Request for Qualification cum Request for Proposal (RFQ cum RFP)

for

Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar.

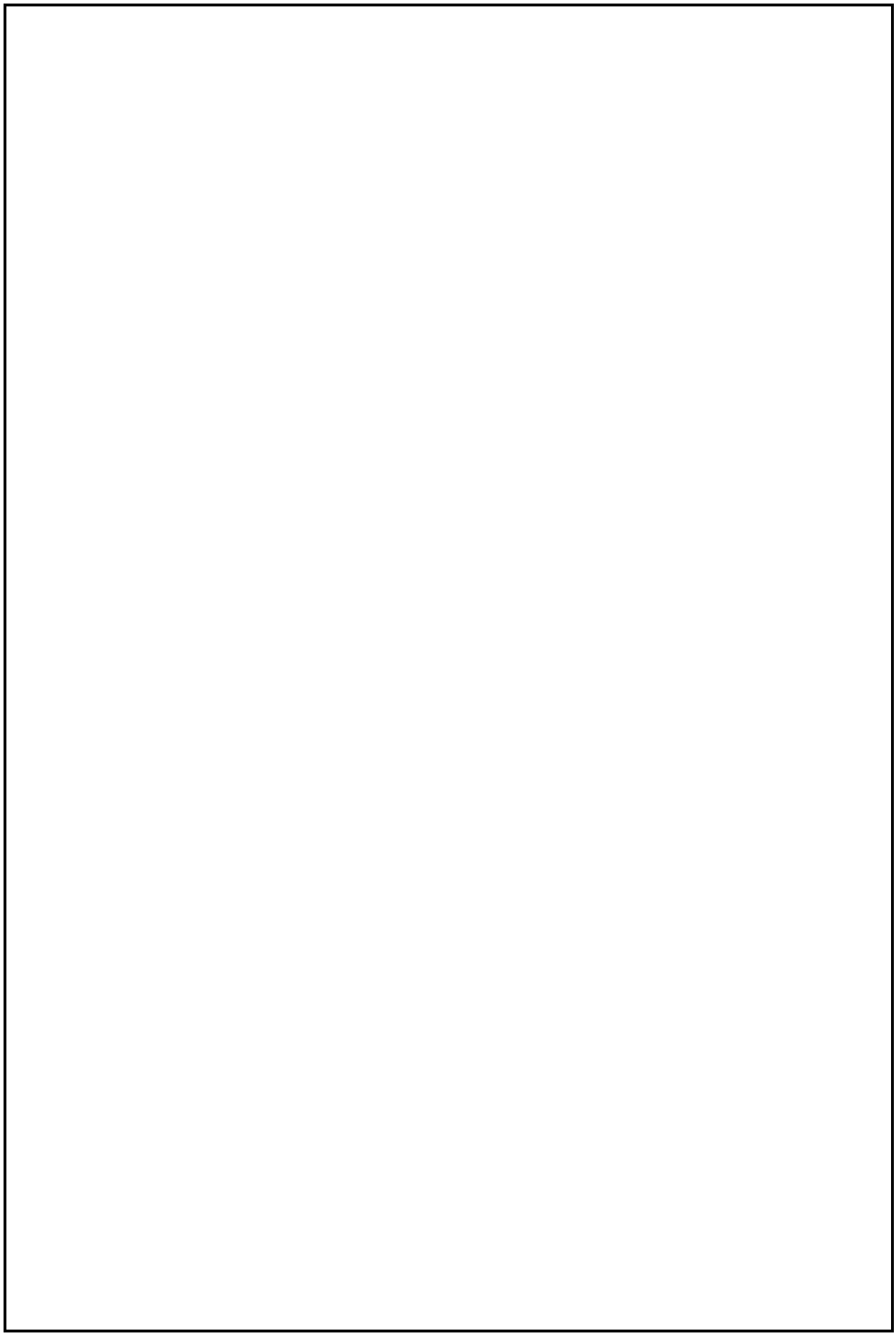
VOLUME 1

PART 1 INSTRUCTION TO BIDDERS (ITB)

November 2026

Managing Director

Maharashtra Industrial Township Limited
Udyog Sarathi, MIDC Office, Marol Industrial Area,
Andheri (East), Mumbai, Maharashtra State, India – 400093



Maharashtra Industrial Township Limited (Formerly Known as AITL)

Notice Inviting RFQ cum RFP

Dated: 18-11-2026

"Maharashtra Industrial Township Limited (MITL) (Formerly Known as Maharashtra Industrial Township Limited (AITL)" is a special purpose vehicle formed with the equity participation of Central and State Government for procurement and construction of trunk infrastructure in Shendra-Bidkin Industrial Area (SBIA) near Aurangabad in Maharashtra.

The Maharashtra Industrial Township Limited (MITL) represented by Managing Director, invites bids from eligible contractors for the following project in the prescribed bid forms and proforma enclosed herewith through the e-Procurement site, for the Scope of Work described in the Bidding Documents. The details of the tender are given below: -

1.	Tender No.	MITL/SBIA/2026-27/T-11
2.	Name of Work	**Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar.**
3.	Location	AURIC - Shendra Industrial Area, Ch. Sambhaji Nagar, Maharashtra
4.	Tender Fee (Non Refundable)	Rs. 11800/- (Rupees Eleven Thousand Eight Hundred only) i.e. Tender fee Rs. 10000/- plus 18% GST
5.	Bid Security	Rs. 21,000/- (Twenty One Thousand Only)
6.	Construction Period	Sixty (60) days from the date of issue of LOA.
7.	Defect Liability Period (DLP)	Defect liability period of all major materials shall be 5 Years (five years) and 1 Year (One Year) for minor materials (Annexure X, volume 1, Part V), supplied and commissioned by the contractor, after their commissioning date.
8.	Address for Correspondence	Managing Director, Maharashtra Industrial Township Limited Udyog Sarathi, MIDC Office, Marol Industrial Area, Andheri (East) Mumbai, Maharashtra State, India – 400093
9.	Details for Downloading Tender Document	The complete RFQ cum RFP document can be viewed/downloaded from website of https://aitl.eproc.in, www.auric.city from 18-11-2026 to 02.12.2026 (up to 1500 hrs. IST)
10.	Submission of Bid	Bid must be submitted online only at (https://aitl.eproc.in) on orbefore up to 02.12.2026 (at 1500 hours IST).

11.	Email address for Pre-Bid Queries	Mr. Rahul Borikar DGM, Electrical (PRA) E- Mail- dgmelecpra@mitl.org.in Mobile Number-9324349517
12.	Email Address for site visit	Mr. Shankar Shinde, GM,Electrical (Project), SBIA E- Mail- eeelec@mitl.org.in Mobile Number – 7506200775

DISCLAIMER

This RFQ cum RFP is not an Agreement and is neither an offer nor invitation by the Employer to the prospective Bidders or any other person. The information contained in this Request for Qualification cum Request for Proposal document (the "RFQ cum RFP") or subsequently provided to Bidder(s), whether verbally or in documentary or any other form by or on behalf of the Employer or any of its employees or advisors, is provided to Bidder(s) on the terms and conditions set out in this RFQ cum RFP and such other terms and conditions subject to which such information is provided.

The purpose of this RFQ cum RFP is to provide interested parties with information that may be useful to them in making their financial offers (BIDs) pursuant to this RFQ cum RFP. This RFQ cum RFP includes statements, which reflect various assumptions and assessments arrived at by The Employer in relation to the Project. Such assumptions, assessments and statements do not purport to contain all the information that each Bidder may require. This RFQ cum RFP may not be appropriate for all persons, and it is not possible for the Employer, its employees or advisors to consider the objectives, financial situation and particular needs of each party who reads or uses this RFQ cum RFP. The assumptions, assessments, statements and information contained in the Bidding Documents, especially the Preliminary Design details/ information, 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 RFQ cum RFP and obtain independent advice from appropriate sources.

Information provided in this RFQ cum 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 Employer accepts no responsibility for the accuracy or otherwise for any interpretation or opinion on law expressed herein.

The Employer, 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 RFQ cum RFP or otherwise, including the accuracy, adequacy, correctness, completeness or reliability of the RFQ cum RFP and any assessment, assumption, statement or information contained therein or deemed to form part of this RFQ cum RFP or arising in any way for participation in this Bidding Process.

The Employer 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 RFQ cum RFP.

The Employer 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 RFQ cum RFP. The issue of this RFQ cum RFP does not imply that the Employer is bound to select a Bidder or Contractor, as the case may be, for the Project and The Employer 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 Employer or any other costs incurred in connection with or relating to its BID. All such costs and expenses shall remain with the Bidder and The Employer shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by a Bidder in preparation or submission of the BID, regardless of the conduct or outcome of the Bidding Process.

Nothing in this RFQ cum RFP shall constitute the basis of a contract which may be concluded in relation to the Project nor shall such documentation/information be used in construing any such contract. Each Bidder must rely on the terms and conditions contained in any contract, when, and if, finally executed, subject to such limitations and restrictions which may be specified in such contract.

The Bidders are prohibited from any form of collusion or arrangement in an attempt to influence the selection and award process of the Bid. Giving or offering of any gift, bribe or inducement or any attempt to any such act on behalf of the Bidder towards any officer/employee of Employer or to any other person in apposition to influence the decision of the Employer for showing any favour in relation to this RFQ cum RFP or any other contract, shall render the Bidder to such liability/penalty as the Employer may deem proper, including but not limited to rejection of the Bid of the Bidder and forfeiture of its Bid Security.

