
2032	9	20	148	0	7	0	66927	**729413**	64258	700327	**0.70**	15

Various borrow areas along the project corridor are tested for suitability of the sub grade / Embankment construction. It is observed that the adequate quantity of sub grade for design CBR of 8% is available.Using 8% CBR for sub grade and from the curves as mentioned in IRC: 37- 2012 pavement thickness were computed for the relevant millions of standard axles and furnished in Table.

Pavement thickness required for the above designed MSA and as per IRC guidelines is shown in following table:

Table: Proposed Pavement Composition

Calculated MSA		Adopted MSA*		CBR (%	Pavement Composition (mm)			
10 Year	15 Year	10 Year	15 Year		BC	DBM	WMM	GSB
0.41	0.70	10	10	8%	40	60	250	200

**** Calculated MSA on the project road is very low. As per IRC 37-2012 city roads are to be designed for a minimum of 2 MSA. The project Road is shortest route between new Bhopal (Kolar, Nehru Nagar & Ratibad area etc.) and old Bhopal, airport etc and hence it is expected after construction of the road traffic will increase in near future. Considering this fact and also based on the discussion with Client regarding pavement design, 10 MSA has been adopted for pavement design.***

f) Structures

These include culverts structures. Details of existing structures and their improvement proposals are given below:

Besides, there are 8 existing culverts, final proposal of which has been provided below:-

Table: Final Proposal

Sr. No.	Location	Detail of Existing Structure				Details of Proposed structure				
		Type of Structure	Span	Total Width	Length of Culvert (m)	Proposed	Type of	Span	Width of	
1	0.145	HPC	1 x 300	6.90		Reconstruction	HPC	1 x 600	30.00	
2	0.425	Slab	1 x 1.00	8.80	5.00	Reconstruction	HPC	1 x 1000	30.00	
3	0.600	Slab	1 x 1.50	11.60	6.50	Reconstruction	RCC Slab	1 x 2.00	30.00	

4	0.845	Slab	1 x 3.80	12.60	8.80	Reconstruction	RCC Slab	1 x 4.00	30.00	
5	1.185	Slab	1 x 1.20	12.10	7.60	Reconstruction	RCC Slab	1 x 2.00	30.00	
6	1.370	Slab	1 x 2.00	11.50	11.40	Reconstruction	RCC Slab	1 x 3.00	30.00	
7	1.630	Slab	1 x 5.00	24.20	14.50	Reconstruction	RCC Slab	1 x 6.00	30.00	
8	1.850	Slab	1 x 0.70	24.20	7.00	Reconstruction	HPC	1 x 1000	30.00	

g) Width of structures

The Width of the reconstruction culvert has been considered as 30.0m.

h) Road Drainage System

Pavement & shoulder drainage is proposed by way of Cross camber 2.50% for pavement. Drainage is proposed by providing longitudinal drains at edge of carriageway which are further drained through RCC drains. At Drain Wall and culverts weep holes of 100 mm dia A.C. Pipes with gratings in parapet walls are proposed at road surface level to drain off road surface water.

i) Signage & Road Markings

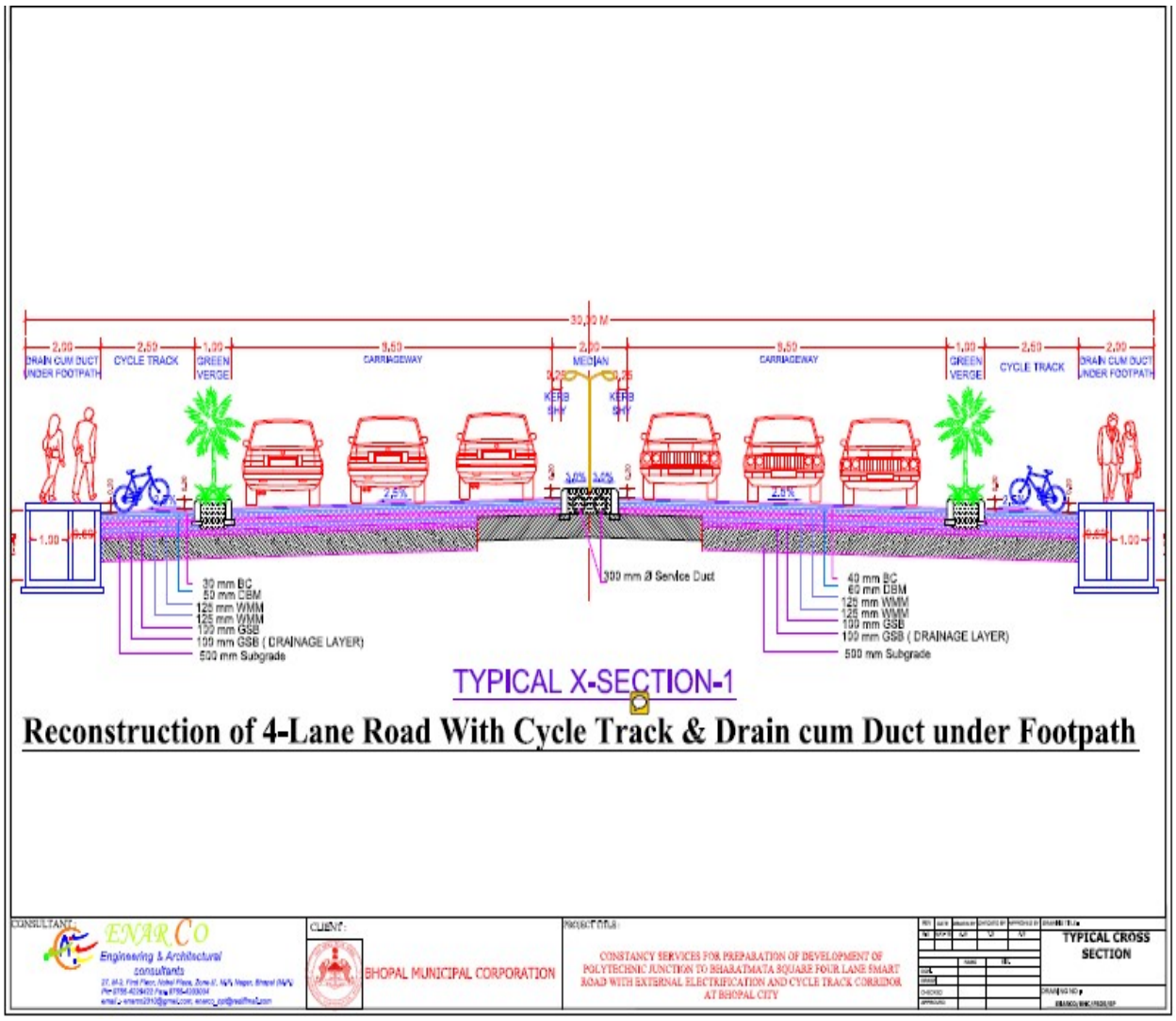
Adequate provision for signage's viz. overhead gantry signs, direction / information boards etc. are proposed as per IRC: 67-2012 for the entire project reach. Besides, suitable provision is proposed for road markings for centre line, Drain and median side edge lines for the entire length. Besides, provision of reflective posts/bollards at the intersections taken to ensure road safety. For pedestrian crossings have also been marked at junctions and other places where it has been felt necessary keeping in view the road safety.

0.7 SALIENT FEATURES

Table: Salient Features of the Proposed Road:

Descriptions		Existing	Proposed
Terrain	:	Plain & Rolling	Plain & Rolling
Length	:	2.205 Km	2.205 Km
Design Speed	:	Avg. 20-40 Km/h	80 Km/h
Cross-Section	:	Carriageway = 7.0 to 2 x 7.0 m Footpath / Shoulder =	Carriageway 2 x 7.00 M, Paved Shoulder 2 x 1.50 M, Green Verge 2 x 1.00 M, Cycle Track 2 x 2.50 M, Drain Cum Duct Under Footpath both Side 2 x 2.00 M
CBR	:	8%	Design CBR - 8%

<table>
<tr><td>Traffic (2016)</td><td>:</td><td>At Km 1+800
PCU –1531
CVPD – 168</td><td>At Km 1+800
PCU 2018 = 1688
PCU 2027 = 2629</td></tr>
<tr><td>Pavement Design Life</td><td>:</td><td>-</td><td>10/15 Years</td></tr>
<tr><td>Pavement Crust Thickness</td><td>:</td><td>BT – 75
WBM – 190
GSB – 105</td><td>BC-40
DBM-60
WMM-250</td></tr>
<tr><td>Culverts</td><td>:</td><td>Pipe Culvert = 1 No.
Slab Culvert =7 No.
Total Culvert =8 Nos.</td><td>
<table>
<tr><th>Type</th><th>Existing No.</th><th>Retained</th><th>Widening</th><th>Reconstruction</th></tr>
<tr><td>HPC</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>SLAB</td><td>7</td><td>0</td><td>0</td><td>7</td></tr>
</table>
</td></tr>
<tr><td>Longitudinal Drain</td><td>:</td><td>Nil</td><td>Total Length = 2 x 2205m = 4410m (RCC Drain)</td></tr>
<tr><td>Intersection</td><td>:</td><td>1 No.</td><td>1 No.</td></tr>
<tr><td>Retaining Wall</td><td>:</td><td>Nil</td><td>1300m</td></tr>
</table>



TYPICAL X-SECTION-1

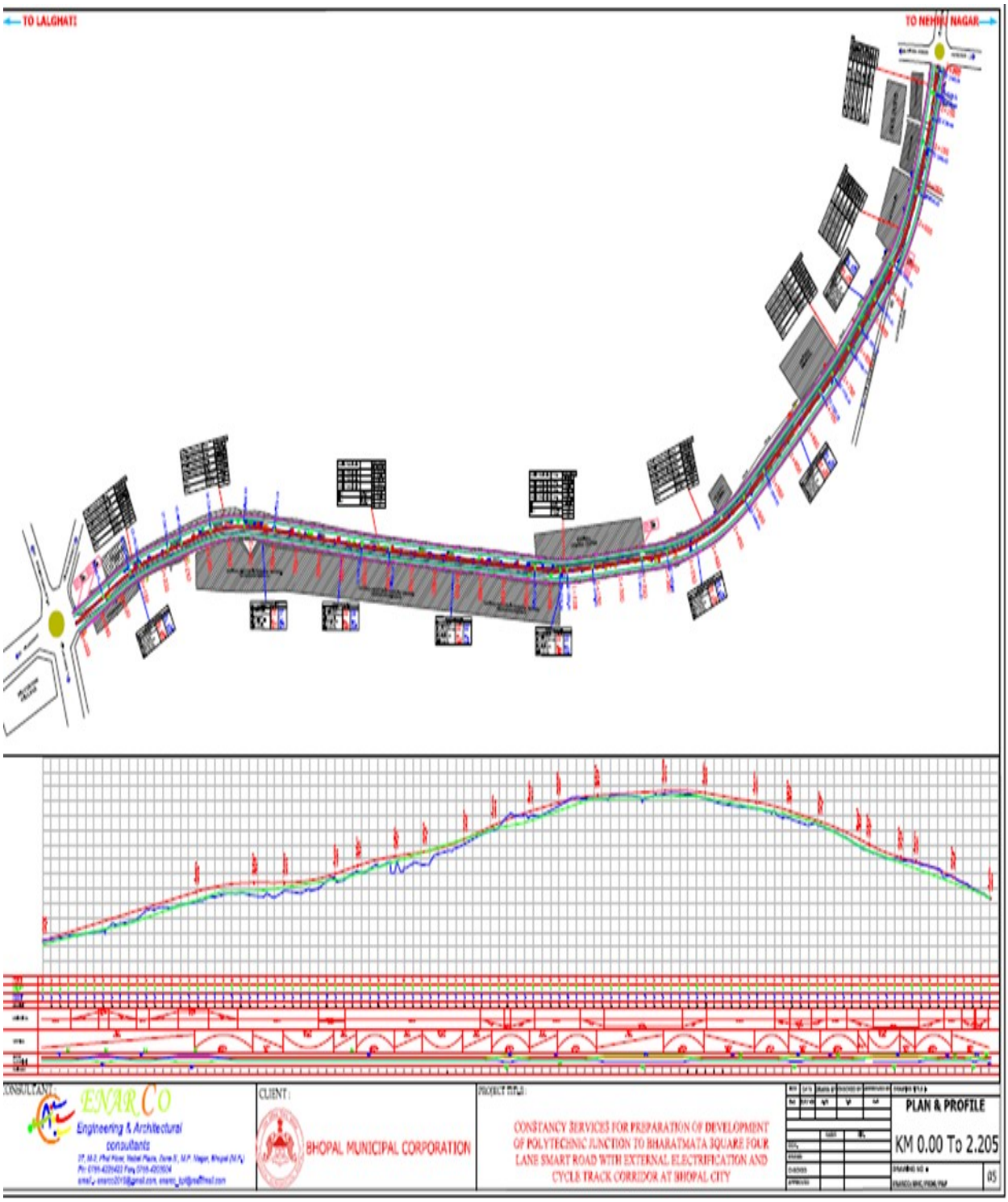
Reconstruction of 4-Lane Road With Cycle Track & Drain cum Duct under Footpath

CONSULTANT: ENARCO Engineering & Architectural consultants

CLIENT: BHOPAL MUNICIPAL CORPORATION

CONSTANCY SERVICES FOR PREPARATION OF DEVELOPMENT OF POLYTECHNIC JUNCTION TO BHARATMATA SQUARE FOUR LANE SMART ROAD WITH EXTERNAL ELECTRIFICATION AND CYCLE TRACK CORRIDOR AT BHOPAL CITY

TYPICAL CROSS SECTION


TO LALGHATI
TO NEHRU NAGAR
CONSULTANT:
ENARCO
Engineering & Architectural consultants
CLIENT:
BHOPAL MUNICIPAL CORPORATION
PROJECT TITLE:
CONSTANCY SERVICES FOR PREPARATION OF DEVELOPMENT OF POLYTECHNIC JUNCTION TO BHARATMATA SQUARE FOUR LANE SMART ROAD WITH EXTERNAL ELECTRIFICATION AND CYCLE TRACK CORRIDOR AT BHOPAL CITY
PLAN & PROFILE
KM 0.00 To 2.205
05

11.Draft Contract Agreement

ENGINEERING, PROCUREMENT AND CONSTRUCTION AGREEMENT

THIS AGREEMENT is entered into on this the …….. day of ……, 20…..

BETWEEN

The CEO,BSCDCL (hereinafter referred to as the "**BSCDCL**" which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns) of One Part;

AND

{----------,} means the selected bidder having its registered office at ……, (hereinafter referred to as the "**Contractor**" which expression shall, unless repugnant to the context or meaning thereof, include its successors and permitted assigns) of the Other Part.

WHEREAS:

(A) The Bhopal Municipal Corporation had entrusted to the BSCDCL for the Development of Polytechnic Junction to Bharatmata Square Four Lane Smart Road with External Electrification and Cycle Track Corridor (2.205 km)

(B) The BSCDCL had resolved to Development of Polytechnic Junction to Bharatmata Square Four Lane Smart Road with External Electrification and Cycle Track Corridor in the State of Madhya Pradesh by Four-Laning on Engineering, Procurement, Construction ("EPC") basis in accordance with the terms and conditions to be set forth in an agreement to be entered into.

(C) The BSCDCL had accordingly invited proposals by its Request for Proposal No. *** dated *** (the "**Request for Proposals" or "RFP**") for short listing of bidders for EPC of Development of Polytechnic Junction to Bharatmata Square Four Lane Smart Road with External Electrification and Cycle Track Corridor and had shortlisted certain bidders including, inter alia, the selected bidder.

(D) The BSCDCL had prescribed the technical and commercial terms and conditions, and invited bids (the "**Request for Proposals**" or "**RFP**") from the bidders for undertaking the Project.

(E) After evaluation of the bids received, the BSCDCL had accepted the bid of the selected bidder and issued its Letter of Acceptance No. …….. dated …….. (hereinafter called the "**LOA**") to the selected Development of Polytechnic Junction to Bharatmata Square Four Lane Smart

Road with External Electrification and Cycle Track Corridor at the contract price specified hereinafter, requiring the selected bidder to inter alia:

(i) execute this Agreement within 15 (fifteen) days of the date of issue of LOA.

NOW THEREFORE in consideration of the foregoing and the respective covenantsand agreements set forth in this Agreement, the sufficiency and adequacy of which is hereby acknowledged, the BSCDCL hereby covenants to pay the Contractor, in consideration of the obligations specified herein, the Contract Price or such other sum as may become payable under the provisions of the Agreement at the times and in the manner specified by the Agreement and intending to be legally bound hereby, the Parties agree as follows:

The following documents attached hereto shall be deemed to form an integral part of this Contract:

(a) Volume-I:

The Agreement;
Corrigendum to the Agreement;
Addendum, if any, to RFP;
Letter Comprising the financial Bid;
Letter of Acceptance;
Power of Attorney;
Any other document to be specified

ARTICLE 1

DEFINITIONS AND INTERPRETATION

1.1 Definitions

The words and expressions beginning with capital letters and defined in this Agreement shall, unless the context otherwise requires, have the meaning ascribed thereto herein, and the words and expressions defined in the Schedules and used therein shall have the meaning ascribed thereto in the Schedules.

1.2 Interpretation

1.2.1 In this Agreement, unless the context otherwise requires,

(a) references to any legislation or any provision thereof shall include amendment or re-enactment or consolidation of such legislation or any provision thereof so far as such amendment or re-enactment or consolidation applies or is capable of applying to any transaction entered into hereunder;

(b) references to laws of India or Indian law or regulation having the force of law shall include the laws, acts, ordinances, rules, regulations, bye laws or notifications which have the force of law in the territory of India and as from time to time may be amended, modified, supplemented, extended or re-enacted;

(c) references to a "person" and words denoting a natural person shall be construed as a reference to any individual, firm, company, corporation, society, trust, government, state or agency of a state or any association or partnership (whether or not having separate legal personality) of two or more of the above and shall include successors and assigns;

(d) the table of contents, headings or sub-headings in this Agreement are for convenience of reference only and shall not be used in, and shall not affect, the construction or interpretation of this Agreement;

(e) the words "include" and "including" are to be construed without limitation and shall be deemed to be followed by "without limitation" or "but not limited to" whether or not they are followed by such phrases;

(f) references to "construction" or "building" include, unless the context otherwise requires, survey and investigation, design, developing, engineering, procurement, supply of plant, materials, equipment, labour, delivery, transportation, installation, processing, fabrication, testing, and commissioning of the Project Highway, including maintenance during the Construction Period, removing of defects, if any, and other activities incidental to the construction and "construct" or "build" shall be construed accordingly;

(g) references to "development" include, unless the context otherwise requires, construction, renovation, refurbishing, augmentation, up-gradation and other activities incidental thereto during the Construction Period, and "develop" shall be construed accordingly;

(h) any reference to any period of time shall mean a reference to that according to Indian standard time;

(i) any reference to day shall mean a reference to a calendar day;

(j) references to a "business day" shall be construed as a reference to a day (other than a Sunday) on which banks in Bhopal are generally open for business;

(k) any reference to month shall mean a reference to a calendar month as per the Gregorian calendar;

(l) references to any date, period or Project Milestone shall mean and include such date, period or Project Milestone as may be extended pursuant to this Agreement;

(m) any reference to any period commencing "from" a specified day or date and "till" or "until" a specified day or date shall include both such days or dates; provided that if the last day of any period computed under this Agreement is not a business day, then the period shall run until the end of the next business day;

(n) the words importing singular shall include plural and vice versa;

(o) references to any gender shall include the other and the neutral gender;

(p) "lakh" means a hundred thousand (100,000) and "crore" means ten million (10,000,000);

(q) "indebtedness" shall be construed so as to include any obligation (whether incurred as principal or surety) for the payment or repayment of money, whether present or future, actual or contingent;

(r) References to the "winding-up", "dissolution", "insolvency", or "reorganization" of a company or corporation shall be construed so as to include any equivalent or analogous proceedings under the law of the jurisdiction in which such company or corporation is incorporated or any jurisdiction in which such company or corporation carries on business including the seeking of liquidation, winding-up, reorganization, dissolution, arrangement, protection or relief of debtors;

(s) save and except as otherwise provided in this Agreement, any reference, at any time, to any agreement, deed, instrument, licence or document of any description shall be construed as reference to that agreement, deed, instrument, licence or other document as amended, varied, supplemented, modified or suspended at the time of such reference; provided that this Clause shall not operate so as to increase

liabilities or obligations of the BSCDCL hereunder or pursuant hereto in any manner whatsoever;

(t) Any agreement, consent, approval, authorization, notice, communication, information or report required under or pursuant to this Agreement from or by any Party or the BSCDCL's Engineer shall be valid and effective only if it is in writing under the hand of a duly authorized representative of such Party or the BSCDCL's Engineer, as the case may be, in this behalf and not otherwise;

(u) The Schedules and Recitals to this Agreement form an integral part of this Agreement and will be in full force and effect as though they were expressly set out in the body of this Agreement;

(v) references to Recitals, Articles, Clauses, Sub-clauses or Schedules in this Agreement shall, except where the context otherwise requires, mean references to Recitals, Articles, Clauses, Sub-clauses and Schedules of or to this Agreement, and references to a Paragraph shall, subject to any contrary indication, be construed as a reference to a Paragraph of this Agreement or of the Schedule in which such reference appears;

(w) the damages payable by either Party to the other of them, as set forth in this Agreement, whether on per diem basis or otherwise, are mutually agreed genuine pre-estimated loss and damage likely to be suffered and incurred by the Party entitled to receive the same and are not by way of penalty (the "**Damages**"); and

(x) time shall be of the essence in the performance of the Parties' respective obligations. If any time period specified herein is extended for the reasons specified in the Agreement, such extended time shall also be of the essence.

1.2.2 Unless expressly provided otherwise in this Agreement, any Documentation required to be provided or furnished by the Contractor to the BSCDCL shall be provided free of cost and in three copies, and if the BSCDCL is required to return any such Documentation with its comments and/or approval, it shall be entitled to retain two copies thereof.

1.2.3 The rule of construction, if any, that a contract should be interpreted against the parties responsible for the drafting and preparation thereof, shall not apply.

1.2.4 Any word or expression used in this Agreement shall, unless otherwise defined or construed in this Agreement, bear its ordinary English meaning and, for these purposes, the General Clauses Act, 1897 shall not apply.

1.3 Measurements and arithmetic conventions

All measurements and calculations shall be in the metric system and calculations done to 2 (two) decimal places, with the third digit of 5 (five) or above being rounded up and below 5 (five) being rounded down.

1.4 Priority of agreements and errors/discrepancies

1.4.1 This Agreement, and all other agreements and documents forming part of or referred to in this Agreement are to be taken as mutually explanatory and, unless otherwise expressly provided elsewhere in this Agreement, the priority of this Agreement and other documents and agreements forming part hereof or referred to herein shall, in the event of any conflict between them, be in the following order:

(a) this Agreement; and

(b) All other agreements and documents forming part hereof or referred to herein; i.e. this Agreement at (a) above shall prevail over the agreements and documents at (b).

1.4.2 Subject to the provisions of Clause 1.4.1, in case of ambiguities or discrepancies within this Agreement, the following shall apply:

(a) Between two or more Clauses of this Agreement, the provisions of a specific Clause relevant to the issue under consideration shall prevail over those in other Clauses;

(b) between the Clauses of this Agreement and the Schedules, the Clauses shall prevail and between Schedules and Annexes, the Schedules shall prevail;

(c) Between any two Schedules, the Schedule relevant to the issue shall prevail;

(d) Between the written description on the Drawings and the Specifications and Standards, the latter shall prevail;

(e) between the dimension scaled from the Drawing and its specific written dimension, the latter shall prevail; and

(f) Between any value written in numerals and that in words, the latter shall prevail.

1.5 Joint and several liability

1.5.1 If the Contractor has formed a Consortium of two or more persons for implementing the Project:

(a) these persons shall, without prejudice to the provisions of this Agreement, be deemed to be jointly and severally liable to the BSCDCL for the performance of the Agreement; and

(b) The Contractor shall ensure that no change in the composition of the Consortium is effected without the prior consent of the BSCDCL.

1.5.2 Without prejudice to the joint and several liability of all the members of the Consortium, the Lead Member shall represent all the members of the Consortium and shall at all times be liable and responsible for discharging

the functions and obligations of the Contractor. The Contractor shall ensure that each member of the Consortium shall be bound by any decision, communication, notice, action or inaction of the Lead Member on any matter related to this Agreement and the BSCDCL shall be entitled to rely upon any such action, decision or communication of the Lead Member. The BSCDCL shall have the right to release payments solely to the Lead Member and shall not in any manner be responsible or liable for the inter *se* allocation of payments among members of the Consortium.}[$]

ARTICLE 2

SCOPE OF THE PROJECT

2.1 Scope of the Project

Under this Agreement, the scope of the Project (the "**Scope of the Project**")

shall mean and include:

(a) Include Development of four lane road with pavement, , culverts, road, drains, intersection, interchanges, etc. and

(b) conversion of overhead HT lines to underground cables ,RMUs,PSS , Street Light etc and

(c) Rectify the defects during Defect Liability Period, which shall be 3 years for civil works and 3 years for electrical works after completion of work.

d) Different items and tentative quantities to be used for this project is mentioned in Bill of Quantities BOQ however these quantities may vary as per the approved design and site requirement

ARTICLE 3

OBLIGATIONS OF THE CONTRACTOR

3.1 Obligations of the Contractor

3.1.1 Subject to and on the terms and conditions of this Agreement, the Contractor shall undertake the survey, investigation, design, engineering, procurement, construction, and maintenance of the Project and observe, fulfil, comply with and perform all its obligations set out in this Agreement or arising hereunder.

3.1.2 The Contractor shall comply with all Applicable Laws and Applicable Permits (including renewals as required) in the performance of its obligations under this Agreement.

3.1.3 Subject to the provisions of Clauses 3.1.1 and 3.1.2, the Contractor shall discharge its obligations in accordance with Good Industry Practice and as a reasonable and prudent person.

3.1.4 The Contractor shall remedy any and all loss or damage to the Project from the Appointed Date until the end of the Construction Period at the Contractor's cost, save and except to the extent that any such loss or damage shall have arisen from any default or neglect of the BSCDCL.

3.1.5 The Contractor shall remedy any and all loss or damage to the Project during the Defects Liability Period at the Contractor's cost to the extent that such loss or damage shall have arisen out of the reasons specified in Clause 17.3.

3.1.6 The Contractor shall remedy any and all loss or damage to the Project during the Maintenance Period at the Contractor's cost, including those stated in RFP save and except to the extent that any such loss or damage shall have arisen on account of any default or neglect of the BSCDCL or on account of a Force Majeure Event.

3.1.7 The Contractor shall, at its own cost and expense, in addition to and not in derogation of its obligations elsewhere set out in this Agreement:

(a) make, or cause to be made, necessary applications to the relevant Government Instrumentalities with such particulars and details as may be required for obtaining Applicable Permits set forth in Schedule-F and obtain and keep in force and effect such Applicable Permits in conformity with the Applicable Laws;

(b) procure, as required, the appropriate proprietary rights, licences, agreements and permissions for Materials, methods, processes and systems used or incorporated into the Project Highway;

(c) make reasonable efforts to maintain harmony and good industrial relations among the personnel employed by it or its Sub-contractors in connection with the performance of its obligations under thisAgreement;

(d) ensure and procure that its Sub-contractors comply with all Applicable Permits and Applicable Laws in the performance by them of any of the Contractor's obligations under this Agreement;

(e) not do or omit to do any act, deed or thing which may in any manner be violative of any of the provisions of this Agreement;

(f) support, cooperate with and facilitate the BSCDCL in the implementation and operation of the Project in accordance with the provisions of this Agreement;

(g) ensure that the Contractor and its Sub-contractors comply with the safety and welfare measures for labour in accordance with the Applicable Laws and Good Industry Practice;

(h) keep, on the Site, a copy of this Agreement, publications named in this Agreement, the Drawings, Documents relating to the Project, and Change of Scope Orders and other communications given under this Agreement. The BSCDCL's Engineer and its authorised personnel shall have the right of access to all these documents at all reasonable times;

(i) cooperate with other contractors employed by the BSCDCL and personnel of any public BSCDCL; and

(j) not interfere unnecessarily or improperly with the convenience of the public, or the access to and use and occupation of all roads and footpaths, irrespective of whether they are public or in the possession of the BSCDCL or of others.

3.1.8 The Contractor shall undertake all necessary superintendence to plan, arrange, direct, manage, inspect and test the Works.Discharged solely by the Lead Member.}[$]

3.4 Contractor's personnel

3.4.1 The Contractor shall ensure that the personnel engaged by it or by its Sub-contractors in the performance of its obligations under this Agreement are

at all times appropriately qualified, skilled and experienced in their respective functions in conformity with Good Industry Practice.

3.4.2 The BSCDCL's Engineer may, for reasons to be specified in writing, direct the Contractor to remove any member of the Contractor's or Sub- contractor's personnel. Provided that any such direction issued by the BSCDCL's Engineer shall specify the reasons for the removal of such person.

3.4.3 The Contractor shall on receiving such a direction from the BSCDCL's Engineer order for the removal of such person or persons with immediate effect. It shall be the duty of the Contractor to ensure that such persons are evicted from the Site within 10 (ten) days of any such direction being issued in pursuance of Clause 3.4.2. The Contractor shall further ensure that such persons have no further connection with the Works or Maintenance under this Agreement. The Contractor shall then appoint (or cause to be appointed) a replacement.

3.5 **Environmental Clearances**

If environmental clearances is required for construction of the Project shall be procured by the cotractor prior to the date of start of work.However necessary support shall be provided by BSCDCL

3.6 Contractor's care of the Works

The Contractor shall bear full risk in and take full responsibility for the care of the Works, and of the Materials, goods and equipment for incorporation therein, from the Appointed Date until the date of Provisional Certificate (with respect to the Works completed prior to the issuance of the Provisional Certificate) and/or Completion Certificate (with respect to the Works referred to in the Punch List), save and except to the extent that any such loss or damage shall have arisen from any default or neglect of the BSCDCL.

3.7 Electricity, water and other services

The Contractor shall be responsible for procuring of all power, water and other services that it may require.

3.8 Unforeseeable difficulties

Except as otherwise stated in the Agreement:

(a) The Contractor accepts complete responsibility for having foreseen all difficulties and costs of successfully completing the Works;

(b) the Contract Price shall not be adjusted to take account of any unforeseen difficulties or costs; and

(c) The Scheduled Completion Date shall not be adjusted to take account of any unforeseen difficulties or costs.

ARTICLE 4

OBLIGATIONS OF THE BSCDCL

4.1 Obligations of the BSCDCL

4.1.1 The BSCDCL shall, at its own cost and expense, undertake, comply with and perform all its obligations set out in this Agreement or arising hereunder.

4.1.2 The BSCDCL shall be responsible for the correctness of the Scope of the Project, Project Facilities, Specifications and Standards and the criteria for testing of the completed Works.

4.1.3 The BSCDCL shall provide to the Contractor:

(a) upon receiving the Performance Security under Clause 7.1.1, the Right of Way in accordance with the provisions of Clauses 8.2 and 8.3, within a period of 15 (fifteen) days from the date of this Agreement, on no less than 90% (ninety per cent) of the total length of the Project Highway;

(b) Approval of the general arrangement drawings (the "**GAD**") AND design submitted by the contractor

4.1.6 The BSCDCL agrees to provide support to the Contractor and undertakes to observe, comply with and perform, subject to and in accordance with the provisions of this Agreement and the Applicable Laws, the following:

(a) upon written request from the Contractor, and subject to the Contractor complying with Applicable Laws, provide reasonable support to the Contractor in procuring Applicable Permits required from any Government Instrumentality for implementation of the Project;

(b) upon written request from the Contractor, provide reasonable assistance to the Contractor in obtaining access to all necessary infrastructure facilities and utilities, including water and electricity at rates and on terms no less favorable than those generally available to commercial customers receiving substantially equivalent services;

(c) procure that no barriers that would have a material adverse effect on the works are erected or placed on or about the Project by any Government Instrumentality or persons claiming through or under it, except for reasons of Emergency, national security, law and order or collection of inter-state taxes;

(d) Not do or omit to do any act, deed or thing which may in any manner be violates of any of the provisions of this Agreement;

(e) Support, cooperate with and facilitate the Contractor in the implementation of the Project in accordance with the provisions of this Agreement; and

(f) upon written request from the Contractor and subject to the provisions of Clause 3.3, provide reasonable assistance to the Contractor and any expatriate personnel of the Contractor or its Sub-contractors to obtain applicable visas and work permits for the purposes of discharge by the Contractor or its Sub-contractors of their obligations under this Agreement and the agreements with the Sub-contractors.

4.2 Maintenance obligations prior to the Appointed Date

The BSCDCL shall, prior to the Appointed Date, maintain the Project Highway, at its own cost and expense, so that its traffic worthiness and safety are at no time materially inferior as compared to its condition 10 (ten) days prior to the last date for submission of the Bid, and in the event of any material deterioration or damage other than normal wear and tear, undertake repair thereof. For the avoidance of doubt, the BSCDCL shall undertake only routine maintenance prior to the Appointed Date, and it shall undertake special repairs only in the event of excessive deterioration or damage caused due to unforeseen events such as floods or earthquake.