Laws of the Republic of India are applicable to this RFQ cum RFP.

Each Bidder's procurement of this RFQ cum RFP constitutes its agreement to, and acceptance of, the terms set forth in this Disclaimer. By acceptance of this RFQ cum RFP, the recipient agrees that this RFQ cum RFP and any information herewith supersedes documents(s) or earlier information, if any, in relation to the subject matter hereto.

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1. INTRODUCTION

1.1 Project Information

1.1.1 Background

The Government of India is developing the Delhi Mumbai Industrial Corridor (DMIC) Project, as a global manufacturing and investment destination by utilising the high-capacity 1,504 km long Western Dedicated Freight Corridor (WDFC) as the backbone. The DMIC project is being implemented jointly by the Government of India and the respective State Governments. Investment Regions/Industrial Areas have been identified for development, across six states namely Gujarat, Haryana, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh.

A node/city level SPV has been formed as a joint venture between Government of India (GoI) and Government of Maharashtra (GoM) under the name "Maharashtra Industrial Township Limited (MITL)". The share of GOI through NICDIT Trust is 49% and the remaining 51% is held by GoM through Maharashtra Industrial Development Corporation (MIDC). MIDC has notified 101 sq km of area for industrial development under SBIA.

Maharashtra Industrial Township Limited (MITL) commenced power distribution operations in the Bidkin Industrial Area on 2nd July 2025. To ensure reliable, uninterrupted power supply and establish network redundancy, it is necessary to execute the distribution network augmentation by laying a second cable run and completing the ring connection to RMU No. 505A in the Bidkin Industrial Area, District Chhatrapati Sambhajinagar.

The Scope and brief particulars of the Project are as follows:

Scope of work is Providing Electrical Distribution Network which includes, but not limited to, following activities:

Sr No	Activity Details	Unit	Qty
1	Erecting & terminating 3 x 240 sq. mm. aluminium 11 kV, XLPE armoured cable on wall/ceiling or laid in provided trench / pipe in an approved manner as per specification no. CB-HT	Mtr	1350
2	Supplying & laying (including excavation) half round reinforced cement concrete pipe of NP-2 class of 150 mm diameter in proper line, level and slope including providing and fixing collars in cement mortar 1:2 and curing etc. complete.	Meter	750
3	Supplying and laying (including excavation of suitable width & depth upto 90 cm) 200 mm outside dia, double wall corrugated pipes (DWC) of HDPE for enclosing cable below ground/road surface, complete.	Meter	100
4	Providing and erecting Heat shrinkable straight through joint kit for 11 kV XLPE HT cable 3x240 to 300 sq.mm. with necessary material as per specification no. CB-JT/HT	Each	2
5	Supply, Transport, jointing, testing and commissioning of 11 kV touchproof indoor termination suitable for 11 kV, 3C x 300 Sq. mm XLPE cable.	Each	4

I. Setting Out:

The Contractor shall be responsible for the accurate setting-out of the Works in relation to original site coordinates, lines and levels of reference. Detailed site survey and site visit is expected to be carried out by prospective bidder before bidding

The checking of any setting-out or of any line or level by the Engineer – in – charge shall not in any way relieve the Contractor of his responsibility for the accuracy there of and Contractor shall carefully protect and preserve all bench-marks, sight- rails, pegs and other items used in setting-out the Works. The Contractor shall give to the Engineer – in – charge not less than 48 hours' notice of his intention to set out or give levels for any part of the Work so that timely arrangement may be made for checking and issuing instructions.

II. Specifications

All materials used shall be of high grade, free from defects and imperfection, recent manufacture and unused. The materials shall conform to the relevant standard specifications accepted and approved as per above mentioned MERC regulation. The material should be inspected with due approval by MITL authority. Test reports of the major item like Power Quality Meters, Indoor Meter cubicle, Data Concentrator/ Gateway and their accessories, etc. shall be submitted at the time of transporting the material to the work site.

The material to be used should be of the make approved by the MITL/MSEDCL and the method of construction should be as per the standard method of construction approved by MITL/MSEDCL & adhering to relevant Acts & rules in force. All relevant specifications of required materials and drawings shall be made available to MITL. All, material should be approved and inspected / tested by MITL.

III. **Co-ordination:**

The contractor shall be responsible for the payment of supervision fees if any to be paid to Government authorities, the same amount shall be reimbursed in the bills with submission of valid receipt. All the approval's required from MITL pertaining to the said works shall be taken by the contractor. Post completion of works till the commissioning and the handing over of the assets to MITL is the responsibility of the contractor.

IV. **Defect Liability**:

Defect liability period of all major materials shall be 5 Years (five years) and 1 Year (One Year) for minor materials (Annexure X, volume 1, Part V), supplied and commissioned by the contractor, after their commissioning date.

1.2 Brief description of Bidding Process

1.2.1 The Employer has adopted a **single stage two-part process** (collectively 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 viz. Technical Bid and Financial Bid.

1.2.2 The Bidder has to compile and submit his Bid in accordance to requirements detailed in Clause 5 [Submission of Bids] of ITB

1.2.3 Eligibility and qualification of the Bidder will be first examined based on the details submitted under First Part i.e. Technical Bid with respect to eligibility and qualifications criteria prescribed in this RFQ cum RFP.

1.2.4 Prior to making an Application, the Bidder shall pay Tender Fee to the Employer as indicated in the clause 4.5 [Bid Validity] of the ITB. The Financial Bid under the second part shall be opened only for only the Bidders whose Technical Bids are found to be responsive to the eligibility and qualifications requirements as per this RFQ cum RFP.

1.2.5 In the Bid Stage, the aforesaid qualified Bidders, including their successors (the “Bidders”), are being called upon to submit their financial offers (the "BIDs") in accordance with the terms specified in the Bidding Documents. The Bid shall be valid for a period of 180 days from the Bid Due Date.

1.2.6 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.

1.2.7 The Bidders can visit site, raise pre-bid queries and attend pre-bid meeting prior to Bid submission.

1.3 Schedule of Bidding Process

The Employer shall endeavour to adhere to the following schedule:

Sl. No.	Event Description	Date
i.	Date of availability of RFQ cum RFP	18th November 2026
ii.	Last date for receiving queries	20th November 2026
iii.	Pre-Bid meeting (If any bidder intends to attend online pre-bid meeting through MS team platform, the prospective bidder shall request through email for acceptance of his online attendance via MS team)	25th November 2026
iv.	The Employer response to queries	25th November2026
v.	Bid Due Date (BDD)	02nd December2026 @ 1500 Hrs.
vi.	Physical submission of bid security/ POA/etc	02nd December2026 @ 1500 Hrs.
vii.	Opening of Technical Bids	02nd December2026 @ 1600 Hrs.
viii.	Declaration of eligible/ qualified bidder	3rd December 2026 (Tentatively)
ix.	Opening of Financial Bid	3rd December 2026 (Tentatively)
x.	Letter of Award (LOA)	4th December 2026 (Tentatively)
xi.	Validity of BID	60 days from Bid Due Date
xii.	Signing of Contract	Within 7 days from LOA

1.4 Pre-bid Meeting and Pre-bid Clarifications

1.4.1 Pre-Bid meeting of the Bidders shall be convened at the designated date, time and place, as indicated in the Contract Data Sheet. A maximum of two representatives of each Bidder shall be allowed to participate on production of the Employer letter from the Bidder.

1.4.2 The Bidder or its official representative can attend pre-bid meeting, which will take place at the venue indicated in Contract Data Sheet.

1.4.3 The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage and thus the Bidders will be free to seek clarifications and make suggestions for consideration of the Employer. The Employer 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.

1.4.4 The Bidder is requested to submit any questions or queries by email, to the address provided in Volume 1 Part 2" Contract Data Sheet" (Sr.no 21). The questions or queries should reach the Employer not later than date specified before the date of pre-bid meeting.

1.4.5 The envelopes/communication shall clearly bear the following identification/Title: "Queries/Request for Additional Information: "Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar".

1.4.6 Minutes of the meeting, including the text of the questions raised and the responses given, will be shall be uploaded on to the eProcurement portal including a description of the inquiry but without identifying its source. Any modification of the bidding documents which may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of a Corrigendum and not through the minutes of the pre-bid meeting.

1.4.7 Bidders are advised to attend the pre-bid meeting. However, non-attendance at the pre-bid meeting will not be a cause for dis-qualification of a Bidder. Bidders who do not attend the pre-bid meeting assume the responsibility to comply with modifications to the Bidding documents and which are communicated through Corrigendum.

1.5 Site Visit

1.5.1 The Bidder is advised to visit and examine the Project site and its surroundings and obtain for itself on its own responsibility all the information like site conditions, traffic, location, surroundings, potential developments during the construction period of the project, climate, availability of power, water and 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 that may be necessary for preparing the bid and entering into a contract for construction of the works. The costs of visiting the proposed site shall be at the bidder's own expense. Bidder can contact Employers personnel stated in Volume 1 Part 2" Contract Data Sheet" (Sr.no 22) for conducting their site visit.

1.5.2 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such inspection, but only upon the express condition that the bidder, its personnel and agents, will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof and will be responsible for death or personal injury, loss of or damage to property and any other loss, damage, costs and expenses incurred as a result of the inspection.