ARTICLE 5

REPRESENTATIONS AND WARRANTIES

5.1 Representations and warranties of the Contractor

The Contractor represents and warrants to the BSCDCL that:

(a) it is duly organised and validly existing under the laws of India, and has full power and BSCDCL to execute and perform its obligations under this Agreement and to carry out the transactions contemplated hereby;

(b) it has taken all necessary corporate and/or other actions under Applicable Laws to authorise the execution and delivery of this Agreement and to validly exercise its rights and perform its obligations under this Agreement;

(c) this Agreement constitutes its legal, valid and binding obligation, enforceable against it in accordance with the terms hereof, and its obligations under this Agreement will be legally valid, binding and enforceable obligations against it in accordance with the terms hereof;

(d) it is subject to the laws of India, and hereby expressly and irrevocably waives any immunity in any jurisdiction in respect of this Agreement or matters arising thereunder including any obligation, liability or responsibility hereunder;

(e) the information furnished in the Bid and as updated on or before the date of this Agreement is true and accurate in all respects as on the date of this Agreement;

(f) the execution, delivery and performance of this Agreement will not conflict with, result in the breach of, constitute a default under, or accelerate performance required by any of the terms of its memorandum and articles of association or any Applicable Laws or any covenant, contract, agreement, arrangement, understanding, decree or order to which it is a party or by which it or any of its properties or assets is bound or affected;

(g) there are no actions, suits, proceedings, or investigations pending or, to its knowledge, threatened against it at law or in equity before any court or before any other judicial, quasi-judicial or other BSCDCL, the outcome of which may result in the breach of this Agreement or which individually or in the aggregate may result in any material impairment of its ability to perform any of its obligations under this Agreement;

(h) it has no knowledge of any violation or default with respect to any order, writ, injunction or decree of any court or any legally binding order of any Government Instrumentality which may result in any material adverse effect on its ability to perform its obligations under this Agreement and no fact or circumstance exists which may give

rise to such proceedings that would adversely affect the performance of its obligations under this Agreement;

(i) it has complied with Applicable Laws in all material respects and has not been subject to any fines, penalties, injunctive relief or any other civil or criminal liabilities which in the aggregate have or may have a material adverse effect on its ability to perform its obligations under this Agreement;

(j) no representation or warranty by it contained herein or in any other document furnished by it to the BSCDCL or to any Government Instrumentality in relation to Applicable Permits contains or will contain any untrue or misleading statement of material fact or omits or will omit to state a material fact necessary to make such representation or warranty not misleading;

(k) no sums, in cash or kind, have been paid or will be paid, by it or on its behalf, to any person by way of fees, commission or otherwise for securing the contract or entering into this Agreement or for influencing or attempting to influence any officer or employee of the BSCDCL in connection therewith;

(l) all information provided by the {selected bidder/ members of the Consortium} in response to the Request for Proposals or otherwise, is to the best of its knowledge and belief, true and accurate in all material respects; and

(m) nothing contained in this Agreement shall create any contractual relationship or obligation between the BSCDCL and any Sub-contractors, designers, consultants or agents of the Contractor.

5.2 Representations and warranties of the BSCDCL

The BSCDCL represents and warrants to the Contractor that:

(a) it has full power and BSCDCL to execute, deliver and perform its obligations under this Agreement and to carry out the transactions contemplated herein and that it has taken all actions necessary to execute this Agreement, exercise its rights and perform its obligations, under this Agreement;

(b) it has taken all necessary actions under the Applicable Laws to authorise the execution, delivery and performance of this Agreement;

(c) it has the financial standing and capacity to perform its obligations under this Agreement;

(d) this Agreement constitutes a legal, valid and binding obligation enforceable against it in accordance with the terms hereof

e) it has no knowledge of any violation or default with respect to any order, writ, injunction or any decree of any court or any legally binding order of any Government Instrumentality which may result in any material adverse effect on the BSCDCL's ability to perform its obligations under this Agreement;

(f) it has complied with Applicable Laws in all material respects;

(g) it has good and valid right to the Site and has the power and BSCDCL to grant the Right of Way in respect thereof to the Contractor; and

(h) it has procured Right of Way and environment clearances such that the Contractor can commence construction forthwith on 90% (ninety per cent) of the total length of the Project Highway.

5.3 Disclosure

In the event that any occurrence or circumstance comes to the attention of either Party that renders any of its aforesaid representations or warranties untrue or incorrect, such Party shall immediately notify the other Party of the same. Such notification shall not have the effect of remedying any breach of the representation or warranty that has been found to be untrue or incorrect nor shall it adversely affect or waive any obligation of either Party under this Agreement.

ARTICLE 6

DISCLAIMER

6.1 Disclaimer

6.1.1 The Contractor acknowledges that prior to the execution of this Agreement, the Contractor has, after a complete and careful examination, made an independent evaluation of the Request for Proposal, Scope of the Project, Specifications and Standards of design, construction and maintenance, Site, local conditions, physical qualities of ground, subsoil and geology, traffic volumes, suitability and availability of access routes to the Site and all information provided by the BSCDCL or obtained, procured or gathered otherwise, and has determined to its satisfaction the accuracy or otherwise thereof and the nature and extent of difficulties, risks and hazards as are likely to arise or may be faced by it in the course of performance of its obligations hereunder. Save as provided in Clause 4.1.2 and Clause 5.2, the BSCDCL makes no representation whatsoever, express, implicit or otherwise, regarding the accuracy, adequacy, correctness, reliability and/or completeness of any assessment, assumptions, statement or information provided by it and the Contractor confirms that it shall have no claim whatsoever against the BSCDCL in this regard.

6.1.2 The Contractor acknowledges and hereby accepts to have satisfied itself as to the correctness and sufficiency of the Contract Price.

6.1.3 The Contractor acknowledges and hereby accepts the risk of inadequacy, mistake or error in or relating to any of the matters set forth in Clause 6.1.1 above and hereby acknowledges and agrees that the BSCDCL shall not be liable for the same in any manner whatsoever to the Contractor, or any person claiming through or under any of them, and shall not lead to any adjustment of Contract Price or Scheduled Completion Date.

6.1.4 The Parties agree that any mistake or error in or relating to any of the matters set forth in Clause 6.1.1 above shall not vitiate this Agreement, or render it voidable.

6.1.5 In the event that either Party becomes aware of any mistake or error relating to any of the matters set forth in Clause 6.1.1 above, that Party shall immediately notify the other Party, specifying the mistake or error.

6.1.6 Except as otherwise provided in this Agreement, all risks relating to the Project shall be borne by the Contractor; and the BSCDCL shall not be liable in any manner for such risks or the consequences thereof.

ARTICLE 7

PERFORMANCE SECURITY

7.1 Performance Security

7.1.1 The Contractor shall, for the performance of its obligations hereunder during the Construction Period, provide to the BSCDCL, within 10 (ten) days of the date of this Agreement, an irrevocable and unconditional guarantee from a Bank in the form set forth in Schedule-G (the "Performance Security") for an amount equal to 10% (ten percent) of the Contract Price. The Performance Security shall be valid until 60 (sixty) days after the Defects Liability Period. Until such time the Performance Security is provided by the Contractor pursuant hereto and the same comes into effect, the Bid Security shall remain in force and effect, and upon such provision of the Performance Security, the BSCDCL shall release the Bid Security to the Contractor.

7.1.2 Notwithstanding anything to the contrary contained in this Agreement, the Parties agree that in the event of failure of the Contractor to provide the Performance Security in accordance with the provisions of Clause 7.1.1 and within the time specified therein or such extended period as may be provided by the BSCDCL, in accordance with the provisions of Clause 7.1.3, the BSCDCL may encash the Bid Security and appropriate the proceeds thereof as Damages, and thereupon all rights, privileges, claims and entitlements of the Contractor under or arising out of this Agreement shall be deemed to have been waived by, and to have ceased with the concurrence of the Contractor, and this Agreement shall be deemed to have been terminated by mutual agreement of the Parties.

7.1.3 In the event the Contractor fails to provide the Performance Security within

10 (ten) days of this Agreement, it may seek extension of time for a period not exceeding 30 (Thirty) days on payment of Damages for such extended period in a sum calculated at the rate of 0.01% (zero point zero one per cent) of the Contract Price for each day until the Performance Security is provided. For the avoidance of doubt the agreement shall be deemed to be terminated on expiry of additional 30 days time period and Bid security shall be encashed by the BSCDCL.

7.2 Extension of Performance Security

The Contractor may initially provide the Performance Security for a period of 2 (two) years; provided that it shall procure the extension of the validity of the Performance Security, as necessary, at least 2 (two) months prior to the date of expiry thereof. Upon the Contractor providing an extended Performance Security, the previous Performance Security shall be deemed to

be released and the BSCDCL shall return the same to the Contractor within a period of 7 (seven) business days from the date of submission of the extended Performance Security.

7.3 Appropriation of Performance Security

7.3.1 Upon occurrence of a Contractor's Default, the BSCDCL shall, without prejudice to its other rights and remedies hereunder or in law, be entitled to encash and appropriate the relevant amounts from the Performance Security as Damages for such Contractor's Default.

7.3.2 Upon such encashment and appropriation from the Performance Security, the Contractor shall, within 30 (thirty) days thereof, replenish, in case of partial appropriation, to its original level the Performance Security, and in case of appropriation of the entire Performance Security provide a fresh Performance Security, as the case may be, and the Contractor shall, within the time so granted, replenish or furnish fresh Performance Security as aforesaid failing which the BSCDCL shall be entitled to terminate the Agreement in accordance with Article 23. Upon replenishment or furnishing of a fresh Performance Security, as the case may be, as aforesaid, the Contractor shall be entitled to an additional Cure Period of 30 (thirty) days for remedying the Contractor's Default, and in the event of the Contractor not curing its default within such Cure Period, the BSCDCL shall be entitled to encash and appropriate such Performance Security as Damages, and to terminate this Agreement in accordance with Article 23.

7.4 Release of Performance Security

The BSCDCL shall return the Performance Security to the Contractor within

60 (sixty) days of the later of the expiry of the Maintenance Period or the Defects Liability Period under this Agreement. Notwithstanding the aforesaid, the Parties agree that the BSCDCL shall not be obliged to release the Performance Security until all Defects identified during the Defects Liability Period have been rectified.

7.5 Retention Money

7.5.1 From every payment for Works due to the Contractor in accordance with the provisions of Clause 19.5, the BSCDCL shall deduct 6% (six per cent) thereof as guarantee money for performance of the obligations of the Contractor during the Construction Period (the "**Retention Money**") subject to the condition that the maximum amount of Retention Money shall not exceed 5% (five per cent) of the Contract Price.

7.5.2 Upon occurrence of a Contractor's Default, the BSCDCL shall, without prejudice to its other rights and remedies hereunder or in law, be entitled to

appropriate the relevant amounts from the Retention Money as Damages for such Contractor's Default.

7.5.3 The Contractor may, upon furnishing an irrevocable and unconditional bank guarantee substantially in the form provided at Annex-II of Schedule-G, require the BSCDCL to refund the Retention Money deducted by the BSCDCL under the provisions of Clause 7.5.1. Provided that the refund hereunder shall be made in tranches of not less than 1% (one per cent) of the Contract Price.

7.5.4 Within 15 (fifteen) days of the date of issue of the Completion Certificate, the BSCDCL shall discharge the bank guarantees furnished by the Contractor under the provisions of Clause 7.5.3 and refund the balance of Retention Money remaining with the BSCDCL after adjusting the amounts appropriated under the provisions of Clause 7.5.2 and the amounts refunded under the provisions of Clause 7.5.3.

7.5.5 The Parties agree that in the event of Termination of this Agreement, the Retention Money and the bank guarantees specified in this Clause 7.5 shall be treated as if they are Performance Security and shall be reckoned as such for the purposes of Termination Payment under Clause 23.6.

ARTICLE 8

UTILITIES AND TREES

8.1 Existing utilities and roads

Notwithstanding anything to the contrary contained herein, the Contractor shall ensure that the respective entities owning the existing roads, right of way, level crossings, structures, or utilities on, under or above the Site are enabled by it to keep them in continuous satisfactory use, if necessary, by providing suitable temporary diversions with the BSCDCL of the controlling body of that road, right of way or utility.

8.2 Shifting of obstructing utilities

The Contractor shall, in accordance with Applicable Laws and with assistance of the BSCDCL, cause shifting of any utility (including electric lines, water pipes and telephone cables) to an appropriate location or alignment, if such utility or obstruction adversely affects the execution of Works of the Project in accordance with this Agreement

8.3 New utilities

8.3.1 The Contractor shall allow, subject to such conditions as the BSCDCL may specify, access to, and use of the Site for laying telephone lines, water pipes, electric cables or other public utilities. Where such access or use causes any financial loss to the Contractor, it may require the user of the Site to pay compensation or damages as per Applicable Laws. For the avoidance of doubt, it is agreed that use of the Site under this Clause 9.3 shall not in any manner relieve the Contractor of its obligation to construct and maintain the Project Highway in accordance with this Agreement and any damage caused by such use shall be restored forthwith at the cost of the BSCDCL.

8.3.2 The BSCDCL may, by notice, require the Contractor to connect any adjoining road to the Project Highway, and the connecting portion thereof falling within the Site shall be constructed by the Contractor at the BSCDCL's cost in accordance with Article 10.

8.3.3 The BSCDCL may by notice require the Contractor to connect, through a paved road, any adjoining service station, hotel, motel or any other public facility or amenity to the Project Highway, whereupon the connecting portion thereof that falls within the Site shall be constructed by the Contractor on payment of the cost. The cost to be paid by the BSCDCL to the Contractor shall be determined by the BSCDCL's Engineer. For the avoidance of doubt, in the event such road is to be constructed for the benefit

of any entity, the BSCDCL may require such entity to make an advance deposit with the Contractor or the BSCDCL, as the case may be, of an amount equal to the estimated cost as determined by the BSCDCL's Engineer and such advance shall be adjusted against the cost of construction as determined by the BSCDCL's Engineer hereunder.

8.3.4 In the event the construction of any Works is affected by a new utility or works undertaken in accordance with this Clause 9.3, the Contractor shall be entitled to a reasonable Time Extension as determined by the BSCDCL.

8.4 Felling of trees

The BSCDCL shall assist the Contractor in obtaining the Applicable Permits for felling of trees to be identified by the BSCDCL for this purpose if and only if such trees cause a Material Adverse Effect on the construction or maintenance of the Project. The cost of such felling shall be borne by the BSCDCL and in the event of any delay in felling thereof for reasons beyond the control of the Contractor; it shall be excused for failure to perform any of its obligations hereunder if such failure is a direct consequence of delay in the felling of trees. The Parties hereto agree that the felled trees shall be deemed to be owned by the BSCDCL and shall be disposed in such manner and subject to such conditions as the BSCDCL may in its sole discretion deem appropriate. For the avoidance of doubt, the Parties agree that if any felling of trees hereunder is in a forest area, the Applicable Permit thereof shall be procured by the BSCDCL within the time specified in the Agreement.

ARTICLE 9 DELETED.....

ARTICLE 10

DESIGN AND CONSTRUCTION OF THE PROJECT

10.1 Obligations prior to commencement of Works

10.1.1 Within 20 (twenty) days of the Appointed Date, the Contractor shall:

(a) appoint its representative, duly authorised to deal with the BSCDCL in respect of all matters under or arising out of or relating to this Agreement;

(b) appoint a design director (the "**Design Director**") who will head the Contractor's design unit and shall be responsible for surveys, investigations, collection of data, and preparation of preliminary and detailed designs;

(c) undertake and perform all such acts, deeds and things as may be necessary or required before commencement of Works under and in accordance with this Agreement, the Applicable Laws and Applicable Permits; and And design shall be detailed by the govt reputed institute

(d) make its own arrangements for quarrying of materials needed for the Project Highway under and in accordance with the Applicable Laws and Applicable Permits.

10.1.2 The BSCDCL shall, within 15 (fifteen) days of the date of this Agreement, appoint an engineer (the "**BSCDCL's Engineer**") to discharge the functions and duties specified in this Agreement, and shall notify to the Contractor the name, address and the date of appointment of the BSCDCL's Engineer forthwith.

10.1.3 Within 30 (thirty) days of the Appointed Date, the Contractor shall submit to the BSCDCL and the BSCDCL's Engineer a programme (the **"Programme")** for the Works, developed using networking techniques giving the following details:

Part I Contractor's organisation for the Project, the general methods and arrangements for design and construction, environmental management plan, Quality Assurance Plan including design quality plan, traffic management and safety plan covering safety of users and workers during construction, Contractor's key personnel and equipment.

Part II Programme for completion of all stages of construction given in Schedule-H and Project Milestones of the Works as specified in Project Completion Schedule set forth in Schedule-J. The Programme shall include:

(a) the order in which the Contractor intends to carry out the Works, including the anticipated timing of design and stages of Works;

(b) the periods for reviews under Clause 10.2;

(c) the sequence and timing of inspections and tests specified in this Agreement.

The Contractor shall submit a revised programme whenever the previous programme is inconsistent with the actual progress or with the Contractor's obligations.

10.2 Design and Drawings

10.2.1 Design and Drawings shall be developed in conformity with the Specifications and Standards set forth in Schedule-D. In the event, the Contractor requires any relaxation in design standards due to restricted Right of Way in any section, the alternative design criteria for such section shall be provided for review of the BSCDCL's Engineer.

10.2.4 In respect of the Contractor's obligations with respect to the design and Drawings of the Project Highway as set forth in Schedule-I, the following shall apply:

(a) The Contractor shall prepare and submit, with reasonable promptness and in such sequence as is consistent with the Project Completion Schedule, three copies each of the design and Drawings, duly certified by the Proof Consultant, to the BSCDCL's Engineer for review. Provided, however, that in respect of Major Bridges and Structures, the BSCDCL's Engineer may require additional drawings for its review in accordance with Good Industry Practice.

(b) by submitting the Drawings for review to the BSCDCL's Engineer, the Contractor shall be deemed to have represented that it has determined and verified that the design and engineering, including field construction criteria related thereto, are in conformity with the

Scope of the Project, the Specifications and Standards and the Applicable Laws;

(c) within 15 (fifteen) days of the receipt of the Drawings, the BSCDCL's Engineer shall review the same and convey its observations to the Contractor with particular reference to their conformity or otherwise with the Scope of the Project and the Specifications and Standards. The Contractor shall not be obliged to await the observations of the BSCDCL's Engineer on the Drawings submitted pursuant hereto beyond the said period of 15 (fifteen) days and may begin or continue Works at its own discretion and risk; Provided, however that in case of a Major Bridge or Structure, the aforesaid period of 15 (fifteen) days may be extended upto 30 (thirty) days;

(d) if the aforesaid observations of the BSCDCL's Engineer indicate that the Drawings are not in conformity with the Scope of the Project or the Specifications and Standards, such Drawings shall be revised by the Contractor in conformity with the provisions of this Agreement and resubmitted to the BSCDCL's Engineer for review. The BSCDCL's Engineer shall give its observations, if any, within 10 (ten) days of receipt of the revised Drawings. In the event the Contractor fails to revise and resubmit such Drawings to the BSCDCL's Engineer for review as aforesaid, the BSCDCL's Engineer may withhold the payment for the affected works in accordance with the provisions of Clause 19.5.4. If the Contractor disputes any decision, direction or determination of the BSCDCL's Engineer hereunder, the Dispute shall be resolved in accordance with the Dispute Resolution Procedure;

(e) no review and/or observation of the BSCDCL's Engineer and/or its failure to review and/or convey its observations on any Drawings shall relieve the Contractor of its obligations and liabilities under this Agreement in any manner nor shall the BSCDCL's Engineer or the BSCDCL be liable for the same in any manner; and if errors, omissions, ambiguities, inconsistencies, inadequacies or other Defects are found in the Drawings, they and the construction works shall be corrected at the Contractor's cost, notwithstanding any review under this Article 10;

(f) the Contractor shall be responsible for delays in submitting the Drawing as set forth in Schedule-I caused by reason of delays in surveys and field investigations, and shall not be entitled to seek any relief in that regard from the BSCDCL; and

(g) the Contractor warrants that its designers, including any third parties engaged by it, shall have the required experience and capability in accordance with Good Industry Practice and it shall indemnify the BSCDCL against any damage, expense, liability, loss or claim, which the Authority might incur, sustain or be subject to arising from any breach of the Contractor's design responsibility and/or warranty set out in this Clause.

10.2.5 Any cost or delay in construction arising from review by the BSCDCL's Engineer shall be borne by the Contractor.

10.2.6 Works shall be executed in accordance with the Drawings provided by the Contractor in accordance with the provisions of this Clause 10.2 and the observations of the BSCDCL's Engineer thereon as communicated pursuant to the provisions of Clause 10.2.4 (d). Such Drawings shall not be amended or altered without prior written notice to the BSCDCL's Engineer. If a Party becomes aware of an error or defect of a technical nature in the design or Drawings, that Party shall promptly give notice to the other Party.

10.2.7 Within 90 (ninety) days of the Project Completion Date, the Contractor shall furnish to the BSCDCL and the BSCDCL's Engineer a complete set of as-built Drawings, in 2 (two) hard copies and in micro film form or in such other medium as may be acceptable to the BSCDCL, reflecting the Project as actually designed, engineered and constructed, including an as- built survey illustrating the layout of the Project Highway and setback lines, if any, of the buildings and structures forming part of Project Facilities.

10.5 Extension of time for completion

10.5.1 Without prejudice to any other provision of this Agreement for and in respect of extension of time, the Contractor shall be entitled to extension of time in the Project Completion Schedule (the **"Time Extension")** to the extent that completion of any Project Milestone is or will be delayed by any of the following, namely:

(a) delay in providing the Right of Way, environmental clearances or approval of railway authorities, specified in Clause 4.1.4;

(b) Change of Scope (unless an adjustment to the Scheduled Completion Date has been agreed under Article 13);

(c) occurrence of a Force Majeure Event;

(d) any delay, impediment or prevention caused by or attributable to the BSCDCL, the BSCDCL's personnel or the BSCDCL's other contractors on the Site; and

(e) any other cause or delay which entitles the Contractor to Time Extension in accordance with the provisions of this Agreement.

10.5.2 The Contractor shall, no later than 15 (fifteen) business days from the occurrence of an event or circumstance specified in Clause 10.5.1, inform the BSCDCL's Engineer by notice in writing, with a copy to the BSCDCL, stating in reasonable detail with supporting particulars, the event or

circumstances giving rise to the claim for Time Extension in accordance with the provisions of this Agreement. Provided that the period of 15 (fifteen) business days shall be calculated from the date on which the Contractor became aware, or should have become aware, of the occurrence of such an event or circumstance.

Provided further that notwithstanding anything to the contrary contained in this Agreement, Time Extension shall be due and applicable only for the Works which are affected by the aforesaid events or circumstances and shall not in any manner affect the Project Completion Schedule for and in respect of the Works which are not affected hereunder.

10.5.3 In the event of the failure of the Contractor to issue to the BSCDCL's Engineer a notice in accordance with the provisions of Clause 10.5.2 within the time specified therein, the Contractor shall not be entitled to any Time Extension and shall forfeit its right for any such claims in future. For the avoidance of doubt, in the event of failure of the Contractor to issue notice as specified in this clause 10.5.3, the BSCDCL shall be discharged from all liability in connection with the claim.

10.5.4 The Authority's Engineer shall, on receipt of the claim in accordance with the provisions of Clause 10.5.2, examine the claim expeditiously within the time frame specified herein. In the event the BSCDCL's Engineer requires any clarifications to examine the claim, the BSCDCL's Engineer shall seek the same within 15 (fifteen) days from the date of receiving the claim. The Contractor shall, on receipt of the communication of the BSCDCL's Engineer requesting for clarification, furnish the same to the BSCDCL's Engineer within 10 (ten) days thereof. The BSCDCL's Engineer shall, within a period of 60 (sixty) days from the date of receipt of such clarifications, forward in writing to the Contractor .

Provided that when determining each extension of time under this Clause 10.5, the BSCDCL's Engineer shall review previous determinations and may increase, but shall not decrease, the total Time Extension.

10.5.5 If the event or circumstance giving rise to the notice has a continuing effect:

(a) a fully detailed claim shall be considered as interim;

(b) the Contractor shall, no later than 10 (ten) days after the close of each month, send further interim claims specifying the accumulated delay, the extension of time claimed, and such further particulars as the BSCDCL's Engineer may reasonably require; and

(c) the Contractor shall send a final claim within 30 (thirty) days after the effect of the event or the circumstance ceases.

Upon receipt of the claim hereunder, the BSCDCL's Engineer shall examine the same in accordance with the provisions of Clause 10.5.4 within a period of 60 (sixty) days of the receipt thereof.

10.6 Incomplete Works

In the event the Contractor fails to complete the Works in accordance with the Project Completion Schedule, including any Time Extension granted under this Agreement, the Contractor shall endeavour to complete the balance work expeditiously and shall pay Damages to the BSCDCL in accordance with the provisions of Clause 10.3.2 for delay of each day until the Works are completed in accordance with the provisions of this Agreement. Recovery of Damages under this Clause shall be without prejudice to the rights of the BSCDCL under this Agreement including the right to termination under Clause 23.1.

ARTICLE 11

QUALITY ASSURANCE, MONITORING AND SUPERVISION

11.1 Quality of Materials and workmanship

The Contractor shall ensure that the Construction, Materials and workmanship are in accordance w

ith the requirements specified in this Agreement, Specifications and Standards and Good Industry Practice.

11.2 Quality control system

11.2.1 The Contractor shall establish a quality control mechanism to ensure compliance with the provisions of this Agreement (the **"Quality Assurance Plan"** or **"QAP"**).

11.2.2 The Contractor shall, within 30 (thirty) days of the Appointed Date, submit to the BSCDCL's Engineer its Quality Assurance Plan which shall include the following:

(a) organisation, duties and responsibilities, procedures, inspections and documentation;

(b) quality control mechanism including sampling and testing of Materials, test frequencies, standards, acceptance criteria, testing facilities, reporting, recording and interpretation of test results, approvals, check list for site activities, and proforma for testing and calibration in accordance with the Specifications for Road and Bridge Works issued by MORTH, relevant IRC specifications and Good Industry Practice; and

(c) internal quality audit system.

The BSCDCL's Engineer shall convey its comments to the Contractor within a period of 21 (twenty-one) days of receipt of the QAP stating the modifications, if any, required, and the Contractor shall incorporate those in the QAP to the extent required for conforming with the provisions of this Clause 11.2.

11.2.3 The Contractor shall procure all documents, apparatus and instruments, fuel, consumables, water, electricity, labour, Materials, samples, and qualified personnel as are necessary for examining and testing the Project Assets and workmanship in accordance with the Quality Assurance Plan.

11.2.4 The cost of testing of Construction, Materials and workmanship under this Article 11 shall be borne by the Contractor.

11.3. Methodology

The Contractor shall, at least 15 (fifteen) days prior to the commencement of the construction, submit to the BSCDCL's Engineer for review the methodology proposed to be adopted for executing the Works, giving details of equipment to be deployed, traffic management and measures for ensuring safety. The BSCDCL's Engineer shall complete the review and convey its comments to the Contractor within a period of 10 (ten) days from the date of receipt of the proposed methodology from the Contractor.

11.4. Inspection and technical audit by the BSCDCL

The BSCDCL or any representative authorised by the BSCDCL in this behalf may inspect and review the progress and quality of the construction of Project Highway and issue appropriate directions to the BSCDCL's Engineer

and the Contractor for taking remedial action in the event the Works are not in accordance with the provisions of this Agreement.

11.5 External technical audit

At any time during construction, the BSCDCL may appoint an external technical auditor to conduct an audit of the quality of the Works. The findings of the audit, to the extent accepted by the BSCDCL, shall be notified to the Contractor and the BSCDCL's Engineer for taking remedial action in accordance with this Agreement. The Contractor shall provide all assistance as may be required by the auditor in the conduct of its audit hereunder. Notwithstanding anything contained in this Clause 11.5, the external technical audit shall not affect any obligations of the Contractor or the BSCDCL's Engineer under this Agreement.

11.6 Inspection of construction records

The BSCDCL shall have the right to inspect the records of the Contractor relating to the Works.

11.7 Monthly progress reports

During the Construction Period, the Contractor shall, no later than 10 (ten) days after the close of each month, furnish to the BSCDCL and the BSCDCL's Engineer a monthly report on progress of the Works and shall promptly give such other relevant information as may be required by the BSCDCL's Engineer.

11.8 Inspection

11.8.1 The BSCDCL's Engineer and its authorised representative shall at all reasonable times:

(a) have full access to all parts of the Site and to all places from which natural Materials are being obtained for use in the Works; and

(b) during production, manufacture and construction at the Site and at the place of production, be entitled to examine, inspect, measure and test

the Materials and workmanship, and to check the progress of manufacture of Materials.

11.8.2 The Contractor shall give the BSCDCL's Engineer and its authorised agents access, facilities and safety equipment for carrying out their obligations under this Agreement.

11.8.3 The BSCDCL's Engineer shall submit a monthly inspection report (the "**Inspection Report**") to the BSCDCL and the Contractor bringing out the results of inspections and the remedial action taken by the Contractor in respect of Defects or deficiencies. For the avoidance of doubt, such inspection or submission of Inspection Report by the BSCDCL's Engineer shall not relieve or absolve the Contractor of its obligations and liabilities under this Agreement in any manner whatsoever.

11.9 Samples

The Contractor shall submit the following samples of Materials and relevant information to the BSCDCL's Engineer for pre-construction review:

(a) manufacturer's test reports and standard samples of manufactured Materials; and

(b) samples of such other Materials as the BSCDCL's Engineer may require.

11.10 Tests

11.10.1 For determining that the Works conform to the Specifications and Standards, the BSCDCL's Engineer shall require the Contractor to carry out or cause to be carried out tests, at such time and frequency and in such manner as specified in this Agreement, and in accordance with Good Industry Practice for quality assurance. The test checks by the BSCDCL's Engineer shall comprise at least 20 (twenty) percent of the quantity or number of tests prescribed for each category or type of test for quality control by the Contractor.

11.10.2 In the event that results of any tests conducted under this Clause 11.10 establish any Defects or deficiencies in the Works, the Contractor shall carry out remedial measures and furnish a report to the BSCDCL's Engineer in this behalf. The BSCDCL's Engineer shall require the Contractor to carry out or cause to be carried out tests to determine that such remedial measures have brought the Works into compliance with the Specifications and

Standards, and the procedure shall be repeated until such Works conform to the Specifications and Standards. For the avoidance of doubt, the cost of such tests and remedial measures in pursuance thereof shall be solely borne by the Contractor.

11.11 Examination of work before covering up

In respect of the work which the BSCDCL's Engineer is entitled to examine, inspect, measure and/or test before it is covered up or put out of view or any part of the work is placed thereon, the Contractor shall give notice to the BSCDCL's Engineer whenever any such work is ready and before it is covered up. The BSCDCL's Engineer shall then either carry out the examination, inspection or testing without unreasonable delay, or promptly give notice to the Contractor that the BSCDCL's Engineer does not require to do so. Provided, however, that if any work is of a continuous nature where it is not possible or prudent to keep it uncovered or incomplete, the Contractor shall notify the schedule of carrying out such work to give sufficient opportunity, not being less than 3 (three) business days' notice, to the BSCDCL's Engineer to conduct its inspection, measurement or test while the work is continuing. Provided further that in the event the Contractor receives no response from the BSCDCL's Engineer within a period of 3 (three) business days from the date on which the Contractor's notice hereunder is delivered to the BSCDCL's Engineer, the Contractor shall be entitled to assume that the BSCDCL's Engineer would not undertake the said inspection.

11.12 Rejection

If, as a result of an examination, inspection, measurement or testing, any Plant, Materials, design or workmanship is found to be defective or otherwise not in accordance with the provisions of this Agreement, the BSCDCL's Engineer shall reject the Plant, Materials, design or workmanship by giving notice to the Contractor, with reasons. The Contractor shall then promptly make good the Defect and ensure that the rejected item complies with the requirements of this Agreement.

If the BSCDCL's Engineer requires the Plant, Materials, design or workmanship to be retested, the tests shall be repeated under the same terms and conditions, as applicable in each case. If the rejection and retesting cause the BSCDCL to incur any additional costs, such cost shall be recoverable by the BSCDCL from the Contractor; and may be deducted by the BSCDCL from any monies due to be paid to the Contractor.

11.13 Remedial work

11.13.1 Notwithstanding any previous test or certification, the BSCDCL's Engineer may instruct the Contractor to:

(a) remove from the Site and replace any Plant or Materials which are not in accordance with the provisions of this Agreement;

(b) remove and re-execute any work which is not in accordance with the provisions of this Agreement and the Specification and Standards; and

(c) execute any work which is urgently required for the safety of the Project Highway, whether because of an accident, unforeseeable event or otherwise; provided that in case of any work required on account of a Force Majeure Event, the provisions of Clause 21.6 shall apply.

11.13.2 If the Contractor fails to comply with the instructions issued by the BSCDCL's Engineer under Clause 11.13.1, within the time specified in the BSCDCL's Engineer's notice or as mutually agreed, the BSCDCL's Engineer may advise the BSCDCL to have the work executed by another agency. The cost so incurred by the BSCDCL for undertaking such work shall, without prejudice to the rights of the BSCDCL to recover Damages in accordance with the provisions of this Agreement, be recoverable from the Contractor and may be deducted by the BSCDCL from any monies due to be paid to the Contractor.

11.14 Delays during construction

Without prejudice to the provisions of Clause 10.3.2, in the event the Contractor does not achieve any of the Project Milestones or the BSCDCL's Engineer shall have reasonably determined that the rate of progress of Works is such that Completion of the Project Highway is not likely to be achieved by the end of the Scheduled Completion Date, it shall notify the same to the Contractor, and the Contractor shall, within 15 (fifteen) days of such notice, by a communication inform the BSCDCL's Engineer in reasonable detail about the steps it proposes to take to expedite progress and the period within which it shall achieve the Project Completion Date.

11.15 Quality control records and Documents

The Contractor shall hand over to the BSCDCL's Engineer a copy of all its quality control records and documents before the Completion Certificate is issued pursuant to Clause 12.2.

11.16 Video recording

During the Construction Period, the Contractor shall provide to the BSCDCL for every calendar quarter, a video recording, which will be compiled into a 3 (three)-hour compact disc or digital video disc, as the case may be, covering the status and progress of Works in that quarter. The video recording shall be provided to the BSCDCL no later than 15 (fifteen) days after the close of each quarter after the Appointed Date.

11.17 Suspension of unsafe Construction Works

11.17.1 Upon recommendation of the BSCDCL's Engineer to this effect, the BSCDCL may by notice require the Contractor to suspend forthwith the whole or any part of the Works if, in the reasonable opinion of the BSCDCL's Engineer, such work threatens the safety of the Users and pedestrians.

11.17.2 The Contractor shall, pursuant to the notice under Clause 11.17.1, suspend the Works or any part thereof for such time and in such manner as may be specified by the BSCDCL and thereupon carry out remedial measures to secure the safety of suspended works, the Users and pedestrians. The Contractor may by notice require the BSCDCL's Engineer to inspect such remedial measures forthwith and make a report to the BSCDCL recommending whether or not the suspension hereunder may be revoked. Upon receiving the recommendations of the BSCDCL's Engineer, the BSCDCL shall either revoke such suspension or instruct the Contractor to carry out such other and further remedial measures as may be necessary in the reasonable opinion of the BSCDCL, and the procedure set forth in this Clause 11.17 shall be repeated until the suspension hereunder is revoked.

11.17.3 Subject to the provisions of Clause 21.6, all reasonable costs incurred for maintaining and protecting the Works or part thereof during the period of

suspension (the "**Preservation Costs**"), shall be borne by the Contractor; provided that if the suspension has occurred as a result of any breach of this Agreement by the BSCDCL, the Preservation Costs shall be borne by the BSCDCL.

11.17.4 If suspension of Works is for reasons not attributable to the Contractor, the BSCDCL's Engineer shall determine any Time Extension to which the Contractor is reasonably entitled.