1.5.3 The Employer may conduct a Site Visit concurrently with the Pre-Bid Meeting.

1.6 Corrupt or Fraudulent Practices

1.6.1 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 Employer 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 or the Contractor, as the case may be, 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 Employer shall be entitled to forfeit and appropriate the BID Security or Performance Security and Additional performance Security, as the case may be, as Damages, without prejudice to any other right or remedy that may be available to the Employer under the Bidding Documents and/ or the Agreement, or otherwise.

1.6.2 Without prejudice to the rights of the Employer under Clause 1.6.1 hereinabove and the rights and remedies which the Employer may have under the LOA or the Agreement, or otherwise if a Bidder or Contractor, as the case may be, is found by the Employer 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 or Contractor shall not be eligible to participate in any tender or RFP issued by the Employer

1.6.3 The following terms shall have the meaning hereinafter respectively assigned to them:

"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 Employer 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 Employer, shall be deemed to constitute influencing the actions of a person connected with the Bidding Process); or

ii. save and except as permitted under Clause 2.2.1 of this RFQ cum 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 technical adviser of the Employer in relation to any matter concerning the Project;

"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;

"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;

"Undesirable practice" means (i) establishing contact with any person connected with or employed or engaged by the Employer 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;

"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.

2. GENERAL

2.1 Scope of Bid

2.1.1 Maharashtra Industrial Township Limited (MITL), (the “Employer") invites Bids for “Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar”.

The successful Bidder is expected to complete the Works, including Supply, installation, Testing and Commissioning within 180 days after award of work as detailed stated in the clause1.1.1 by the intended completion date specified in the Contract Data Sheet.

2.2 Eligible Bidders

2.2.1 For determining the eligibility of Bidders for their qualification hereunder, the following shall apply:

1. **Consortium agreement/ Joint Venture is not permitted in this tender.**
2. A Bidder may be a company incorporated under the Indian Companies Act, 1956/2013 or should be a legal entity registered in India with appropriate statutory authority as required under the law.
3. A Bidder firm 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.
4. The Bidder firm shall be profit (net) making firm and shall have made profit at least in any Three out of last Five financial years (FY 2020-21 to 2024-25). The Bidder should submit attested copies of auditor’s report and audited financial statements. (Balance sheet, Profit &Loss accounts, note to accounts etc.)

2.2.2 The Bidder **shall not** be falling under any one of the following criteria:

- A constituent of one Bidder is also a constituent of another Bidder
- Bidder has the same legal representative for purposes of this Bid as any other Bidder
- Bidder has a relationship with another Bidder directly or through common third party/ parties, that puts either or both of them in a position to have access to each other’s' information about, or to influence the Bid of either or each other;
- Such Bidder or any of its member thereof has participated as a consultant to the Employer in the preparation of any documents, Design or Technical specifications of the Project.

2.2.3 A Bidder shall be liable for disqualification if any legal, financial or technical adviser of the Employer in relation to the Project is engaged by the Bidder, or any of its Members, as the case may be, in any manner for matters related to or incidental to the Project. This disqualification shall not apply where such adviser was engaged by the Bidder, its Member in the past but its assignment expired or was terminated 6 (six) months prior to the date of issue of this RFQ cum RFP.

2.2.4 Without prejudice to the satisfaction of the above requirements and any other prerequisites as per the terms of this RFP by the Bidder, a Bid may still be disqualified if it has, in the sole and exclusive opinion of the Employer:

1. Made any misleading or false representation or deliberately suppressed the information in the technical schedules/enclosures required to be submitted with /in support/as a clarification with respect to its Bid; and/or
2. Has been black–listed/debarred by any government/semi-government department/ public sector company in India (certificate from statutory auditor) in any other foreign country;

and/or

3. All the directors in the company should also have not been a part of any other company which is been black listed/ debarred or pulled up for any offence
4. Has a record of poor performance such as abandoning work, not properly completing the contract, or financial failures/weaknesses; and/or
5. Engaged in Fraud & Corrupt practices as mentioned under this RFQ cum RFP

2.2.5 Each Bidder shall provide a statement that it complies with Clause 2.3 in all respects and provide such further evidence of their eligibility satisfactory to the Employer as the Employer shall reasonably request.

2.3 Qualification of the Bidder

2.3.1 All bidders shall include the following information and documents with their Bids in duly completed Tender Forms in the order specified in Clause 5.1 [Sealing and Marking of Bids].

- Document defining the constitution or legal statutes, place of registration and principal place of business
- Written power of attorney of the signatory of the Bid to commit the Bidder
- Reports on the financial standing of the Bidder, such as attested copies of auditor's report & audited financial statements for the last 5 (Five) financial years (FY 2020-21 to 2024-25). (Balance sheet, Profit &Loss accounts, Notes to the accounts etc.)
- Evidence of adequacy of working capital for this contract (access to line of credit and availability of other financial resources);
- Information regarding any litigation, or arbitration resulting from contracts executed by the Bidder in the last 5 years (FY 2020-21 to 2024-25) or currently under execution. The information shall include the names of the parties concerned, the disputed amount, cause of litigation and matter in dispute
- Experience in works of a similar nature and details of work carried out during the qualifying period
- Bidder Should have valid Electrical Contractor License.

2.3.2 **Joint venture/consortium:**

Consortium agreement/ joint venture is not permitted in this tender.

2.3.3 To be eligible for pre-qualification and evaluation of the bid, an Applicant shall fulfil the following conditions of eligibility:

In this the 'Similar Works' or 'Similar Project' will mean **SITC (Supply, Installation, Testing, and Commissioning of 11KV & above UG Cable,11KV or above RMU/11/0.433 KV CSS work** during the last Five (5) financial years (FY 2020-21 to FY 2024-25).

The Bidder should have successfully handed over the project to the Client after successful completion, testing & commissioning during the above period.

1. Financial Capacity:

i. Minimum Value of Work Completed:

The applicant should have:

a) One Similar completed work costing not less than Rs.8.5 Lakhs.

Or

b) Two similar completed works costing not less than Rs. 5.25 Lakhs.

Or

c) Three similar completed works costing not less than Rs.4.2 Lakhs.

Definition of 'similar work' has been already clearly defined in clause 2.3.3.

The work orders of only Central/State Government department or Central/State Autonomous Body (or) Central/State Public Sector, including all Power Distribution licensees, SEZ and Distribution Franchisees shall be considered.

ii. Bidder should furnish information as required in ITB Vol 1, Part 5, ANNEXURE V: FINANCIAL CAPACITY - MINIMUM PROJECT VALUE to demonstrate compliance with the criteria of having executed and commissioned similar project as defined above.

iii. Average Annual Financial Turnover: The bidder shall have achieved average annual financial turnover of Rs. 15.75 Lakhs (Rupees Fifteen Lakh Seventy Five Lakh only), from electrical distribution business during any one of the last Five financial years i.e. (FY 2020-21 to 2024-25). Bidder should furnish Five financial years (FY 2020-21 to 2024-25) information as required in ITB Vol 1, Part 5, ANNEXURE III FINANCIAL CAPACITY QUALIFICATION INFORMATION – ANNUAL TURNOVER

iv. **Net Worth:** The Bidder shall have positive Net Worth in any of one of the last 5 (Five) financial years FY 2020-21 to 2024-2025. Bidder should furnish information as required in ITB Vol 1, Part 5, ANNEXURE III FINANCIAL CAPACITY QUALIFICATION INFORMATION – ANNUAL TURNOVER

v. **Liquid Assets / Credit Facilities/Solvency certificate:** The bidder shall have Liquid Assets / Credit Facilities/ Solvency of not less than **Rs.3.25 Lakh.** (Rupees Three Lakh Twenty Five Thousand Lakh only) as on the date of submission of the bid. Bidder should furnish information as required in ITB Vol 1, Part 5, ANNEXURE IV BANK CERTIFICATE FOR ACCESS TO LINES OF CREDIT.

vi. IT (Income Tax Return) Clearance/ Paid of Last 3 Years. Attested copies of IT returns for last three financial years (AY 2023-24, AY 2024-25, AY-2025-26) shall be submitted.

vii. The Bidder should be financially sound and should not have applied for Corporate Debt Restructuring (CDR) during last 5 (Five) Financial Years (FY 2020-21 to 2024-25).

2. Technical Capacity - Project Works:

i. The bidder should have at least 5 years' (FY 2020-21 to 2024-25) experience as a prime contractor in the electrical works required under this contract.

The Bidder must demonstrate successful completion of SITC (Supply, Installation, Testing, and Commissioning of 11KV & above UG Cable,11KV or above RMU/11/0.433 KV CSS work during the last Five (5) financial years (FY 2020-21 to FY 2024-25).
Bidder should furnish the information as required in ITB Vol 1, Part 5, ANNEXURE VI TECHNICAL CAPACITY – PROJECT QUALIFICATION INFORMATION

ii. The Bidder must have adequate engineering capacity and staff on their Payroll with relevant expertise and experience in the Construction of similar Projects. Bidder should furnish information as required in ITB Vol 1, Part 5, ANNEXURE IX – ENGINEERING AND CONSTRUCTION CAPACITY.

iii. The Bidder must have adequate Plant Machinery and Equipment pertaining to civil construction either owned or leased. Bidder should furnish information as required in ITB Vol 1, Part 5, ANNEXURE IX – ENGINEERING AND CONSTRUCTION CAPACITY. The bidder should dedicate exclusively all the machinery & equipment required for this project at any point of time

2.3.4 Bidders shall submit satisfactory performance certificates in support of each quoted reference along with the copy of work/purchase order with the completion certificate. The certificate should be signed by an officer not below the rank of Divisional Engineer/Executive Engineer/head of Department in case of municipal/government client or the rank of General Manager in case of public sector. The certificate should include the details of Name, location and brief scope of project, technology provided, Project value, flow details.