ARTICLE 12

COMPLETION CERTIFICATE

12.1 Tests on completion

12.1.1 At least 30 (thirty) days prior to the likely completion of the Project Highway, or a Section thereof, the Contractor shall notify the BSCDCL's Engineer of its intent to subject the Project Highway or a Section thereof, to Tests. The date and time of each of the Tests shall be determined by the BSCDCL's Engineer in consultation with the Contractor, and notified to the BSCDCL who may designate its representative to witness the Tests. The Contractor shall either conduct the Tests as directed by the BSCDCL's Engineer or provide such assistance as the BSCDCL's Engineer may reasonably require for conducting the Tests. In the event of the Contractor and the BSCDCL's Engineer failing to mutually agree on the dates for conducting the Tests, the Contractor shall fix the dates by giving not less than 10 (ten) days notice to the BSCDCL's Engineer.

12.1.2 All Tests shall be conducted in accordance with Schedule-K. The BSCDCL's Engineer shall either conduct or observe, monitor and review the Tests conducted by the Contractor, as the case may be, and review the results of the Tests to determine compliance of the Project Highway or a Section thereof, with Specifications and Standards and if it is reasonably anticipated or determined by the BSCDCL's Engineer during the course of any Test that the performance of the Project Highway or Section or any part thereof, does not meet the Specifications and Standards, it shall have the right to suspend or delay such Test and require the Contractor to remedy and rectify the Defect or deficiencies. Upon completion of each Test, the BSCDCL's Engineer shall provide to the Contractor and the BSCDCL copies of all Test data including detailed Test results. For the avoidance of doubt, it is expressly agreed that the BSCDCL's Engineer may require the Contractor to carry out or cause to be carried out additional Tests, in accordance with Good Industry Practice, for determining the compliance of the Project Highway or Section thereof with the Specifications and Standards.

12.2 Provisional Certificate

12.2.1 Subject to the provisions of Clause 12.2.5, upon completion of all Works forming part of the Project Highway, save and except the Works for which Time Extension has been granted under Clause 10.5, the BSCDCL's Engineer shall, at the request of the Contractor, issue a provisional certificate

of completion substantially in the form set forth in Schedule-L (the "**Provisional Certificate**") if the Tests for and in respect of the completed Works are successful. The Provisional Certificate shall have appended thereto a list of outstanding items of work (the "**Punch List**") that need to be completed in accordance with the provisions of this Agreement. The Contractor undertakes to complete the minor outstanding items of works in respect of those Sections of the Project Highway for which the Provisional Certificate has been issued, within a period of 30 (thirty) days of the date of Provisional Certificate, and those parts of the Works in respect of which Time Extension has been granted, within the extended period thereof. For the avoidance of doubt, the Parties agree that the Punch List shall include all Works for which Time Extension has been granted and shall also include any minor outstanding items of work forming part of the completed Sections if such works do not materially affect the use of the completed Sections for their intended purpose. The Parties further agree that Provisional Certificate shall not be issued if the completed Works can not be safely and reliably placed in service of the Users thereof.

12.2.2 Upon issue of Provisional Certificate, the provisions of Articles 14 and 17 shall apply to the completed parts of the Project Highway and the property and ownership of all such completed Works shall vest in the BSCDCL.

12.2.3 If the BSCDCL's Engineer determines that the Project Highway or any completed part thereof does not conform to the provisions of this Agreement and cannot be safely and reliably placed in operation, it shall forthwith make a report in this behalf and send copies thereof to the BSCDCL and the Contractor and withhold issuance of the Provisional Certificate until the Defects or deficiencies are rectified by the Contractor and Tests are successful in accordance with this Article 12.

12.2.4 Notwithstanding anything to the contrary contained in Clause 12.2.3, the BSCDCL may, at any time after receiving a report from the BSCDCL's Engineer under that Clause, direct the BSCDCL's Engineer to issue a Provisional Certificate under Clause 12.2.1 and such direction shall be complied forthwith.

12.2.5 No Provisional Certificate shall be issued under the provisions of this Clause 12.2 until the Contractor has submitted valid claims for payment of at least 80% (eighty per cent) of the amount arrived at after reducing the lump sum price specified in Clause 19.1.1 by the amount attributable to works which have been withdrawn under the provisions of Clause 8.3.3. For the avoidance of doubt and by way of illustration, the Parties agree that if the Contract Price specified in Clause 19.1.1 is Rs. 105 Cr. (Rs. One Hundred And Five Crore) and the works withdrawn under Clause 8.3.3 have a value of Rs. 5 Cr. (Rs. Five Crore), a Provisional Certificate shall not be issued until valid

claims for payment of an amount of Rs. 80 Cr. (Rs. Eighty Crore) have been submitted by the Contractor in accordance with the provisions of this Agreement. It is further agreed that all price adjustments made in pursuance of Clause 19.10 shall not be reckoned for computation of the claims for payments referred to in this Clause 12.2.5.

12.3 Completion of remaining Works

All items in the Punch List shall be completed by the Contractor in accordance with the provisions of this Agreement. For any delay in their completion other than for the reasons solely attributable to the BSCDCL or due to Force Majeure, the BSCDCL shall be entitled to recover Damages from the Contractor in accordance with the provisions of Clause 10.3.2 of this Agreement.

12.4 Completion Certificate

12.4.1 Upon completion of all Works, including the items specified in the Punch List, and the BSCDCL's Engineer determining the Tests to be successful, it shall forthwith issue to the Contractor and the BSCDCL a certificate substantially in the form set forth in Schedule-L (the "**Completion Certificate**").

12.4.2 Upon receiving the Completion Certificate, the Contractor shall remove its equipment, materials, debris and temporary works from the Site within a period of 30 (thirty) days thereof, failing which the BSCDCL may remove or cause to be removed, such equipment, materials, debris and temporary works and recover from the Contractor an amount equal to 120% (one hundred and twenty per cent) of the actual cost of removal incurred by the BSCDCL.

12.4.3 Without prejudice to the obligations of the Contractor specified in Articles 14 and 17, the property and ownership of all the completed Works forming part of the Project Highway shall vest in the BSCDCL.

12.5 Rescheduling of Tests

If the BSCDCL's Engineer certifies to the BSCDCL and the Contractor that it is unable to issue the Completion Certificate or Provisional Certificate, as the case may be, because of events or circumstances on account of which the Tests could not be held or had to be suspended, the Contractor shall be

entitled to re-schedule the Tests and hold the same as soon as reasonably practicable.

ARTICLE 13

CHANGE OF SCOPE

13.1 Change of Scope

13.1.1 The BSCDCL may, notwithstanding anything to the contrary contained in this Agreement, require the Contractor to make modifications/alterations to the Works ("**Change of Scope**") before the issue of the Completion Certificate either by giving an instruction or by requesting the Contractor to submit a proposal for Change of Scope involving additional cost or reduction in cost. Any such Change of Scope shall be made and valued in accordance with the provisions of this Article 13.

13.1.2 Change of Scope shall mean:

(a) change in specifications of any item of Works;

(b) omission of any work from the Scope of the Project except under Clause 8.3.3; provided that, subject to Clause 13.5, the BSCDCL shall not omit any work under this Clause in order to get it executed by any other BSCDCL; and / or

(c) any additional work, Plant, Materials or services which are not included in the Scope of the Project, including any associated Tests on completion of construction.

13.1.3 If the Contractor determines at any time that a Change of Scope will, if adopted, (i) accelerate completion, (ii) reduce the cost to the BSCDCL of executing, maintaining or operating the Project Highway, (iii) improve the efficiency or value to the BSCDCL of the completed Project Highway, or (iv) otherwise be of benefit to the BSCDCL, it shall prepare a proposal with relevant details at its own cost. The Contractor shall submit such proposal, supported with the relevant details and the amount of reduction in the Contract Price to the BSCDCL to consider such Change of Scope. The BSCDCL shall, within 15 (fifteen) days of receipt of such proposal, either accept such Change of Scope with modifications, if any, and initiate proceedings therefor in accordance with this Article 13 or reject the proposal and inform the Contractor of its decision. For the avoidance of doubt, the Parties agree that the Contractor shall not undertake any Change of Scope without the express consent of the BSCDCL, save and except any Works necessary for meeting any Emergency.

13.2 Procedure for Change of Scope

13.2.1 In the event of the BSCDCL determining that a Change of Scope is necessary, it may direct the BSCDCL's Engineer to issue to the Contractor a notice specifying in reasonable detail the works and services contemplated thereunder (the "**Change of Scope Notice**").

13.2.2 Upon receipt of a Change of Scope Notice, the Contractor shall, with due diligence, provide to the BSCDCL and the BSCDCL's Engineer such information as is necessary, together with preliminary documentation in support of:

(a) the impact, if any, which the Change of Scope is likely to have on the Project Completion Schedule if the works or services are required to be carried out during the Construction Period; and

(b) the options for implementing the proposed Change of Scope and the effect, if any, each such option would have on the costs and time thereof, including the following details:

(i) break down of the quantities, unit rates and cost for different items of work;

(ii) proposed design for the Change of Scope; and

(iii) proposed modifications, if any, to the Project Completion Schedule of the Project Highway.

For the avoidance of doubt, the Parties expressly agree that, subject to the provisions of Clause 13.4.2, the Contract Price shall be increased or decreased, as the case may be, on account of Change of Scope.

13.2.3 The Contractor's quotation of costs for the Change of Scope shall be determined on the following principles:

(a) For works where Schedule of Rates (SOR) of concerned circle of State's Public Works Department are available shall be applicable for determination of costs. In case of non-availability of current SOR, the available Schedule of Rates shall be applied by updating the same based on WPI.

(b) For works not similar in nature to the Works being executed, the cost

of work shall be derived on the basis of MORTH Standard Data Book and the applicable schedule of rates for the relevant circle, as published by the respective State Government, and such rates shall be indexed with reference to the WPI once every year, with the base being the month and year of the publication of the said schedule of rates; provided, however, that for any item not included in the schedule of rates, the prevailing market rates as determined by the BSCDCL's Engineer shall apply, and for any item in respect of which MORTH Standard Data Book does not provide the requisite details, the BSCDCL's Engineer shall determine the rate in accordance with Good Industry Practice.

13.2.4 Upon reaching an agreement, the BSCDCL shall issue an order (the "**Change of Scope Order**") requiring the Contractor to proceed with the performance thereof. In the event that the Parties are unable to agree, the BSCDCL may:

(a) issue a Change of Scope Order requiring the Contractor to proceed with the performance thereof at the rates and conditions approved by the BSCDCL till the matter is resolved in accordance with Article 26; or

(b) proceed in accordance with Clause 13.5.

13.2.5 The provisions of this Agreement, insofar as they relate to Works and Tests, shall apply *mutatis mutandis* to the works undertaken by the Contractor under this Article 13.

13.3 Payment for Change of Scope

Payment for Change of Scope shall be made in accordance with the payment schedule specified in the Change of Scope Order.

13.4 Restrictions on Change of Scope

13.4.1 No Change of Scope shall be executed unless the BSCDCL has issued the Change of Scope Order save and except any Works necessary for meeting any Emergency.

13.4.2 Unless the Parties mutually agree to the contrary, the total value of all Change of Scope Orders shall not exceed 10 (ten) per cent of the Contract Price.

13.4.3 Notwithstanding anything to the contrary in this Article 13, no change made necessary because of any default of the Contractor in the performance of its obligations under this Agreement shall be deemed to be Change of Scope, and shall not result in any adjustment of the Contract Price or the Project Completion Schedule.

13.5 Power of the BSCDCL to undertake works

13.5.1 In the event the Parties are unable to agree to the proposed Change of Scope Orders in accordance with Clause 13.2, the BSCDCL may, after giving notice to the Contractor and considering its reply thereto, award such works or services to any person on the basis of open competitive bidding from amongst bidders who are pre-qualified for undertaking the additional work; provided that the Contractor shall have the option of matching the first ranked bid in terms of the selection criteria, subject to payment of 2% (two per cent) of the bid amount to the BSCDCL[$], and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Contractor shall be entitled to exercise such option only if it has participated in the bidding process and its bid does not exceed the first ranked bid by more than 10% (ten percent) thereof. It is also agreed that the Contractor shall provide assistance and cooperation to the person who undertakes the works or services hereunder, but shall not be responsible for rectification of any Defects and/ or maintenance of works carried out by other agencies.

ARTICLE 14
& 15
DELETED.....

ARTICLE 16

TRAFFIC REGULATION

16.1 Traffic regulation by the Contractor

16.1.1 The Contractor shall take all the required measures and make arrangements for the safety of Users during the construction and maintenance of the Project Highway or a Section thereof in accordance with the provisions of MORTH Specifications. It shall provide, erect and maintain all such barricades, signs, markings, flags, and lights as may be required by Good Industry Practice for the safety of the traffic passing through the Section under construction or maintenance.

16.1.2 All works shall be carried out in a manner creating least interference to traffic passing through the Project Highway or a Section thereof. In stretches where construction or maintenance works on the carriageway are taken up, the Contractor shall ensure that proper passage is provided for the traffic. Where it is not possible or safe to allow traffic on part width of the carriageway, a temporary diversion of proper specifications shall be constructed by the Contractor at its own cost. The Contractor shall take prior approval of the BSCDCL's Engineer for any proposed arrangement for traffic regulation during Construction and Maintenance, which approval shall not be unreasonably withheld.

ARTICLE 17

DEFECTS LIABILITY

17.1 Defects Liability Period

17.1.1 The Contractor shall be responsible for all the Defects and deficiencies, except usual wear and tear in the Project Highway or any Section thereof, till the expiry of a period commencing from the date of Provisional Certificate (the "**Defects Liability Period**"). Provided that the Defects Liability Period shall in no case be less than 36 (THIRTY SIX) months from the date of Completion Certificate for and in respect of works for which Time Extension was granted. Provided further that in the event no Provisional Certificate is issued, the Defects Liability Period shall commence from the date of the Completion Certificate. For the avoidance of doubt, any repairs or restoration on account of usual wear or tear in the Project Highway or any Section thereof shall form a part of the Maintenance obligations of the Contractor as specified.

17.1.2 Deleted.

17.2 Remedying Defects

Save and except as provided in Clause 14.1.2, the Contractor shall repair or rectify all Defects and deficiencies observed by the BSCDCL's Engineer during the Defects Liability Period within a period of 15 (fifteen) days from the date of notice issued by the BSCDCL's Engineer in this behalf, or within such reasonable period as may be determined by the BSCDCL's Engineer at the request of the Contractor, in accordance with Good Industry Practice.

17.3 Cost of remedying Defects

For the avoidance of doubt, any repair or rectification undertaken in accordance with the provisions of Clause 17.2, including any additional testing, shall be carried out by the Contractor at its own risk and cost, to the extent that such rectification or repair is attributable to:

(a) the design of the Project;

(b) Plant, Materials or workmanship not being in accordance with this Agreement and the Specifications and Standards;

(c) improper maintenance during construction of the Project Highway by the Contractor; and/ or

(d) failure by the Contractor to comply with any other obligation under this Agreement.

17.4 Contractor's failure to rectify Defects

In the event that the Contractor fails to repair or rectify such Defect or deficiency within the period specified in Clause 17.2, the BSCDCL shall be entitled to get the same repaired, rectified or remedied at the Contractor's cost so as to make the Project Highway conform to the Specifications and Standards and the provisions of this Agreement. All costs consequent thereon shall, after due consultation with the BSCDCL and the Contractor, be determined by the BSCDCL's Engineer. The cost so determined and an amount equal to twenty percent of the cost as Damages shall be recoverable by the BSCDCL from the Contractor and may be deducted by the BSCDCL from any monies due to the Contractor.

17.5 Contractor to search cause

17.5.1 The BSCDCL's Engineer may instruct the Contractor to examine the cause of any Defect in the Works or part thereof before the expiry of the Defects Liability Period.

17.5.2 In the event any Defect identified under Clause 17.5.1 is attributable to the Contractor, the Contractor shall rectify such Defect within the period specified by the BSCDCL's Engineer, and shall bear the cost of the examination and rectification of such Defect.

17.5.3 In the event such Defect is not attributable to the Contractor, the BSCDCL's Engineer shall, after due consultation with the BSCDCL and the Contractor, determine the costs incurred by the Contractor on such examination and notify the same to the Contractor, with a copy to the BSCDCL, and the Contractor shall be entitled to payment of such costs by the BSCDCL.

17.6. Extension of Defects Liability Period

The Defects Liability Period shall be deemed to be extended till the identified Defects under Clause 17.2 have been remedied.

ARTICLE 18 DELETED.....

ARTICLE 19

PAYMENTS

19.1 Contract Price

19.1.2 The Contract Price includes all duties, taxes, royalty, and fees that may be levied in accordance with the laws and regulations in force as on the Base Date on the Contractor's equipment, Plant, Materials and supplies acquired for the purpose of this Agreement and on the services performed under this Agreement. Nothing in this Agreement shall relieve the Contractor from its responsibility to pay any tax including any tax that may be levied in India on profits made by it in respect of this Agreement.

19.1.3 The Contract Price shall not be adjusted to take account of any unforeseen difficulties or costs, unless otherwise provided for in this Agreement.

19.1.5 Unless otherwise stated in this Agreement, the Contract Price covers all the Contractor's obligations for the Works under this Agreement and all things necessary for the Construction and the remedying of any Defects in the Project Highway.

19.1.6 All payments under this Agreement shall be made in Indian Rupees.

19.2 Advance Payment

19.2.1 The BSCDCL shall make an interest-bearing advance payment (the **"Advance Payment"**), equal in amount to 10 (ten) percent of the Contract Price, for mobilisation expenses and for acquisition of equipment. The Advance Payment shall be made in two instalments each equal to 5% (five percent) of the Contract Price.The advance payment would be deemed as interest bearing advance at an interest rate of 10%(ten) per annum, to be compounded quarterly. The interest would be recovered along with the recovery of advanced Payment.