2.3.5 Ongoing projects or the projects which are yet to be commissioned shall not be considered for evaluation.

2.4 One Bid per Bidder

Each bidder shall submit only one Bid. A Bidder who submits or participates in more than one Bid will be disqualified. No firm can be a subcontractor while submitting a Bid individually in the same Bidding process. A firm, if acting in the capacity of a subcontractor in any Bid, may participate in more than one Bid in that capacity.

2.5 Cost of Bidding

The Bidder shall bear all costs associated with the preparation and submission of its Bid and the Employer will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the Bidding process.

3. BIDDING DOCUMENTS

3.1 Content of Bidding Documents

Each Bidder shall submit only one Bid. A Bidder who submits or participates in more than one Bid will be disqualified. No firm can be a subcontractor while submitting a Bid individually in the same Bidding process.

3.1.1 This RFQ cum RFP comprises the Disclaimer set forth hereinabove, the contents as listed below, and will additionally include any Addenda issued in accordance with clause 3.2.

- Invitation for Bids
- Instructions to Bidders and Conditions of Contract

3.1.2 The Draft Contract Agreement provided by the Employer as part of the Bid Document shall be deemed to be part of this RFQ cum RFP.

3.1.3 The Bidder is expected to carefully examine the contents of the Bidding documents. Failure to comply with the requirements of Bid submission will be at the Bidder's own risk. The Bids which are not substantially responsive to the requirements of the Bidding documents will be rejected.

3.1.4 Bidders are informed that the site investigation information which may be provided is only for Bidder's information and the Employer does not warrant either its accuracy or sufficiency. The Bidder is responsible to inspect and examine the site, its surroundings and other available information and data, and to have satisfied himself, so far as practicable, before submitting the bid as to the form and nature of the site, the hydrological and climatic conditions, the extent and nature of works, the means of access to the site and the accommodation he may require, and all other risks, contingencies and circumstances which may influence or affect the Bid. Bidders are also advised to carry out any additional survey or investigations that may deem to be appropriate or necessary before submitting the Bid.

3.1.5 The terms Bid and Tender and their derivatives (Bidder/Tenderer, Bid/Tender, Bidding /Tendering, etc) throughout these Bidding documents are synonymous and day means calendar day. Singular also means plural.

3.2 Clarification of Bidding Documents

3.2.1 Bidders requiring any clarification on the RFQ cum RFP may notify the Employer in writing or e-mail. They should send in their queries on or before the date mentioned in the Schedule of Bidding Process specified in Clause 1.3 also stated in Part 1 Vol 2 "Contract data sheet" (Sr. No 21). The Employer shall endeavour to respond to the queries within the period specified therein, but no later than 5 (five)day prior to the **Bid Due Date.** The responses will be sent by e-mail. The Employer will forward all the queries and its responses thereto, to all Bidders without identifying the source of queries.

3.2.2 The Employer shall endeavour to respond to the questions raised or clarifications sought by the Bidders. However, the Employer reserves the right not to respond to any question or provide any clarification which is not in relevance to the Bid, and nothing in this Clause shall be taken or read as compelling or requiring the Employer to respond to any question or to provide any clarification.

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

3.3 Amendment of Bidding Documents

3.3.1 At any time prior to the deadline for submission of bids, the Employer may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding documents by issuing addenda.

3.3.2 Any corrigendum thus issued shall be part of the Bidding documents pursuant to clause 3.2.3 and shall be communicated in writing or by email to all Bidders. Prospective Bidders shall acknowledge receipt of each corrigendum by email to the Employer within one working day of receipt. Even though the same is not acknowledged within the specified time it shall be deemed that the corrigendum is received by the Bidder.

3.3.3 In order to afford the Bidders a reasonable time for taking a Corrigendum into account, or for any other reason, the Employer may, in its sole discretion, extend the Bid Due Date.

4.PREPARATION OF BIDS

4.1 Language of Bid

The Bid and all related correspondence and documents in relation to the Bidding Process shall be in English language. Supporting documents and printed literature furnished by the Bidder with the Bid may be in any other language provided that they are accompanied by translations of all the pertinent passages in the English language, duly authenticated and certified by the bidder. Supporting materials, which are not translated into English, may not be considered. For the purpose of interpretation and evaluation of the Bid, the English language translation shall prevail.

4.2 Documents Comprising the Bid

4.2.1 The Bid submitted by the Bidder shall comprise two parts with one containing the Technical Proposal and the other containing Financial Proposal, both submitted at the same time.

4.2.2 The Technical Proposal shall comprise General Requirements, Employer's Requirements covering the fully completed Technical Specifications, Technical Schedules, Indicative Tender Drawings and any other relevant document. Without limiting the generality of the foregoing, the Technical Proposal shall contain following:

- Bid Security in the form of Original Bank Guarantee/Surety Bond from a Nationalised/Scheduled bank as specified;
- Power of Attorney for authorized signatory for this bid;
- Bid Form for Technical Proposal, signed by the authorized signatory;
- All pages of Tender and Appendix to Tender, signed by the authorized signatory;
- Any other information/data required to be submitted in the Technical Proposal by the bidders in accordance with these Instructions to Bidders.

4.2.3 The Financial Proposal shall be comprised of the fully completed Price Bid as per instruction given on Procurement website indicating capital cost with breakup.

Without limiting the generality of the forgoing, the Financial Proposal shall contain the following:

- Bid Form for Financial Proposal; signed by the authorized signatory;
- Schedule of Prices and Schedule of Payments;
- Any other materials required to be completed and submitted by bidders in accordance with these Instructions to Bidders.
- The Financial Proposal shall be completed as per the itemized activity detailed in the price schedules. However total Lump-sum amount quoted shall be only considered for deciding the award. A lumpsum amount without the detailed breakup will be deemed as a non-responsive bid and the Bid will be rejected.

4.2.4 The Bid Form, Appendix to Bid and unit rates and price shall be filled-in without exception, subject to extensions thereof in the same format and to the provisions of Clause 4.6 regarding the alternative forms of bid security.

4.3 Bid Prices

4.3.1 Unless otherwise specified in Employer's Requirements, Bidders shall quote for the entire facilities such that the total Bid price covers all the Contractor's obligations mentioned in or to be reasonably inferred from the Bidding documents in respect of the Investigation, preparation of Construction Documents, manufacture, including Procurement and subcontracting (if any), delivery, Construction, Installation, completion of the facilities and works. This includes all requirements under the Contractor's responsibilities for inspecting, testing, pre-commissioning, commissioning and trial run of the facilities and, where so required by the bidding documents, the acquisition of all permits, approvals and licences, etc., operation and maintenance during Defect Notification Period and training services and such other items and services as may be specified in the Bidding Documents, all in accordance with the requirements of the Conditions of Contract. The price bid shall include the cost of pre- despatch inspections and testing by the Employer's personnel or any authorized person/agency whether inside country or outside the country.

4.3.2 The quoted rates shall be for finished work and shall be inclusive of all costs including manufacturing, supply, transportation and safe storage of materials at site, cost of insurance and protection of the Works, accommodation and sanitation of the Workers, protection of workmen, working notices, temporary works, drainage facilities and/or detour, sign boards, public protection including providing security personnel, barricades and lighting, etc., incidental costs, taxes, duties, work contract tax, levies, royalties, custom duties and charges of any kind whatsoever, payable on the components or the complete works and satisfactory performance of the bidder's obligations under this contract.

4.3.3 The quoted prices for the works during testing and commissioning, defect notification period shall include cost of all materials, repairs, staff, labour etc. to upkeep the project works in perfect condition to the desired standards and quantity.

4.3.4 The bidder has to quote in a way that his prices shall include for all the liabilities and Contractual obligations including all taxes, duties, levies, cess etc. wherever payable and applicable on the date of submission of their bids whether separately specified or not.

4.3.5 The Bidder shall give a break-up of prices in the manner and detail called for in the Schedule of Prices. The Bidder shall fill unit rates and prices for all items of the Works described in the Schedule of Prices. Items against which no rate or price is entered by the bidder will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Schedule of Prices.

4.3.6 The Bidders shall fill in the prices for all items of the Works as applicable and no alteration or addition shall be made to the Schedule by the bidders. Quoted rates must type out clearly and legibly in both figures and words against each item of the Works. The Employer reserves the right to reject any incomplete or not fulfilling the conditions of quoting the rates in figures and words, without assigning any reason thereof.