19.2.2 The Contractor may apply to the BSCDCL for the first instalment of the Advance Payment at any time after the Appointed Date, along with an irrevocable and unconditional guarantee from a Bank for an amount

equivalent to 110% (one hundred and ten per cent) of such instalment, substantially in the form provided at Annex-III of Schedule-G, to remain effective till the complete and full repayment thereof.

19.2.3 Deleted.

19.2.4 At any time, after 60 (sixty) days from the Appointed Date, the Contractor may apply to the BSCDCL for the second instalment of the Advance Payment along with an irrevocable and unconditional guarantee from a Bank for an amount equivalent to 110% (one hundred and ten per cent) of such instalment, substantially in the form provided at Annex-III of Schedule-G, to remain effective till the complete and full repayment thereof.

19.2.5 The first and the second instalments shall be paid by the BSCDCL to the Contractor within 15 (fifteen) days of the receipt of its respective requests in accordance with the provisions of this Clause 19.2.

19.2.6 Deleted.

19.2.7 The advance payment shall be repaid through percentage deductions from the stage payments determined by the BSCDCL's Engineer in accordance with Sub-Clause 19.5, as follows:

(a) deductions shall commence in the next Stage Payment Statement following that in which the total of all certified stage payments (excluding the advance payment and deductions and repayments of retention) exceeds

20% (twenty percent) of the Contract Price; and

(b) deductions shall be made at the rate of 15% (fifteen percent) of each Stage Payment Statement with interest until such time as the advance payment has been repaid; provided that the advance payment shall be completely repaid along with interest prior to the time when 80% (80 percent) of the Contract Price has been certified for payment..

19.2.8 If the Advance Payment has not been fully repaid prior to Termination under Clause 21.7 or Article 23, as the case may be, the whole of the balance then outstanding shall immediately become due and payable by the Contractor to the BSCDCL. Without prejudice to the provisions of Clause 19.2.7, in the event of Termination for Contractor Default, the Advance Payment shall be deemed to carry interest at the rate of 10% (ten per cent) per annum from the date of Advance Payment to the date of recovery by encashment of the Bank Guarantee for the Advance Payment. For the avoidance of doubt, the aforesaid interest shall be payable on each instalment of the Advance Payment, regardless of whether the instalment or any part thereof has been repaid to the BSCDCL prior to Termination.

19.3 Procedure for estimating the payment for the Works

19.4 SCHEDULE OF RATES :

i. The rates quoted by the Contractor shall remain firm till the completion of the work and shall not be subject to escalation. Schedule of rates shall be deemed to include and cover all costs, expenses and liabilities of every description and risks or every kind to be taken in executing, completing and handing over the work to owner by Contractor. The contractor shall be deemed to have known the nature, scope, magnitude and the extent of work and materials required though contract documents may not fully and precisely furnish them. He shall make such provision in the Schedule of Rates as he may consider necessary to cover the cost of such items of work and materials as may be reasonable and necessary to complete the work. The opinion of Engineer-In-Charge as to the item of work which are necessary and reasonable for completion of the work shall be final and binding on Contractor although the same may be not shown on drawings or described specifically in contract documents.

ii. The Schedule of Rates shall be deemed to include and cover the cost of all constructional plant, temporary work, materials, labour and all other matters in connection with each item in Schedule of Rates and the execution of work or any portion thereof finished complete in every respect and maintained as shown or described in the contract document or as may be ordered in writing during the continuance of the contract.

iii. The Schedule of Rates shall be deemed to include and cover the cost of all royalties and fees for the articles and processes, protected by letters patent or otherwise incorporated in or used in connection with work, also all royalties, rents and other payments in connection with obtaining material of whatsoever kind for work and shall include an indemnity to owner which Contractor hereby gives against all action, proceedings, claims, damages, costs and expenses arising from the incorporation in or use on the works of any such articles, processes or materials. Octroi or other Municipal or local Board charges if levied on material, equipment or machineries to be brought to site for use on work shall be borne by the Contractor.

iv. No exemption or reduction of custom duties, excise duties, sales tax or any other taxes or charges of the Central or State Government or of any Local Body whatsoever will be granted or obtained and all such expenses shall be deemed to have been included in and covered by Schedule of Rates. Contractor shall also obtain and pay for all permits or other privileges necessary to complete the work.

v. The Schedule of Rates shall be deemed to include and cover risk on account of delay and interference with Contractor's conduct of work which may occur from any cause including orders of owner in the exercise of his powers and on account of extension of time granted due to various reasons.

vi. For work under unit rate basis, no alteration will be allowed in the Schedule of Rates by reasons of work or any part of them being modified, altered, extended, diminished or omitted.

19.5 PROCEDURE FOR MEASUREMENT OF WORK IN PROGRESS:

i. All measurements shall be in metric system. All the work in progress will be jointly measured by the representative of Engineer-In-Charge and Contractor's authorized agent. Such measurements will be got recorded in the Measurement Book by the Engineer-In-

Charge or his authorized representative and signed by the Contractor or his authorized agent in token of acceptance. If the Contractor or his authorized agent fails to be present whenever required by the Engineer-In-Charge for taking measures for every reasons whatsoever, the measurement will be taken by the Engineer-In-Charge or his authorized representative not withstanding the absence of Contractor and these measurements will be deemed to be correct and binding on the Contractor.

ii. Contractor will submit a bill in approved proforma in quadruplicate to the Engineer-In-Charge of the work giving abstract and detailed measurements of various items executed during a month as mutually agreed. The Engineer-In-Charge shall verify the bill and the claim, as far as admissible, adjusted if possible, within 10 days of presentation of the bills.

19.6 RUNNING ACCOUNT PAYMENTS TO BE REGARDED AS ADVANCES :

i. All running account payments shall be regarded as payments by way of advance against the final payment only and not as payment for work actually done and completed and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or rejected or to be considered as an admission of the due performance of contract or any part thereof.

ii. Five (5) percent of the gross R A Bill amount shall be retained from each bill as retention amount and the same will be paid with the final bill.

19.7 NOTICE FOR CLAIM FOR ADDITIONAL PAYMENT :

If the Contractor considers that he is entitled to extra payment or compensation or any claim whatsoever in respect of work, he shall forthwith give notice in writing to the Engineer-In-Charge about his extra payment and / or compensation. Such notice shall be given to the Engineer-In-Charge within ten (10) days from the happening of any event upon which Contractor basis such claims and such notice shall contain full particulars of the nature of such claim with full details and amount claimed. Failure on the part of the Contractor to put forward any claim with the necessary particulars as above, within the time above specified shall be an absolute waiver thereof. No omission by owner to reject any such claim and no delay in dealing therewith shall waiver by owner or any rights in respect thereof.

19.8 PAYMENT OF CONTRACTOR'S BILL :

i. The price to be paid by the owner to Contractor for the work to be done and for the performance of all the obligations undertaken by the Contractor under contract shall be based on the contract price and payment to be made accordingly for the work actually executed and approved by the Engineer-In-Charge.

ii. No payment shall be made for work costing less than 5% of Contract amount till the work is completed and a certificate of completion given. But in case of work estimated to cost more than 5% of contract amount. Contractor on submitting the bill thereof will be entitled to receive a monthly payment proportionate to the part thereof, approved and passed by Engineer-In-Charge, whose certificate of such approval and passing of the sum so payable shall be final and conclusive against contractor. This payment shall be made after necessary deductions as stipulated elsewhere in the contract documents for materials, security deposit etc. The payment shall be released to the Contractor within two (2) months of submission of the bill duly pre-occupied on proper revenue stamp. Payment due to Contractor shall be made by the owner through ECS mode in Indian currency in the Account of Contractor. Owner shall not be responsible if the Account Number is mislaid or misappropriated by unauthorized persons.

19.20 FINAL BILL :

The final bill shall be submitted by Contractor within one (1) month of the date of physical completion of work, otherwise the Engineer-In-Charge's certificate of the measurement and of total amount payable for work shall be final and binding on all parties.

19.21 RECEIPT FOR PAYMENT :

Receipt for payment made on account of work when executed by a firm must be signed by a person holding Power of Attorney in this respect on behalf of Contractor except when described in the tender as a limited company in which case the receipt must be signed in the name of the Company by one of its principal officers or by some person having authority to give effectual receipt for the Company.

19.22 COMPLETION CERTIFICATE :

i. When the Contractor fulfils his obligation as per terms of contract, he shall be eligible to apply for Completion Certificate. Contractor may apply for separate Completion Certificate in respect of each such portion of work by submitting the completion documents along with such application for Completion Certificate.

ii. The Engineer-In-Charge shall normally issue to Contractor the Completion Certificate within one (1) month after receiving an application thereof from Contractor after verifying, from the completion documents and satisfying himself that work has been completed in accordance with and as set out in the construction and erection drawings and the contract documents. Contractor after obtaining the Completion Certificate is eligible to present the final bill for work executed by him under the terms of contract.

iii. Within one month of completion of work in all respects Contractor shall be furnished with a certificate by the Engineer-In-Charge of such completion but no certificate shall be given nor shall work be deemed to have been executed until all (i) scaffolding, surplus materials and rubbish is cleaned off site completely, (ii) until work shall have been measured by the Engineer-In-Charge whose measurement shall be binding and conclusive and, (iii) until all the temporary works, labour and staff colonies etc. constructed are removed and the work site cleaned to the satisfaction of the Engineer-In-Charge. If Contractor shall fail to comply with the requirements as aforesaid or before date fixed for the completion of work, the Engineer-In-Charge may at the expense of Contractor remove such scaffolding, surplus materials and rubbish and dispose off the same as he thinks fit.

iv. The following documents will form the completion documents:-

a) Technical documents according to which the work has been carried out.
b) Three sets of construction drawings showing therein the modifications and corrections made during the course of execution signed by the Engineer-In-Charge.
c) Completion Certificate for "Embedded" or "Covered" up work.
d) Certificate of final levels as set out for various works.
e) Certificate of test performed for various work.
f) Material appropriation statement for the materials issued by owner for work and list of surplus materials returned to owner's store duly supported by necessary documents.
g) Operation and maintenance manual (if necessary).

v. Upon expiry of the period of defect liability and subject to Engineer-In-Charge being satisfied that work has been duly maintained by Contractor during the defect liability period of fixed originally or as extended subsequently and that Contractor has in all respects made up any subsidence and performed all his obligations under contract, the Engineer-In-Charge (without prejudice to the rights of owner in any way) give final certificate to that effect. The Contractor shall not be considered to have fulfilled the whole of his obligation until final certificate shall have been given by the Engineer-In-Charge.

vi. **Final Certificate only evidence of completion:** Except the final certificate, no other certificate of payment against a certificate or on general account shall be taken to be an admission by owner of the due performance of contract or any part thereof of occupancy or validity or any claim by the Contractor.

19.23 TAXES, DUTIES, OCTROI ETC. :

i. Contractor agrees to and does hereby accept full and exclusive liability for the payment of any and all taxes including Sales Tax, GST, Duties, Octroi etc., now or hereinafter imposed, increased or modified from time to time in respect of work and materials and all contributions and taxes for unemployment, compensation, insurance and old age pension or annuities now or hereinafter imposed by the Central or State Government authorities with respect to or covered by the wages, salaries or other compensation paid to the persons employed by Contractor. If the Contractor is not liable to Sales Tax assessment, VAT, a certificate to that effect from the Competent Authority shall be produced without which final payment to the Contractor shall not be made No.IP, 'C' and 'D' Form shall be supplied by the owner, and the Contractor shall be required to pay full tax as applicable.

ii. Contractor shall be responsible for compliance with all obligations and restrictions imposed by the labour law or any other law affecting employer-employee relationship.

iii. Contractor further agrees to comply and to secure the compliance of all sub contractors with applicable Central, State, Municipal and local laws and regulations and requirement. Contractor also agrees to defend, indemnify the hold harmless the owner from any liability or penalty which may be imposed by Central, State or local authority by reasons of any violation by Contractor or sub Contractor of such laws, regulations or requirements and also from all claims, suits or proceedings that may be brought against owner arising under, growing out of or by reasons or work provided for by this Contract by third parties or by Central or State Government authority or any administrative Sub-Division thereof.

iv. The Sales Tax on work contract will be borne by Contractor.

ARTICLE 20

INSURANCE

20.1 Insurance for Works and Maintenance

20.1.1 The Contractor shall effect and maintain at its own cost the insurances specified in Schedule-P and as per the requirements under the Applicable Laws.

20.1.2 Subject to the provisions of Clause 21.6, the BSCDCL and the Contractor shall, in accordance with its obligations as provided for in this Agreement, be liable to bear the cost of any loss or damage that does not fall within the scope of this Article 20 or cannot be recovered from the insurers.

20.1.3 Subject to the exceptions specified in Clause 20.1.4 below, the Contractor shall, save and except as provided for in this Agreement, fully indemnify, hold harmless and defend the BSCDCL from and against any and all losses, damages, costs, charges and/or claims with respect to:

(a) the death of or injury to any person; or

(b) the loss of or damage to any property (other than the Works);

that may arise out of or in consequence of any breach by the Contractor of this Agreement during the execution of the Works or the remedying of any Defects therein.

20.1.4 Notwithstanding anything stated above in Clause 20.1.3, the BSCDCL shall fully indemnify the Contractor from and against any and all losses, damages, costs, charges, proceedings and/or claims arising out of or with respect to

(a) the use or occupation of land or any part thereof by the BSCDCL;

(b) the right of the BSCDCL to execute the Works, or any part thereof, on, over, under, in or through any land;

(c) the damage to property which is the unavoidable result of the execution and completion of the Works, or the remedying of any Defects therein, in accordance with this Agreement; and

(d) the death of or injury to persons or loss of or damage to property resulting from any act or neglect of the BSCDCL, its agents, servants or other contractors, not being employed by the Contractor.

Provided that, in the event of any injury or damage as a result of the contributory negligence of the Contractor, the BSCDCL shall be liable to indemnify the Contractor from and against any and all losses, damages, costs, charges, proceedings and/or claims to the extent as may be proportionately determined to be the liability of the BSCDCL, its servants or agents or other contractors not associated with the Contractor in such injury or damage.

20.1.5 Without prejudice to the obligations of the Parties as specified under Clauses

20.1.3 and 20.1.4, the Contractor shall maintain or effect such third party insurances as may be required under the Applicable Laws.

20.1.6 The Contractor shall provide to the BSCDCL, within 30 days of the Appointed Date, evidence of professional liability insurance maintained by its Design Director and/or consultants to cover the risk of professional negligence in the design of Works. The professional liability coverage shall be for a sum of not less than 3% (three per cent) of the Contract Price and shall be maintained until the end of the Defects Liability Period.

20.2 Notice to the BSCDCL

` No later than 15 (fifteen) days after the date of this Agreement, the Contractor shall by notice furnish to the BSCDCL, in reasonable detail, information in respect of the insurances that it proposes to effect and maintain in accordance with this Article 20. Within 15 (fifteen) days of

receipt of such notice, the BSCDCL may require the Contractor to effect and maintain such other insurances as may be necessary pursuant hereto, and in the event of any difference or disagreement relating to any such insurance, the Dispute Resolution Procedure shall apply.

20.3 Evidence of Insurance Cover

20.3.1 All insurances obtained by the Contractor in accordance with this Article 20 shall be maintained with insurers on terms consistent with Good Industry Practice. Within 10 (ten) days from the Appointed Date, the Contractor shall furnish to the BSCDCL notarised true copies of the certificate(s) of insurance, copies of insurance policies and premia payment receipts in respect of such insurance, and no such insurance shall be cancelled, modified, or allowed to expire or lapse until the expiration of at least 45 (forty-five) days after notice of such proposed cancellation, modification or non-renewal has been delivered by the Contractor to the BSCDCL. The Contractor shall act in accordance with the directions of the BSCDCL. Provided that the Contractor shall produce to the BSCDCL the insurance policies in force and the receipts for payment of the current premia.

20.3.2 The Contractor shall ensure the adequacy of the insurances at all times in accordance with the provisions of this Agreement.

20.4 Remedy for failure to insure

If the Contractor shall fail to effect and keep in force all insurances for which it is responsible pursuant hereto, the BSCDCL shall have the option to either keep in force any such insurances, and pay such premia and recover the costs thereof from the Contractor, or in the event of computation of a Termination Payment, treat an amount equal to the Insurance Cover as deemed to have been received by the Contractor.

20.5 Waiver of subrogation

All insurance policies in respect of the insurance obtained by the Contractor

pursuant to this Article 20 shall include a waiver of any and all rights of subrogation or recovery of the insurers thereunder against, inter alia, the BSCDCL, and its assigns, successors, undertakings and their subsidiaries, Affiliates, employees, insurers and underwriters, and of any right of the insurers to any set-off or counterclaim or any other deduction, whether by attachment or otherwise, in respect of any liability of any such person insured under any such policy or in any way connected with any loss, liability or obligation covered by such policies of insurance.

20.6 Contractor's waiver

The Contractor hereby further releases, assigns and waives any and all rights of subrogation or recovery against, inter alia, the BSCDCL and its assigns, undertakings and their subsidiaries, Affiliates, employees, successors, insurers and underwriters, which the Contractor may otherwise have or acquire in or from or in any way connected with any loss, liability or obligation covered by policies of insurance maintained or required to be maintained by the Contractor pursuant to this Agreement (other than third party liability insurance policies) or because of deductible clauses in or inadequacy of limits of any such policies of insurance.