4.3.7 The Bidder shall be familiar with the Tax laws of India. In the various Schedule of Prices, Bidders shall give required details and breakdown of their prices including all duties, taxes and other levies and charges payable by the Contractor under the Contract, as of the date 28 days prior to the deadline for submission of bids as under:

1. Civil Works, electrical works, including site investigations, layout as applicable, all services, labour, materials, consumables, and all matters and things of whatsoever nature, including transportation, provision of as-built drawings etc., as described in the bidding documents and as necessary for the proper execution and completion of the works in accordance with the requirements of the Contract.
2. Electrical works shall be quoted and shall include rates or prices, as applicable, for all matters and things whatsoever required in connection with the manufacture / fabrication, independent inspection, supply, delivery, testing, installation, commissioning, trial run, provision of as-built drawings , etc., as described in the bidding documents and as necessary for the proper execution and completion of the testing and commissioning and performance of the facility in accordance with the requirements of the Contract. Electrical equipment, whether manufactured from outside or within the country, shall be quoted on the basis of its installed cost, inclusive of transportation, all taxes, duties, levies, royalties, custom duties and charges of any kind whatsoever.
3. The tenderers are required to sign the Letter of Tender at specified places, and the conditions attached with tender. All the signed documents shall be submitted (scanned copy) as a part of the tender at the time of tendering. Tender not so signed shall be liable for rejection.

4.3.8 The rates and prices quoted by the bidder are subject to adjustment during the performance of the Contract in accordance relevant clause indicated in Conditions of Contract.

4.3.9 The supplementary Price Proposal, if applicable should only contain the changes in price resulting from the changes in the Technical Proposals. Bidders shall note that supplementary price Bid shall include price variation (increase or decrease, as the case may be) of individual affected items, resulting from corresponding changes in Technical proposal, and it is not enough to give the overall increase or decrease in price of affected items as a whole. Bidders should note that, if Employer, during the evaluation of the price proposals, considers that the changes in price are unrealistic in comparison with the original price proposal, the original / supplementary / both Bids are liable to be rejected.

4.4 Currencies of Bid and Payment

4.4.1 The unit rates and the prices shall be quoted by the bidder in Indian Rupees (INR).

4.4.2 Payment of the Contract Price shall be made only in Indian Rupees (INR).

4.5 Bid Validity

4.5.1 Bids shall remain valid for a period of not less than 180 days from the Bid Due Date.

4.5.2 In exceptional circumstances, prior to expiry of the original Bid validity period, the Employer may request that the Bidders extend the period of validity for a specified additional period. The request and the responses thereto shall be made in writing or by -. A bidder may refuse the request without forfeiting its bid security. A bidder agreeing to the request will not be required or permitted to modify its bid, but will be required to extend the validity of its bid security for the period of the extension, and in compliance with Clause 4.6 in all respects.

4.6 Bid Security

4.6.1 A Bidder is required to deposit, along with its Bid, a Bid security as indicated in Contract Data Sheet (the "BID Security"), refundable after issue of Letter of Award to the successful bidder. Bid Security in the case of the Selected Bidder shall be retained till the Bidder has provided a Performance Security under the Agreement.

4.6.2 The Bidders will have to provide BID Security in the form of Insurance Surety Bonds, Account Payee Demand Draft and Bank Guarantee/Surety Bond issued by any Nationalised / Scheduled Bank, approved by RBI, located in India, in favour of:

Managing Director,

Maharashtra Industrial Township Limited
Udyog Sarathi, MIDC Office,
Marol Industrial Area, Andheri (East)
Mumbai – 400 093

Bidders are required to scan the original BG/Insurance Surety Bonds and upload the same in the e-tendering portal of Employer along with technical proposal of BID. Original BG/Insurance Surety Bonds will have to be submitted to the Employer's as per clause 5 [Submission of Bids].BG must specify contact details / email address where BG can be sent for verification.

Any Bid not accompanied by the Bid Security will be rejected. BG must specify contact details where BG can be sent for verification. Employer, if desired, will get the Bank Guarantee/Surety Bond submitted for Bid Security verified from the bank. In case the verification reveals that the submitted Bank Guarantee/Surety Bond is fraudulent, Employer reserves the right to reject the BID.

The validity period of the Bank Guarantee/Surety Bond shall not be less than 180 (one hundred and eighty) days from the Bid Due Date with a claim period of 60 (sixty) days from the date of expiry., and may be extended as may be mutually agreed between Employer and the Bidder from time to time. The format of the Bank Guarantee/Surety Bond shall be

in accordance with the sample form of bid security included in this document. The Bank Guarantee/Surety Bond must specify its Mumbai branch & address where the Bank Guarantee/Surety Bond can be encashed.

4.6.3 Bank Details of Employer required for Tender fee, Bid Security:

Name of A/C: Maharashtra Industrial Township Limited
Account No. : 43868319645
Name of Bank: State Bank of India
Brach Name : MIDC Andheri(E), Mumbai
IFSC Code : SBIN0007074
MICR Code : 400002057

4.6.4 The Bid shall be summarily rejected if it is not accompanied by the BID Security.

4.6.5 The Bid securities of unsuccessful Bidders will be returned not later than 15 days after the issue of Letter of Award to the successful bidder.

4.6.6 The Bid security of the successful Bidder will be returned when the Bidder has signed the Agreement and furnished the required performance security.

4.6.7 The Bid security may be forfeited:

- if the Bidder withdraws its Bid during the period of bid validity; or
- if the Bidder does not accept the correction of its bid price in case of any arithmetic errors
- in the case of a successful Bidder, if it fails within the specified time limit to:
  i. sign the Agreement, or
  ii. furnish the required performance security, or
- if the Bidder is determined, at any time prior to the award of contract, to have engaged in corrupt or fraudulent practices in competing for the Contract; or in giving effect to any other provisions given in the Instructions to Bidders.

4.7 Alternative Proposals by Bidders

Alternative proposals will not be considered.

4.8 Format and Signing of Bid

4.8.1 The Bidder shall provide all the information sought under this RFQ cum RFP. The Employer will evaluate only those BIDs that are received online in the required formats and complete in all respects and Bid Security, processing fee and POA are received in hard copies. Incomplete and/or conditional Bids shall be liable to rejection.

4.8.2 The Bid shall be typed or written in indelible ink and shall be signed and sealed by a person or persons duly authorized to sign on behalf of the bidder who shall also initial each page, in blue ink. All pages of the bid and all entries where amendments have been made shall be initialled by the person or persons signing the bid.

4.8.3 The Bid shall contain no alterations, omissions or additions, except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the bidder, in which case such corrections shall be numbered and initialled by the person or persons signing the Bid.

5. SUBMISSION OF BIDS

5.1 Sealing and Marking of Bids

5.1.1 The Bidder shall submit the Technical and Financial Bid online through e-procurement portal. Bidder's technical proposal shall comprise of the following documents in the same order as per the formats provided in Vol 1 Part 6 [Forms of Tender], along with supporting documents as appropriate. All pages of the document should have Bidder's initial or signature.

Technical Bid

i. Bid Security
ii. Annexure I: Form of Bid
iii. Annexure II: Power of Attorney for Signing the Bid
iv. Annexure III: Financial Capacity Qualification Information – Annual Turnover and Net Worth
v. Annexure IV: Bank Certificate for Access to Lines of Credit
vi. Annexure V: Financial Capacity - Minimum Project Value
vii. Annexure VI: Technical Capacity - Project Qualification Information
viii. Annexure VII: Litigation/ Arbitration History
ix. Annexure VIII: List of Deviations
x. Annexure IX: Engineering and Construction Capacity
xi. Annexure X: List of Major items and Minor items for defect liability period.
xii. Appendix A: Form of Bid Security (Bank Guarantee)
xiii. Appendix C: Form of Bid Security (For Insurance Surety Bond)

Financial Bid

- Filled Price Bill of Quantities (Volume-2)
- Appendix B: Form of Performance Security (Bank Guarantee).
- Appendix D: Form of Performance Security (For Insurance Surety Bond)

5.1.2 The following document supporting the Bid shall be submitted (physically in a separate envelope) marked as "Enclosures of the Technical Bid". The documents shall include:

i. **Original Bid Security** for amount indicated in Notice Inviting RFQ cum RFP in the form of Insurance Surety Bond, Demand Draft or Original Bank Guarantee/Surety Bond in the prescribed format.
ii. **Original Power of Attorney** for signing the Bid as per format at Annexure II

5.1.3 The envelope containing enclosures of the Bid shall clearly bear the name and address of the Bidder and following identification **"Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar"** . In addition, the Bid Due Date should be indicated on the right-hand corner of each of the envelopes.

5.1.4 The envelope containing Enclosures of the Bid shall be addressed to Employer at the address indicated in Contract Data Sheet

5.1.5 If the envelope is not sealed and marked as instructed above, the Employer 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.

5.1.6 Bids submitted by -, telex, telegram or e-mail shall not be entertained and shall be rejected.

5.1.7 Technical proposal shall contain only technical information and no price information shall be included in the technical proposal. Failure to do this the bid will be considered non-responsive and will be rejected.

5.1.8 Only the information provided in 'Technical Bid' though online submission will be considered for evaluation. The information provided in 'Enclosures of the Bid' including additional information, if any will be for information purpose only. The information provided in 'Enclosures of the Bid' will not be used in lieu of missing information in the Technical Bid.

5.2 Deadline for Submission of Bids

5.2.1 Technical and Financial Bid comprising of the document listed at clause 5.1.1 of the ITB shall be submitted online through e-procurement portal on or before **Bid Due Date** indicated in **Contract Data Sheet.**

5.2.2 Documents listed at Clause 5.1.2 of the ITB shall be physically submitted on or before the Bid Due Date, at the address provided in Clause 5.1.4 mandatorily in the manner and form as detailed in RFQ cum RFP. A receipt thereof should be obtained from the person specified in Clause 5.1.4.