20.7 Cross liabilities

Any such insurance maintained or effected in pursuance of this Article 20 shall include a cross liability clause such that the insurance shall apply to the Contractor and to the BSCDCL as separately insured.

20.8 Accident or injury to workmen

Notwithstanding anything stated in this Agreement, it is hereby expressly agreed between the Parties that the BSCDCL shall not be liable for or in respect of any damages or compensation payable to any workman or other person in the employment of the Contractor or Sub-contractor, save and except as for death or injury resulting from any act, omission or default of the BSCDCL, its agents or servants. The Contractor shall indemnify and keep indemnified the BSCDCL from and against all such claims, proceedings, damages, costs, charges, and expenses whatsoever in respect of the above save and except for those acts, omissions or defaults for which the BSCDCL shall be liable.

20.9 Insurance against accident to workmen

The Contractor shall effect and maintain during the Agreement such insurances as may be required to insure the Contractor's personnel and any other persons employed by it on the Project Highway from and against any liability incurred in pursuance of this Article 20. Provided that for the purposes of this Clause 20.9, the Contractor's personnel/any person employed by the Contractor shall include the Sub-contractor and its personnel. It is further provided that, in respect of any persons employed by any Sub-contractor, the Contractor's obligations to insure as aforesaid under this Clause 20.9 shall be discharged if the Sub-contractor shall have insured against any liability in respect of such persons in such manner that the

BSCDCL is indemnified under the policy. The Contractor shall require such Sub-contractor to produce before the BSCDCL, when required, such policy of insurance and the receipt for payment of the current premium within 10 (ten) days of such demand being made by the BSCDCL.

20.10 Application of insurance proceeds

The proceeds from all insurance claims, except for life and injury, shall be applied for any necessary repair, reconstruction, reinstatement, replacement, improvement, delivery or installation of the Project Highway and the provisions of this Agreement in respect of construction of works shall apply *mutatis mutandis* to the works undertaken out of the proceeds of insurance.

20.11 Compliance with policy conditions

Each Party hereby expressly agrees to fully indemnify the other Party from and against all losses and claims arising from its failure to comply with conditions imposed by the insurance policies effected in accordance with this Agreement.

Force Majeure and Termination

ARTICLE 21

FORCE MAJEURE

21.1 Force Majeure

As used in this Agreement, the expression "Force Majeure" or "Force Majeure Event" shall mean occurrence in India of any or all of Non-Political Event, Indirect Political Event and Political Event, as defined in Clauses 21.2, 21.3 and 21.4 respectively, if it affects the performance by the Party claiming the benefit of Force Majeure (the "**Affected Party**") of its obligations under this Agreement and which act or event (i) is beyond the reasonable control of the Affected Party, and (ii) the Affected Party could not have prevented or overcome by exercise of due diligence and following Good Industry Practice, and (iii) has Material Adverse Effect on the Affected Party.

21.2 Non-Political Event

A Non-Political Event shall mean one or more of the following acts or events:

(a) act of God, epidemic, extremely adverse weather conditions, lightning, earthquake, landslide, cyclone, flood, volcanic eruption, chemical or radioactive contamination or ionising radiation, fire or explosion (to the extent of contamination or radiation or fire or explosion originating from a source external to the Site);

(b) strikes or boycotts (other than those involving the Contractor, Sub-contractors or their respective employees/representatives, or attributable to any act or omission of any of them) interrupting

supplies and services to the Project Highway for a continuous period of 24 (twenty-four) hours and an aggregate period exceeding 10 (ten) days in an Accounting Year, and not being an Indirect Political Event set forth in Clause 21.3;

(c) any failure or delay of a Sub-contractor but only to the extent caused by another Non-Political Event;

(d) any judgement or order of any court of competent jurisdiction or statutory BSCDCL made against the Contractor in any proceedings for reasons other than (i) failure of the Contractor to comply with any Applicable Law or Applicable Permit, or (ii) on account of breach of any Applicable Law or Applicable Permit or of any contract, or (iii) enforcement of this Agreement, or (iv) exercise of any of its rights under this Agreement by the BSCDCL;

(e) the discovery of geological conditions, toxic contamination or archaeological remains on the Site that could not reasonably have been expected to be discovered through a site inspection; or

(f) any event or circumstances of a nature analogous to any of the foregoing.

21.3 Indirect Political Event

An Indirect Political Event shall mean one or more of the following acts or events:

(a) an act of war (whether declared or undeclared), invasion, armed conflict or act of foreign enemy, blockade, embargo, riot, insurrection, terrorist or military action, civil commotion or politically motivated sabotage;

(b) industry-wide or State-wide strikes or industrial action for a continuous period of 24 (twenty-four) hours and exceeding an aggregate period of 10 (ten) days in an Accounting Year;

(c) any civil commotion, boycott or political agitation which prevents construction of the Project Highway by the Contractor for an aggregate period exceeding 10 (ten) days in an Accounting Year;

(d) any failure or delay of a Sub-contractor to the extent caused by any Indirect Political Event;

(e) any Indirect Political Event that causes a Non-Political Event; or

(f) any event or circumstances of a nature analogous to any of the foregoing.

21.4 Political Event

A Political Event shall mean one or more of the following acts or events by or on account of any Government Instrumentality:

(a) Change in Law, only if consequences thereof cannot be dealt with under and in accordance with the provisions of Clause 19.17;

(b) compulsory acquisition in national interest or expropriation of any Project Assets or rights of the Contractor or of the Sub-Contractors;

(c) unlawful or unauthorised or without jurisdiction revocation of, or refusal to renew or grant without valid cause, any clearance, licence, permit, authorisation, no objection certificate, consent, approval or exemption required by the Contractor or any of the Sub-contractors to perform their respective obligations under this Agreement; provided that such delay, modification, denial, refusal or revocation did not result from the Contractor's or any Sub-contractor's inability or failure to comply with any condition relating to grant, maintenance or renewal of such clearance, licence, authorisation, no objection certificate, exemption, consent, approval or permit;

(d) any failure or delay of a Sub-contractor but only to the extent caused by another Political Event; or

(e) any event or circumstances of a nature analogous to any of the foregoing.

21.5 Duty to report Force Majeure Event

21.5.1 Upon occurrence of a Force Majeure Event, the Affected Party shall by notice report such occurrence to the other Party forthwith. Any notice pursuant hereto shall include full particulars of:

(a) the nature and extent of each Force Majeure Event which is the subject of any claim for relief under this Article 21 with evidence in support thereof;

(b) the estimated duration and the effect or probable effect which such Force Majeure Event is having or will have on the Affected Party's performance of its obligations under this Agreement;

(c) the measures which the Affected Party is taking or proposes to take for alleviating the impact of such Force Majeure Event; and

(d) any other information relevant to the Affected Party's claim.

21.5.2 The Affected Party shall not be entitled to any relief for or in respect of a Force Majeure Event unless it shall have notified the other Party of the occurrence of the Force Majeure Event as soon as reasonably practicable, and in any event no later than 10 (ten) days after the Affected Party knew, or ought reasonably to have known, of its occurrence, and shall have given particulars of the probable material effect that the Force Majeure Event is likely to have on the performance of its obligations under this Agreement.

21.5.3 For so long as the Affected Party continues to claim to be materially affected by such Force Majeure Event, it shall provide the other Party with regular (and not less than weekly) reports containing information as required by Clause 21.5.1, and such other information as the other Party may reasonably request the Affected Party to provide.

21.6 Effect of Force Majeure Event on the Agreement

21.6.1 Upon the occurrence of any Force Majeure after the Appointed Date, the costs incurred and attributable to such event and directly relating to this Agreement (the "**Force Majeure costs**") shall be allocated and paid as follows:

(a) upon occurrence of a Non-Political Event, the Parties shall bear their respective Force Majeure costs and neither Party shall be required to pay to the other Party any costs thereof;

(b) upon occurrence of an Indirect Political Event, all Force Majeure costs attributable to such Indirect Political Event, and not exceeding the Insurance Cover for such Indirect Political Event, shall be borne by the Contractor, and to the extent Force Majeure costs exceed such Insurance Cover, one half of such excess amount shall be reimbursed by the BSCDCL to the Contractor for the Force Majeure events; and

(c) upon occurrence of a Political Event, all Force Majeure costs attributable to such Political Event shall be reimbursed by the BSCDCL to the Contractor.

For the avoidance of doubt, Force Majeure costs may include costs directly attributable to the Force Majeure Event, but shall not include debt repayment obligations, if any, of the Contractor.

21.6.2 Save and except as expressly provided in this Article 21, neither Party shall be liable in any manner whatsoever to the other Party in respect of any loss, damage, cost, expense, claims, demands and proceedings relating to or arising out of occurrence or existence of any Force Majeure Event or exercise of any right pursuant hereto.

21.6.3 Upon the occurrence of any Force Majeure Event during the Construction Period, the Project Completion Schedule for and in respect of the affected Works shall be extended on a day for day basis for such period as performance of the Contractor's obligations is affected on account of the Force Majeure Event or its subsisting effects.

21.7 Termination Notice for Force Majeure Event

21.7.1 If a Force Majeure Event subsists for a period of 60 (sixty) days or more within a continuous period of 120 (one hundred and twenty) days, either Party may in its discretion terminate this Agreement by issuing a Termination Notice to the other Party without being liable in any manner

whatsoever, save as provided in this Article 21, and upon issue of such Termination Notice, this Agreement shall, notwithstanding anything to the contrary contained herein, stand terminated forthwith; provided that before issuing such Termination Notice, the Party intending to issue the Termination Notice shall inform the other Party of such intention and grant 15 (fifteen) days time to make a representation, and may after the expiry of such 15 (fifteen) days period, whether or not it is in receipt of such representation, in its sole discretion issue the Termination Notice.

21.8 Termination Payment for Force Majeure Event

21.8.1 In the event of this Agreement being terminated on account of a Non-Political Event, the Termination Payment shall be an amount equal to the sum payable under Clause 23.5.

Provided that in the event Termination occurs during the Maintenance Period, the BSCDCL's Engineer shall only determine the value of Works associated with Maintenance.

21.8.2 If Termination is on account of an Indirect Political Event, the Termination Payment shall include:

(a) any sums due and payable under Clause 23.5; and

(b) the reasonable cost, as determined by the BSCDCL's Engineer, of the Plant and Materials procured by the Contractor and transferred to the BSCDCL for use in Construction or Maintenance, only if such Plant and Materials are in conformity with the Specifications and Standards;

Provided that in the event Termination occurs during the Maintenance Period, the BSCDCL's Engineer shall only determine the value of Works associated with Maintenance.

21.8.3 If Termination is on account of a Political Event, the BSCDCL shall make a Termination Payment to the Contractor in an amount that would be payable under Clause 23.6.2 as if it were an BSCDCL Default.

21.9 Dispute resolution

In the event that the Parties are unable to agree in good faith about the occurrence or existence of a Force Majeure Event, such Dispute shall be finally settled in accordance with the Dispute Resolution Procedure; provided that the burden of proof as to the occurrence or existence of such Force Majeure Event shall be upon the Party claiming relief and/or excuse on account of such Force Majeure Event.

21.10 Excuse from performance of obligations

If the Affected Party is rendered wholly or partially unable to perform its obligations under this Agreement because of a Force Majeure Event, it shall be excused from performance of such of its obligations to the extent it is unable to perform on account of such Force Majeure Event; provided that:

(a) the suspension of performance shall be of no greater scope and of no longer duration than is reasonably required by the Force Majeure Event;

(b) the Affected Party shall make all reasonable efforts to mitigate or limit damage to the other Party arising out of or as a result of the existence or occurrence of such Force Majeure Event and to cure the same with due diligence; and

(c) when the Affected Party is able to resume performance of its obligations under this Agreement, it shall give to the other Party notice to that effect and shall promptly resume performance of its obligations hereunder.

ARTICLE 22

SUSPENSION OF CONTRACTOR'S RIGHTS

22.1 Suspension upon Contractor Default

Upon occurrence of a Contractor Default, the BSCDCL shall be entitled, without prejudice to its other rights and remedies under this Agreement including its rights of Termination hereunder, to (i) suspend carrying out of the Works or Maintenance or any part thereof, and (ii) carry out such Works or Maintenance itself or authorise any other person to exercise or perform the same on its behalf during such suspension (the "**Suspension**"). Suspension hereunder shall be effective forthwith upon issue of notice by the BSCDCL to the Contractor and may extend up to a period not exceeding 90 (ninety) days from the date of issue of such notice.

22.2 BSCDCL to act on behalf of Contractor

During the period of Suspension hereunder, all rights and liabilities vested in the Contractor in accordance with the provisions of this Agreement shall continue to vest therein and all things done or actions taken, including expenditure incurred by the BSCDCL for discharging the obligations of the Contractor under and in accordance with this Agreement shall be deemed to have been done or taken for and on behalf of the Contractor and the Contractor undertakes to indemnify the BSCDCL for all costs incurred during such period. The Contractor hereby licences and sub-licences respectively, the BSCDCL or any other person authorised by it under Clause

22.1 to use during Suspension, all Intellectual Property belonging to or

licenced to the Contractor with respect to the Project Highway and its design, engineering, construction and maintenance, and which is used or created by the Contractor in performing its obligations under the Agreement.

22.3 Revocation of Suspension

22.3.1 In the event that the BSCDCL shall have rectified or removed the cause of Suspension within a period not exceeding 60 (sixty) days from the date of Suspension, it shall revoke the Suspension forthwith and restore all rights of the Contractor under this Agreement. For the avoidance of doubt, the Parties expressly agree that the BSCDCL may, in its discretion, revoke the

Suspension at any time, whether or not the cause of Suspension has been rectified or removed hereunder.

22.3.2 Upon the Contractor having cured the Contractor Default within a period not exceeding 60 (sixty) days from the date of Suspension, the BSCDCL shall revoke the Suspension forthwith and restore all rights of the Contractor under this Agreement.

22.4 Termination

22.4.1 At any time during the period of Suspension under this Article 22, the Contractor may by notice require the BSCDCL to revoke the Suspension and issue a Termination Notice. The BSCDCL shall, within 15 (fifteen) days ofreceipt of such notice, terminate this Agreement under and in accordance with Article 23.

22.4.2 Notwithstanding anything to the contrary contained in this Agreement, in the event that Suspension is not revoked within 90 (ninety) days from the date of Suspension hereunder, the Agreement shall, upon expiry of the aforesaid period, be deemed to have been terminated by mutual agreement of the Parties and all the provisions of this Agreement shall apply, *mutatis mutandis*, to such Termination as if a Termination Notice had been issued by the BSCDCL upon occurrence of a Contractor Default.

ARTICLE 23

TERMINATION

23.1 Termination for Contractor Default

23.1.1 Save as otherwise provided in this Agreement, in the event that any of the defaults specified below shall have occurred, and the Contractor fails to cure the default within the Cure Period set forth below, or where no Cure Period is specified, then within a Cure Period of 60 (sixty) days, the Contractor shall be deemed to be in default of this Agreement (the "**Contractor Default**"), unless the default has occurred solely as a result of any breach of this Agreement by the BSCDCL or due to Force Majeure. The defaults referred to herein shall include:

(a) the Contractor fails to provide, extend or replenish, as the case may be, the Performance Security in accordance with this Agreement;

(b) subsequent to the replenishment or furnishing of fresh Performance Security in accordance with Clause 7.3, the Contractor fails to cure, within a Cure Period of 30 (thirty) days, the Contractor Default for which the whole or part of the Performance Security was appropriated;

(c) the Contractor does not achieve the latest outstanding Project Milestone due in accordance with the provisions of Schedule-J, subject to any Time Extension, and continues to be in default for 45 (forty five) days;

(d) the Contractor abandons or manifests intention to abandon the construction or Maintenance of the Project Highway without the prior written consent of the BSCDCL;

(e) the Contractor fails to proceed with the Works in accordance with the provisions of Clause 10.1 or stops Works and/or the Maintenance for

30 (thirty) days without reflecting the same in the current programme and such stoppage has not been authorised by the BSCDCL's Engineer;

(f) the Project Completion Date does not occur within the period specified in Schedule-J for the Scheduled Completion Date, or any extension thereof;

(g) failure to complete the Punch List items within the periods stipulated therefor in Clause 12.2.1;

(h) the Contractor fails to rectify any Defect, the non rectification of which shall have a Material Adverse Effect on the Project, within the time specified in this Agreement or as directed by the BSCDCL's Engineer;

(i) the Contractor subcontracts the Works or any part thereof in violation of this Agreement or assigns any part of the Works or the Maintenance without the prior approval of the BSCDCL;

(j) the Contractor creates any Encumbrance in breach of this Agreement;

(k) an execution levied on any of the assets of the Contractor has caused a Material Adverse Effect ;

(l) the Contractor is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Contractor or for the whole or material part of its assets that has a material bearing on the Project;

(m) the Contractor has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of the BSCDCL, a Material Adverse Effect;

(n) a resolution for winding up of the Contractor is passed, or any petition for winding up of the Contractor is admitted by a court of competent jurisdiction and a provisional liquidator or receiver is appointed and such order has not been set aside within 90 (ninety) days of the date thereof or the Contractor is ordered to be wound up by court except for the purpose of amalgamation or reconstruction; provided that, as part of such amalgamation or reconstruction, the entire property, assets and undertaking of the Contractor are

transferred to the amalgamated or reconstructed entity and that the amalgamated or reconstructed entity has unconditionally assumed the obligations of the Contractor under this Agreement; and provided that:

(i) the amalgamated or reconstructed entity has the capability and experience necessary for the performance of its obligations under this Agreement; and

(ii) the amalgamated or reconstructed entity has the financial standing to perform its obligations under this Agreement and has a credit worthiness at least as good as that of the Contractor as at the Appointed Date;

(o) any representation or warranty of the Contractor herein contained which is, as of the date hereof, found to be materially false or the Contractor is at any time hereafter found to be in breach thereof;

(p) the Contractor submits to the BSCDCL any statement, notice or other document, in written or electronic form, which has a material effect on the BSCDCL's rights, obligations or interests and which is false in material particulars;

(q) the Contractor has failed to fulfil any obligation, for which failure Termination has been specified in this Agreement; or

(r) the Contractor commits a default in complying with any other provision of this Agreement if such a default causes a Material Adverse Effect on the Project or on the BSCDCL.

23.1.2 Without prejudice to any other rights or remedies which the BSCDCL may have under this Agreement, upon occurrence of a Contractor Default, the BSCDCL shall be entitled to terminate this Agreement by issuing a Termination Notice to the Contractor; provided that before issuing the Termination Notice, the BSCDCL shall by a notice inform the Contractor of its intention to issue such Termination Notice and grant 15 (fifteen) days to the Contractor to make a representation, and may after the expiry of such 15 (fifteen) days, whether or not it is in receipt of such representation, issue the Termination Notice.

23.1.3 After termination of this Agreement for Contractor Default, the BSCDCL may complete the Works and/or arrange for any other entities to do so. The

BSCDCL and these entities may then use any Materials, Plant and equipment, Contractor's documents and other design documents made by or on behalf of the Contractor.**23.2 Termination for BSCDCL Default**23.2.1 In the event that any of the defaults specified below shall have occurred, and the BSCDCL fails to cure such default within a Cure Period of

90 (ninety) days or such longer period as has been expressly provided in this

Agreement, the BSCDCL shall be deemed to be in default of this Agreement (the "BSCDCL Default") unless the default has occurred as a result of any breach of this Agreement by the Contractor or due to Force Majeure. The defaults referred to herein shall include:(a) the BSCDCL commits a material default in complying with any of the provisions of this Agreement and such default has a Material Adverse Effect on the Contractor;(b) the BSCDCL has failed to make payment of any amount due and

payable to the Contractor within the period specified in this Agreement;

(c) the BSCDCL has failed to provide, within a period of 180 (one hundred and eighty) days from the Appointed Date, the environmental clearances required for construction of the Project Highway;

(d) the BSCDCL repudiates this Agreement or otherwise takes any action that amounts to or manifests an irrevocable intention not to be bound by this Agreement; or

(e) the BSCDCL's Engineer fails to issue the relevant Interim Payment Certificate within 60 (sixty) days after receiving a statement and supporting documents.

23.2.2 Without prejudice to any other right or remedy which the Contractor may have under this Agreement, upon occurrence of an BSCDCL Default, the Contractor shall be entitled to terminate this Agreement by issuing a Termination Notice to the BSCDCL; provided that before issuing the Termination Notice, the Contractor shall by a notice inform the BSCDCL of its intention to issue the Termination Notice and grant 15 (fifteen) days to the BSCDCL to make a representation, and may after the expiry of such 15 (fifteen) days, whether or not it is in receipt of such representation, issue the Termination Notice.

If on the consideration of the BSCDCL's representation or otherwise, the contractor does not issue the Termination Notice on such 15th day and prefers to continue with the project, it is deemed that the cause of action of the

Termination Notice has been condoned by the Contractor. Hence he forfeits his right to any other remedy on that count.

23.3 Termination for BSCDCL's convenience

Notwithstanding anything stated hereinabove, the BSCDCL may terminate this Agreement for convenience. The termination shall take effect 30 (thirty) days from the date of notice hereunder.

23.4 Requirements after Termination

Upon Termination of this Agreement in accordance with the terms of this Article 23, the Contractor shall comply with and conform to the following:

(a) deliver to the BSCDCL all Plant and Materials which shall have become the property of the BSCDCL under this Article 23;

(b) deliver all relevant records, reports, Intellectual Property and other licences pertaining to the Works, Maintenance, other design documents and in case of Termination occurring after the Provisional Certificate has been issued, the "as built' Drawings for the Works;

(c) transfer and/or deliver all Applicable Permits to the extent permissible under Applicable Laws; and

(d) vacate the Site within 15 (fifteen) days.

23.5 Valuation of Unpaid Works

23.5.1 Within a period of 45 (forty-five) days after Termination under Clause 23.1, 23.2 or 23.3, as the case may be, has taken effect, the BSCDCL's Engineer shall proceed in accordance with Clause 18.5 to determine as follows the valuation of unpaid Works (the "**Valuation of Unpaid Works**"):

(a) value of the completed stage of the Works, less payments already made;

(b) reasonable value of the partially completed stages of works as on the date of Termination, only if such works conform with the Specifications and Standards; and

(c) value of Maintenance, if any, for completed months, less payments already made,

and shall adjust from the sum thereof (i) any other amounts payable or recoverable, as the case may be, in accordance with the provisions of this Agreement; and (ii) all taxes due to be deducted at source.

23.5.2 The Valuation of Unpaid Works shall be communicated to the BSCDCL, with a copy to the Contractor, within a period of 30 (thirty) days from the date of Termination.

23.6 Termination Payment

23.6.1 Upon Termination on account of Contractor's Default under Clause 23.1, the BSCDCL shall:

(a) encash and appropriate the Performance Security and Retention Money, or in the event the Contractor has failed to replenish or extend the Performance Security, claim the amount stipulated in Clause 7.1.1, as agreed pre-determined compensation to the BSCDCL for any losses, delays and cost of completing the Works and Maintenance, if any;

(b) encash and appropriate the bank guarantee, if any, for and in respect of the outstanding Advance Payment and interest thereon; and

(c) pay to the Contractor, by way of Termination Payment, an amount equivalent to the Valuation of Unpaid Works after adjusting any other sums payable or recoverable, as the case may be, in accordance with the provisions of this Agreement.

23.6.2 Upon Termination on account of an BSCDCL Default under Clause 23.2 or for BSCDCL's convenience under Clause 23.3, the BSCDCL shall:

(a) return the Performance Security and Retention Money forthwith;

(b) encash and appropriate the bank guarantee, if any, for and in respect of the outstanding Advance Payment; and

(c) pay to the Contractor, by way of Termination Payment, an amount equal to:

(i) Valuation of Unpaid Works;

(ii) the reasonable cost, as determined by the BSCDCL's Engineer, of the Plant and Materials procured by the Contractor and transferred to the BSCDCL for its use, only if such Plant and Materials are in conformity with the Specifications and Standards;

(iii) the reasonable cost of temporary works, as determined by the BSCDCL's Engineer; and

(iv) 10% (ten per cent) of the cost of the Works and Maintenance that are not commenced or not completed,

and shall adjust from the sum thereof (i) any other amounts payable or recoverable, as the case may be, in accordance with the provisions of this Agreement, and (ii) all taxes due to be deducted at source.

23.6.3 Termination Payment shall become due and payable to the Contractor within 30 (thirty) days of a demand being made by the Contractor to the BSCDCL with the necessary particulars, and in the event of any delay, the BSCDCL shall pay interest at the Base Rate plus 2% (two percent), calculated at quarterly rests, on the amount of Termination Payment remaining unpaid; provided that such delay shall not exceed 90 (ninety) days. For the avoidance of doubt, it is expressly agreed that Termination Payment shall constitute full discharge by the BSCDCL of its payment obligations in respect thereof hereunder.

23.6.4 The Contractor expressly agrees that Termination Payment under this Article 23 shall constitute a full and final settlement of all claims of the Contractor on account of Termination of this Agreement and that it shall not have any further right or claim under any law, treaty, convention, contract or otherwise.

23.7 Other rights and obligations of the Parties

Upon Termination for any reason whatsoever

(a) property and ownership in all Materials, Plant and Works and the Project Highway shall, as between the Contractor and the BSCDCL, vest in the BSCDCL in whole; provided that the foregoing shall be without prejudice to Clause 23.6

(b) risk of loss or damage to any Materials, Plant or Works and the care and custody thereof shall pass from the Contractor to the BSCDCL; and

(c) the BSCDCL shall be entitled to restrain the Contractor and any person claiming through or under the Agreement from entering upon the Site or any part of the Project except for taking possession of materials, stores, implements, construction plants and equipment of the Contractor, which have not been vested in the BSCDCL in accordance with the provisions of this Agreement.

23.8 Survival of rights

Notwithstanding anything to the contrary contained in this Agreement any Termination pursuant to the provisions of this Agreement shall be without prejudice to the accrued rights of either Party including its right to claim and recover money damages, insurance proceeds, security deposits, and other rights and remedies, which it may have in law or Agreement. All rights and obligations of either Party under this Agreement, including Termination Payments, shall survive the Termination to the extent such survival is necessary for giving effect to such rights and obligations.

ARTICLE 24

ASSIGNMENT AND CHARGES

24.1 Restrictions on assignment and charges

This Agreement shall not be assigned by the Contractor to any person, save and except with the prior consent in writing of the BSCDCL, which consent the BSCDCL shall be entitled to decline without assigning any reason.

24.2 Hypothecation of Materials or Plant

Notwithstanding the provisions of Clause 24.1, the Contractor may pledge or hypothecate to its lenders, any Materials or Plant prior to their incorporation in the Works. Further, the Contractor may, by written notice to the BSCDCL, assign its right to receive payments under this Agreement either absolutely or by way of charge, to any person providing financing to the Contractor in connection with the performance of the Contractor's obligations under this Agreement. The Contractor acknowledges that any such assignment by the Contractor shall not relieve the Contractor from any obligations, duty or responsibility under this Agreement.

ARTICLE 25 DELETED.....

ARTICLE 26

DISPUTE RESOLUTION

26.1 Dispute Resolution

26.1.1 Any dispute, difference or controversy of whatever nature howsoever arising under or out of or in relation to this Agreement (including its interpretation) between the Parties, and so notified in writing by either Party to the other Party (the "**Dispute**") shall, in the first instance, be attempted to be resolved amicably in accordance with the conciliation procedure set forth in Clause 26.2.

26.1.2 The Parties agree to use their best efforts for resolving all Disputes arising under or in respect of this Agreement promptly, equitably and in good faith, and further agree to provide each other with reasonable access during normal business hours to all non-privileged records, information and data pertaining to any Dispute.

26.2 Conciliation

In the event of any Dispute between the Parties, either Party may call upon the BSCDCL's Engineer, or such other person as the Parties may mutually agree upon (the "**Conciliator**") to mediate and assist the Parties in arriving at an amicable settlement thereof. Failing mediation by the Conciliator or without the intervention of the Conciliator, either Party may require such Dispute to be referred to the Chairman of the BSCDCL and the Chairman of the Board of Directors of the Contractor for amicable settlement, and upon such reference, the said persons shall meet no later than 7 (seven) business days from the date of reference to discuss and attempt to amicably resolve the Dispute. If such meeting does not take place within the 7 (seven) business day period or the Dispute is not amicably settled within 15 (fifteen) days of the meeting or the Dispute is not resolved as evidenced by the signing of written terms of settlement within 30 (thirty) days of the notice in writing referred to in Clause 26.1.1 or such longer period as may be mutually agreed by the Parties, either Party may refer the Dispute to arbitration in accordance with the provisions of Clause 26.3.

26.3 Arbitration

26.3.1 Any Dispute, which is not resolved amicably as provided in clause 26.1 & 26.2 shall be finally settled by arbitration as set forth below:

(i) The Dispute shall be finally settled by arbitration in accordance with the Arbitration & Conciliation Act, 1996, or any statutory amendment thereof. The Arbitral tribunal shall consist of 3 Arbitrators, one each to be appointed by BSCDCL and the Contractor. The third Arbitrator shall be chosen by the two Arbitrators so appointed by the Parties and shall act as Presiding Arbitrator. In case of failure of the two Arbitrators, appointed by the parties to reach upon a consensus within a period of

30 days from the appointment of the Arbitrator appointed

(ii) Neither party shall be limited in the proceedings before such Tribunal to the evidence or arguments before the other party/ Independent consultant.

(iii) Arbitration may be commenced during or after the Contract Period, provided that the obligations of BSCDCL and the Contractor shall not be altered by reason of the arbitration being conducted during the Contract Period.

(v) Arbitration proceedings shall be held at Bhopal, India, and the language of the Arbitration Proceedings and that of all documents and communications between the parties shall be English.

(vi) The expenses incurred by each party in connection with preparation, presentation, etc., of its proceedings shall be borne by each party itself.

26.3.2 Deleted.

26.3.3 The arbitrators shall make a reasoned award (the "**Award**"). Any Award made in any arbitration held pursuant to this Article 26 shall be final and binding on the Parties as from the date it is made, and the Contractor and the BSCDCL agree and undertake to carry out such Award without delay.

26.3.4 The Contractor and the BSCDCL agree that an Award may be enforced against the Contractor and/or the BSCDCL, as the case may be, and their respective assets wherever situated.

26.3.5 This Agreement and the rights and obligations of the Parties shall remain in full force and effect, pending the Award in any arbitration proceedings hereunder.

26.3

ARTICLE 27

MISCELLANEOUS

27.1 Governing law and jurisdiction

This Agreement shall be construed and interpreted in accordance with and governed by the laws of India, and the courts at Bhopal shall have exclusive jurisdiction over matters arising out of or relating to this Agreement.

27.2 Waiver of immunity

Each Party unconditionally and irrevocably:

(a) agrees that the execution, delivery and performance by it of this Agreement constitute commercial acts done and performed for commercial purpose;

(b) agrees that, should any proceedings be brought against it or its assets, property or revenues in any jurisdiction in relation to this Agreement or any transaction contemplated by this Agreement, no immunity (whether by reason of sovereignty or otherwise) from such proceedings shall be claimed by or on behalf of the Party with respect to its assets;

(c) waives any right of immunity which it or its assets, property or revenues now has, may acquire in the future or which may be attributed to it in any jurisdiction; and

(d) consents generally in respect of the enforcement of any judgement or award against it in any such proceedings to the giving of any relief or the issue of any process in any jurisdiction in connection with such proceedings (including the making, enforcement or execution against it or in respect of any assets, property or revenues whatsoever irrespective of their use or intended use of any order or judgement that may be made or given in connection therewith).

27.3

of any obligations or liabilities for loss or damage to the other Party arising out of, or caused by, acts or omissions of such Party prior to the effectiveness of such Termination or arising out of such Termination.

27.7.2 All obligations surviving Termination shall only survive for a period of 3 (three) years following the date of such Termination.

27.4 Entire Agreement

This Agreement and the Schedules together constitute a complete and exclusive statement of the terms of the agreement between the Parties on the subject hereof, and no amendment or modification hereto shall be valid and effective unless such modification or amendment is agreed to in writing by the Parties and duly executed by persons especially empowered in this behalf by the respective Parties. All prior written or oral understandings, offers or other communications of every kind pertaining to this Agreement are abrogated and withdrawn. For the avoidance of doubt, the Parties hereto agree that any obligations of the Contractor arising from the Request for Proposals shall be deemed to form part of this Agreement and treated as such.

27.5 Severability

If for any reason whatever, any provision of this Agreement is or becomes invalid, illegal or unenforceable or is declared by any court of competent jurisdiction or any other instrumentality to be invalid, illegal or unenforceable, the validity, legality or enforceability of the remaining provisions shall not be affected in any manner, and the Parties will negotiate in good faith with a view to agreeing to one or more provisions which may be substituted for such invalid, unenforceable or illegal provisions, as nearly as is practicable to such invalid, illegal or unenforceable provision. Failure to agree upon any such provisions shall not be subject to the Dispute Resolution Procedure set forth under this Agreement or otherwise.

27.6 No partnership

This Agreement shall not be interpreted or construed to create an association, joint venture or partnership between the Parties, or to impose any partnership obligation or liability upon either Party, and neither Party shall have any right, power or BSCDCL to enter into any agreement or undertaking for, or

act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other Party.

27.7 Third parties

This Agreement is intended solely for the benefit of the Parties, and their respective successors and permitted assigns, and nothing in this Agreement shall be construed to create any duty to, standard of care with reference to, or any liability to, any person not a Party to this Agreement.

27.8 Successors and assigns

This Agreement shall be binding upon, and inure to the benefit of the Parties and their respective successors and permitted assigns.

27.9 Language

All notices required to be given by one Party to the other Party and all other communications, Documentation and proceedings which are in any way relevant to this Agreement shall be in writing and in English language.

27.10 Counterparts

This Agreement may be executed in two counterparts, each of which, when executed and delivered, shall constitute an original of this Agreement.

27.11 Confidentiality

The Parties shall treat the details of this Agreement as private and confidential, except to the extent necessary to carry out obligations under it or to comply with Applicable Laws. The Contractor shall not publish, permit to be published, or disclose any particulars of the Works in any trade or technical paper or elsewhere without the previous agreement of the BSCDCL.

N WITNESS
WHEREOF
THE
PARTIES
HAVE
EXECUTED
AND
DELIVERED
THIS
AGREEMENT
AS OF THE
DAY,
MONTH
AND YEAR
FIRST
ABOVE
WRITTEN.

SIGNED, SEALED AND	SIGNED, SEALED AND
DELIVERED	DELIVERED
For and on behalf of	For and on behalf of
BSCDCL	THE CONTRACTOR by:
(Signature)	(Signature)
(Name)	(Name)
(Designation)	(Designation)

In the presence of: 1.

2.

{COUNTERSIGNED and accepted by:

Name and particulars of other members of the Consortium}