5.2.3 The bid submission would be considered to be complete only upon successful completion of both the online submission of the Technical and Financial Bid and physical copy submission of 'Enclosures of the Bid' before the Bid Due Date and Time indicated in **Contract Data Sheet, failing which the bid will not be considered.**

5.2.4 The Employer may, at its discretion, extend the deadline for submission of bids by issuing corrigendum in accordance, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will thereafter be subject to the deadline as extended.

5.3 Late Bids

Bids/ Enclosures of the Bid received physically by the Employer after the specified time on the BID Due Date shall not be eligible for consideration and shall be summarily rejected and will be returned unopened to the bidder.

5.4 Modification and Withdrawal of Bids

5.4.1 The Bidder may modify, substitute or withdraw its BID after submission, provided that written notice of modification, substitution or withdrawal is received by the Employer prior to BID Due Date. No BID shall be modified, substituted or withdrawn by the Bidder on or after the BID Due Date and Time.

5.4.2 For modification of e-BID, Bidder has to detach its old BID from e-procurement portal and upload / resubmit digitally signed modified BID. For withdrawal of BID, bidder has to click

on withdrawal icon at e-procurement portal and can withdraw its e-BID. Before withdrawal of a BID, it may specifically be noted that after withdrawal of a BID for any reasons, Bidder cannot re-submit e-BID again.

5.4.3 Any alteration/modification in the BID or additional information supplied subsequent to the BID Due Date, unless the same has been expressly sought for by the Employer, shall be disregarded.

6. BID OPENING AND EVALUATION

6.1 Bid Opening

6.1.1 The Employer shall open the Enclosures of the Technical Bids indicated in Clause 5 [Submission of Bids], in the presence of the Bidders who choose to attend. "If for any reason, the opening could not be done on Bid Due Date, the new date and the time of opening shall be communicated separately".

6.1.2 Technical Bids of those Bidders, who have not submitted their Bid online, shall not be considered for opening and evaluation.

6.1.3 The Employer will subsequently examine and evaluate Technical Bids in accordance with the provisions set out in Clause 2.3 [*Eligible Bidders*] and Clause 2.4 [*Qualification of the Bidder*]

6.1.4 Bidders are advised that qualification of Bidders will be entirely at the discretion of the Employer. Bidders will be deemed to have understood and agreed that no explanation or justification on any aspect of the Bidding Process or selection will be given.

6.1.5 To facilitate evaluation of Technical BIDs, the Employer may, at its sole discretion, seek clarifications in writing from any Bidder regarding its Technical BID. Such clarification(s) shall be provided within the time specified by the Employer for this purpose. Any request for clarification(s) and all clarification(s) in response thereto shall be in writing.

6.1.6 If a Bidder does not provide clarifications sought under Clause 6.1.5 above within the prescribed time, its Bid may be liable to be rejected. In case the Bid is not rejected, the Employer may proceed to evaluate the Bid by construing the particulars requiring clarification to the best of its understanding, and the Bidder shall be barred from subsequently questioning such interpretation of the Employer.

6.1.7 The Employer reserves the right to reject any Technical BID which is non-responsive as per clause no 6.4 [*Examination of Bids and Determination of Responsiveness*]and no request for alteration, modification, substitution or withdrawal shall be entertained by the Employer in respect of such BID

6.1.8 Any information contained in the Bid shall not in any way be construed as binding on the Employer, its agents, successors or assigns, but shall be binding on the Bidder if the Project is subsequently awarded to him on the basis of such information.

6.1.9 The Employer reserves the right not to proceed with the Bidding Process at any time without notice or liability and to reject any or all Bid(s) without assigning any reasons.

6.1.10 If any information furnished by the Bidder is found to be incomplete, or contained in formats other than those specified herein, the Employer may, in its sole discretion, exclude the relevant project from computation of the Eligible Score of the Bidder.

6.1.11 In the event that a Bidder claims credit for an Eligible Project, and such claim is determined by the Employer as incorrect or erroneous, the Employer shall reject such claim and exclude the same from computation of the Eligible Score, and may also, while computing the aggregate Experience Score of the Bidder, make a further deduction equivalent to the claim rejected hereunder. Where any information is found to be patently false or amounting to a material misrepresentation, the Employer reserves the right to reject the Bid.

6.1.12 The Employer will get the BID security verified from the issuing authority and after due verification, the Authority will evaluate the Technical BIDs for their compliance to the eligibility and qualification requirements pursuant to Clause 2.3 [*Eligible Bidders*] and Clause 2.4 [*Qualification of the Bidder*] of this RFQ cum RFP.

6.1.13 After evaluation of Technical Bids, the Employer will publish a list of technically responsive Bidders whose financial Bids shall be opened. The Employer shall notify other Bidders that they have not been technically responsive. The Employer will not entertain any query or clarification from Applicants who fail to qualify.

6.1.14 The Employer shall inform the venue and time of online opening of the Financial Bids to the technically responsive Bidders through e-procurement portal of the Employer and e-mail. The Employer shall online open the Financial Bids on date and time to be informed in this clause in the presence of the authorised representatives of the Bidders who may choose to attend. The Employer shall publicly announce the Bid Price quoted by the technically responsive Bidder. The Employer shall prepare a record of opening of Financial Bids.

6.2 Process to be Confidential

Information relating to the examination, clarification, evaluation and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award of the successful Bidder is announced. Any effort by a Bidder to influence the Employer's processing of Bids or award decisions may result in rejection of the Bidder's Bid.

6.3 Clarification of Bids and Contacting Employer

6.3.1 To facilitate evaluation of Bids, the Employer may, at its sole discretion, seek clarifications from any Bidder regarding its Bid. Such clarification(s) shall be provided within the time specified by the Employer for this purpose. Any request for clarification(s) and all clarification(s) in response thereto shall be in writing but no change in the price or substance of the bid shall be sought, offered or permitted, except to get additional information to fully understand the proposals of the bidder and to confirm that the requirements of the bidding documents will be met.

6.3.2 The request shall be answered promptly within the time stipulated in the request. Failure to respond promptly may result in the technical proposal being deemed not to be substantially responsive.

6.3.3 In case the Bid is not rejected, the Employer may proceed to evaluate the Bid by construing the particulars requiring clarification to the best of its understanding, and the Bidder shall be barred from subsequently questioning such interpretation of the Employer.

6.4 Examination of Bids and Determination of Responsiveness

6.4.1 Prior to evaluation of Bids, the Employer shall determine whether each Bid is responsive to the requirements of the RFP and has been properly signed.

6.4.2 A substantially responsive Bid is one which conforms to all the terms, conditions and specifications of the Bidding documents, without material deviation or reservation. The material deviation or reservation would be implied by any of the following assumption/condition/criteria.

- which affects the scope, quality or performance of the works in any substantial way;

which is inconsistent with the Bidding documents and/or limits the Employer's rights or the Bidder's obligations under the Contract in any substantial way;

whose rectification would unfairly affect the competitive position of other Bidders presenting substantially responsive bids.

6.4.3 The prerequisite condition for determining substantial responsiveness of the Bid are:

- it is received by the Bid Due Date including any extension thereof
- it is accompanied by the Bid Security for the required value as per the format
- it contains all the information and documents (complete in all respects) as requested in this RFQ cum RFP;
- it contains certificates from its Practicing Charted Accountant/Firm in the formats specified;
- it does not contain any condition or qualification; and
- it is not non-responsive in terms hereof.

6.4.4 The Employer reserves the right to reject any Bid which is non-responsive and no request for alteration, modification, substitution or withdrawal shall be entertained by the Employer in respect of such Bid.

6.5 Correction of Errors

Bids determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errors will be corrected by the Employer as follows:

- where there is a discrepancy between the rates in figures and in words, the lower of the two will govern; and
- where there is a discrepancy between the unit and the line-item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern.

6.5.1 The amount stated in the Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and, with the concurrence of the Bidder, be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount the Bid will be rejected, and the Bid security may be forfeited in accordance with Bid Security Clause.

6.6 Evaluation and Comparison of Technical Proposals

6.6.1 The 'Enclosure of the Bid' will be opened in the presence of Bidder's authorized representatives who are present during the opening of the said part.

6.6.2 Evaluation of technical proposal documents will be taken up only for those Bids which are determined as substantially responsive Bid. Prior to detailed evaluation of the documents, Employer shall examine the documents to determine whether they are complete, whether the documents have been properly signed, and whether the Bids are generally in order.

6.6.3 The information contained in the technical proposal shall prevail during technical and financial evaluation of Bids and shall be binding on the contractor post award of work. In case any data / information is missing from the above listed documents and is likely to have financial implication, Employer reserves the right to load the financial Bid submitted by the Bidder.

6.6.4 If the information given in the technical proposal is determined to be incomplete by Employer, the Employer reserves the right to reject the Bid without assigning any reason thereof.

6.7 Clarification of Technical Proposals

6.7.1 Employer may conduct clarification meetings with each or any Bidder to discuss any matters, technical or otherwise, where Employer requires amendments or changes to be made to the Technical Proposal or conditions required to bring all the Bidders at par.

6.7.2 Where amendments or changes are required by Employer, Bidders will be requested in writing to adjust their Technical Proposals accordingly and submit a revised Technical Proposal and supplementary price proposal within the time and date to be decided later on.

6.8 Evaluation and Comparison of Price Proposals

6.8.1 Employer will evaluate and compare only the Bids determined to be substantially responsive in accordance with above mentioned clause.

6.8.2 In evaluating the Bids, the Employer will determine for each Bid the evaluated Bid Price by adjusting the Bid Price as follows:

- Making any correction for errors pursuant to Correction of Errors; or
- Making an appropriate adjustment for any other acceptable variations, deviations; and

- Making appropriate adjustments to reflect discounts or other price modifications offered in accordance with Correction of Errors clause.

6.8.3 The Employer reserves the right to accept or reject any variation, deviation offer. Variations, deviations, and other factors, which are in excess of the requirements of the Bidding documents or otherwise result in unsolicited benefits shall not be taken into account in Bid evaluation.

6.8.4 The estimated effect of the price adjustment conditions under will not be taken into account for Bid evaluation.

7. AWARD OF CONTRACT

7.1 Award Criteria

Subject to Clause 7.2, the Employer will award the Contract to the Bidder whose Bid has been determined to be substantially responsive to the Bidding documents and who has offered the Lowest Evaluated Bid Price considering cost, provided that such bidder has been determined to be (i) eligible in accordance with the provisions of clause 2.3; (ii) qualified in accordance with the provisions of Clause 2.4; and has submitted substantially responsive Technical Proposals in accordance with clause 6.4.

7.2 Employer's Right to Accept any Bid and to Reject any or all Bids

Notwithstanding Clause 7.1, the Employer reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids, at any time prior to award of Contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the grounds for the Employer's action.

7.3 Notification of Award

7.3.1 Prior to expiry of the period of bid validity prescribed by the Employer, the Employer will notify the successful bidder by email or - confirmed by registered letter that its bid has been accepted. This letter (hereinafter and in the Conditions of Contract called the "Letter of Award" (LOA) shall name the sum which the Employer will pay the Contractor in consideration of the execution, completion of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Conditions of Contract called "the Contract Price").

7.3.2 The notification of award will constitute the formation of the Contract.

7.3.3 Upon furnishing by the successful Bidder of a performance security, the Employer will promptly notify the other Bidders that their Bids have been unsuccessful.

7.4 Signing of Agreement

7.4.1 At the same time that the Employer notifies the successful Bidder that its Bid has been accepted, the Employer will send the Bidder the Form of Agreement provided in the Bidding documents, incorporating all agreements between the parties.

7.4.2 Within 28 days of receipt of the Form of Agreement, the successful bidder shall sign the Form and return it to the Employer.

7.5 Performance Security

The successful bidder upon receipt of Letter of Award shall furnish to the Employer performance security in prescribed format in the form of DD/BG/Insurance Surety Bond for an amount specified in the Contract Data Sheet in accordance with the Conditions of Contract. The Performance Security shall be submitted by the successful bidder within stipulated time as indicated in Contract Data Sheet. The Contractor shall initially provide the Performance Security for a period of five (5) years plus one (1) year claim period

Failure of the successful bidder to comply with the Contract requirements shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security.

Extension of Performance Security - The Contractor shall initially provide the Performance Security for a period of five (5) 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 Employer 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.

Release of Performance Security - The Employer shall return the Performance Security to the Contractor within 60 (sixty) days of the expiry of the claim Period under this Agreement. Notwithstanding the foresaid, the Parties agree that the Employer shall not be obliged to release the Performance Security until all Defects identified during the Defects Liability Period have been rectified.

7.6 Additional Performance Security

Recovery of additional Performance Security for the tenders received below the estimated cost

1) In case the contractor has quoted the offer for tender below the estimated cost, then the contractor shall have to pay additional Performance Security in the form of DD/BG/Insurance Surety Bond of the amount as mentioned below:

a) No additional performance security deposit will have to be paid if the tender offer is received up to 1% below the estimated cost, however if the offer quoted is 1.01 to 10% below the estimated cost, then the additional Performance Security amount shall be 1% of the estimated cost.

b) If the offer quoted is more than 10% below up to 15% below the estimated cost, then the additional performance security deposit shall be equal to the amount of percentage more than 10% below + the amount as per (a) above. (For example, if the tender received at 14% below, the additional performance security shall be – up to 10% = 1% + (14%-10%) = 1 + 4 = Total 5% of the estimated cost).

c) If the offer quoted is more than 15% below the estimated cost, then the additional

performance security deposit shall be equal to double the amount of percentage more than 15% below + 1% for each percentage beyond 10% up to 15% + the amount as per (a) above. (For example, if tender received at 19%below equal to for first 10% below 1% + (15-10=5) + 2 X (19-15=4)) =1% + 5% +8% = 14%).

2) The additional performance security shall be refunded to the contractor within 3 months. from the date of completion of work.

3) The validity of BG/Insurance Surety Bond of additional performance security is 3 months after intended date of completion of contract scope.

Request for Qualification cum Request for Proposal (RFQ cum RFP)

for

Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar.

VOLUME 1

PART 2 CONTRACT DATA SHEET

November 2026

Managing Director
Maharashtra Industrial Township Limited
(Formerly Known as AITL)
Udyog Sarathi, MIDC Office, Marol Industrial Area,
Andheri (East), Mumbai, Maharashtra State, India - 400093

Contents

1. CONTRACT DATA SHEET 2

1. CONTRACT DATA SHEET

Condition	Reference Clause	Data
1. Name of Works	Vol 1 Part 1 [ITB] Clause 2.1	**Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar.**
2. Employer's Name and Address	Vol 1 Part 4 [Conditions of Contract] Clause 1.1.38	Managing Director, Maharashtra Industrial Township Limited, Udyog Sarathi, MIDC Office, Marol Industrial Area, Andheri (East) Mumbai, Maharashtra State, India – 400093
3. Contractor's Name and Address	Vol 1 Part 4 [Conditions of Contract] Clause 1.1.26	[*to be filled by the intending bidder*]
4. Bid Due Date (BDD) and Time	Vol 1 Part 1 [ITB] Clause 5.2 [Deadline for Submission of Bids]	02.12.2026 @ 1500 Hrs
5. Amount of Bid Security	Vol 1 Part 1 [ITB] Clause 4.6 [*Bid Security*]	Rs. 21,000/- (Rupees Twenty One Thousand Only)
6. Date and Venue of Pre-bid Meeting	Vol 1 Part 1 [ITB] Clause 1.4 [Pre-bid Meeting and Pre-bid Clarifications]	Date: 25th November 2026 @ 14:30 hrs. Venue: Same as Employer name and address indicated above. If any bidder intends to attend online pre bid meeting through MS team platform, the prospective bidder shall request through email for acceptance of his online attendance via MS team
7. Address for Correspondence and Pre-bid Queries	Vol 1 Part 1 [ITB] Clause 1.4 [Pre-bid Meeting and Pre-bid Clarifications] and Clause 5 [Submission of Bids]	Same as Employer name and address indicated above.
8. Time for Completion of the Works	Vol 1 Part 1 [ITB] Clause 2.1 and Vol 1 Part 4 [Conditions of Contract] Clause 4.4 and Clause 4.5	Sixty (60) days from the date of issue of Letter of Award (LOA).
9. Defects Liability Period	Vol 1 Part 4 [Conditions of Contract] Clause 1.1.31	5 Years (five Years) for major items and 1 year (One year) for minor items supplied by the contractor, from the date of commissioning of the item.
10. Total Contract Period	Vol 1 Part 4 [Conditions of Contract]	Sixty (60) days from the date of Letter of Award.
11. Project Start date	Vol 1 Part 4 [Conditions of Contract] Clause 7.1	Date of issue of Letter of Award by the Employer.

Condition	Reference Clause	Data
12. Project Plan and Schedule	Vol 1 Part 4 [Conditions of Contract] Clause 4.1 [Obligations prior to commencement of Works]	The Contractor shall submit project plan and schedule along with Bid Submission.
13. Performance Security Amount	Vol 1 Part 1 [ITB] Clause 3.2, 3.3., 3.4, 3.5 [Performance Security]	The amount of Performance Guarantee shall be equal to 5% of the Contract Price and it shall be valid till 60 days after the completion of the Defects Liability period.
14. Time for submission of Performance Security	Vol 1 Part 1 [ITB] Clause 3.2, 3.3., 3.4, 3.5 [Performance Security]	Within 7 days from date of issue of Letter of Award.
15. Delay Damages		
a) Rate of Delay Damages	Vol 1 Part 4 [Conditions of Contract] Clause 7.3	Contractor shall pay Damages to the Employer of a sum calculated at the rate of 0.05% (zero-point zero five percent) of the balance work for delay of each week reckoned from the date specified in accepted base line schedule and until works are completed
b) Maximum Delay Damages	Vol 1 Part 4 [Conditions of Contract] Clause 7.3	10% of accepted Contract Price.
16. Percentage of retention of the Works	Vol 1 Part 4 [Conditions of Contract] Clause 3.6	6% (six percent) of the amount of all Interim Payment Certificates for the Works Contract portion of the Contract.
17. Limit of Retention Money for Part 1 of the Works	Vol 1 Part 4 [Conditions of Contract] Clause 3.6	5% (five percent) of the Works Contract Price, excluding any Provisional Sums.
18. Validity of Insurance Policies as defined in Contract Clauses	Vol 1 Part 4 [Conditions of Contract] Clause 12	All the insurances shall be valid throughout the period of Contract including DLP Period.
19. Periods of submission of insurance: • evidence of insurance • Relevant policies	Vol 1 Part 4 [Conditions of Contract] Clause 12	7 days from date of Letter of Award
20. Maximum total liability of the Contractor to the Employer	Vol 1 Part 4 [Conditions of Contract] Clause 11.6.2	Equal to accepted Contract Price
21. Email address for Pre-Bid Queries		Mr. Rahul Borikar, DGM(Electrical) E- Mail- dgmelecpra@mitl.org.in
22. Contact & Email Address for site visit		Mr. Shankar Shinde, GM, Electrical (Project) E- Mail- eeelec@mitl.org.in

Request for Qualification cum Request for Proposal (RFQ cum RFP)

for

Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar.

VOLUME 1

PART 3 FORM OF CONTRACT AGREEMENT

November 2026

Managing Director
Maharashtra Industrial Township Limited
Udyog Sarathi, MIDC Office, Marol Industrial Area,
Andheri (East), Mumbai, Maharashtra State, India - 400093

FORM OF CONTRACT AGREEMENT

This Agreement made this day of_____ , 2026, Maharashtra Industrial Township Limited, represented by the Managing Director, Maharashtra Industrial Township Limited, Udyog Sarathi, MIDC Office, Marol Industrial Area, Andheri (East), Mumbai, Maharashtra State, India – 400093, India, (hereinafter called "the Employer") of the one part and_____ of (hereinafter called "the Contractor") of the other part.

Whereas the Employer desires that the Works known as the **"Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar."** should be executed by the Contractor, and has accepted a Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein.

The Employer and the Contractor agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement:
   a) the Contract Agreement;
   b) the Letter of Award;
   c) Corrigendum / addendums / Response to Pre-bid queries
   d) the Bid (the accepted Price Proposal)
   e) Contract Data sheet;
   f) the Conditions of Contract,
   g) the Tender Drawings;
   h) the Technical Specifications
   i) the Bill of Quantities
   j) the Bidder's Technical Proposal,
   k) any other document forming the part of the Contract
3. In consideration the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in the constructed facility, in conformity in all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor, in consideration of the execution and completion of the Works and the remedying of defects therein in the Constructed facility, the Contract Price Rs …….. (In Words _____) or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

In Witness whereof the parties hereto have caused this Agreement to be executed the day and year first before written in accordance with their respective laws.

Authorized signature of contractor seal (if any) in the presence of:	Authorized signature of Employer seal (if any) in the presence of:
Name: _____	Name: _____
Signature:_____	Signature:_____
Address: _____	Address: _____

Request for Qualification cum Request for Proposal (RFQ cum RFP)

for

Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar.

VOLUME 1

PART 4 CONDITIONS OF CONTRACT

November 2026

Managing Director
Maharashtra Industrial Township Limited
Udyog Sarathi, MIDC Office, Marol Industrial Area,
Andheri (East), Mumbai, Maharashtra State, India - 400093

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1. GENERAL PROVISIONS

1.1 Definitions

In this Agreement, the following words and expressions shall, unless repugnant to the context or meaning thereof, have the meaning hereinafter respectively assigned to them:

1.1.1 "**Accounting Year**" means the financial year commencing from the first day of April of any calendar year and ending on the thirty-first day of March of the next calendar year.

1.1.2 "**Advance Payment**" shall have the meaning set forth in the recitals.

1.1.3 "**Affected Party**" shall have the meaning set forth in the recitals.

1.1.4 "**Affiliate**" means, in relation to either Party {and/or Members}, a person who controls, is controlled by, or is under the common control with such Party {or Member} (as used in this definition, the expression "control" means, with respect to a person which is a company or corporation, the ownership, directly or indirectly, of more than 50% (fifty per cent) of the voting shares of such person, and with respect to a person which is not a company or corporation, the power to direct the management and policies of such person, whether by operation of law or by contract or otherwise).

1.1.5 "**Agreement**" means this Agreement, its Recitals, the Schedules hereto and any amendments thereto made in accordance with the provisions contained in this Agreement.

1.1.6 "**Applicable Laws**" means all laws, brought into force and effect by GOI or the State Government including rules, regulations and notifications made there under, and judgments, decrees, injunctions, writs and orders of any court of record, applicable to this Agreement and the exercise, performance and discharge of the respective rights and obligations of the Parties hereunder, as may be in force and effect during the subsistence of this Agreement.

1.1.7 "**Applicable Permits**" means all clearances, licenses, permits, authorizations, no objection certificates, consents, approvals and exemptions required to be obtained or maintained under Applicable Laws in connection with the construction, operation and maintenance of the Project Works during the subsistence of this Agreement.

1.1.8 "**Appointed Date**" means that date of issue of Letter of Award (LOA).

1.1.9 "**Arbitration Act**" means the Arbitration and Conciliation Act, 1996 and shall include modifications to or any re-enactment thereof, as in force from time to time.

1.1.10 "**Bank**" means any Nationalised /Scheduled bank incorporated in India and having a minimum net worth of Rs. 1,000 crores (Rupees one thousand crore) or any other bank acceptable to the Employer.

1.1.11 "**Bank Rate**" means the Repo rate of interest announced by the Reserve Bank of India for all its lending operations on the Base Date.

1.1.12 "**Base Date**" means the last date of that calendar month, which date precedes the Bid Due Date by at least 28 (twenty-eight) days.

1.1.13 "**Bid**" means the documents in their entirety comprised in the bid submitted by the [selected bidder/Consortium] in response to the Request for Qualification cum Request for Proposals in accordance with the provisions thereof.

1.1.14 "**Bid Security**" means the Bid Security provided by the Contractor to the Employer in accordance with the Request for Proposal, and which is to remain in force until substituted by the Performance Security.

1.1.15 "**Bill of Quantities**" means the priced and completed Bill of Quantities forming part of the Bid.

1.1.16 "**Change in Law**" means the occurrence of any of the following after the Base Date:

a) the enactment of any new Indian law.

b) the repeal, modification or re-enactment of any existing Indian law;

c) the commencement of any Indian law which has not entered into effect until the Base Date.

d) a change in the interpretation or application of any Indian law by a judgment of a court of record which has become final, conclusive and binding, as compared to such interpretation or application by a court of record prior to the Base Date; or

e) any change in the rates of any of the Taxes or royalties that have a direct effect on the Project.

1.1.17 "**Change of Scope**" shall have the meaning set forth in the recitals;

1.1.18 "**Change of Scope Notice**" shall have the meaning set forth in the recitals;

1.1.19 "**Change of Scope Order**" shall have the meaning set forth in the recitals;

1.1.20 "**Completion Certificate**" shall have the meaning set forth in the recitals;

1.1.21 "**Construction**" shall have the meaning set forth in the recitals;

1.1.22 "**Construction Period**" means the period commencing from the Appointed Date and ending on the date of the Completion Certificate;

1.1.23 "**Contract**" means the Contract Agreement, the Letter of Award, the Form of Bid, Conditions of Contract, Contract Data Sheet, Employer's Requirements, General Specifications, Schedules and Datasheets, Indicative Tender Drawings and the further documents (if any) which are listed in Contract Agreement or in the Letter of Award,

1.1.24 "**Contract Price**" means the amount specified in the recitals;

1.1.25 "**Contractor**" means the person(s) named as contractor in the Form of Bid whose tender has been accepted by the Employer and the legal successors in title to this person(s).;

1.1.26 "**Contractor's Personnel**" means the Contractor's Representative and or authorised signatory of the agreement are contractor's personnel and all personnel who may include the staff, labour, other employees of the Contractor, personnel utilised by contractor on Site, are secondary personnel ; and any other personnel assisting the Contractor in the execution of the Works

1.1.27 "**Labour contractor**" means any person appointed by Contractor for supply of labours for any part of the Works; and the legal successors in title to each of these persons.

1.1.28 "**Contractor Default**" shall have the meaning set forth in the recitals;

1.1.29 "**Damages**" shall have the meaning set forth in the recitals;

1.1.30 "**Defect**" means any defect or deficiency in Construction of the Works or any part thereof, which does not conform with the Specifications and Standards, and in the case of Maintenance, means any defect or deficiency which is specified in Volume-1-Part-5: Particular Conditions of Operation & Maintenance (~~O&M~~);

1.1.31 "**Defects Liability Period**" shall have the meaning set forth in the recitals;

1.1.32 "**Dispute**" shall have the meaning set forth in the recitals;

1.1.33 "**Dispute Resolution Procedure**" means the procedure for resolution of Disputes set forth in the recitals;

1.1.34 "**Drawings**" means all of the drawings, calculations and documents pertaining to the Project Works as set forth in Volume-3, and shall also include 'as built' drawings of the Project Works;

1.1.35 "**Document**" or "**Documentation**" means documentation in printed or written form, or in tapes, discs, drawings, computer programmes, writings, reports, photographs, films, cassettes, or expressed in any other written, electronic, audio or visual form;

1.1.36 "**Emergency**" means a condition or situation that is likely to endanger the safety or security of the individuals on or about the Project Works, including Users thereof, or which poses an immediate threat of material damage to any of the Project Assets;

1.1.37 "**Employer**" means the entity/person named as employer in the Contract Data sheet and the legal successors in title to this person.

1.1.38 "**Employer Default**" shall have the meaning set forth in the recitals;

1.1.39 "**Employer's Engineer**" means the person appointed by the Employer from time to time to act as the Engineer;

1.1.40 "**Employer's Personnel**" means such person or persons as may be authorized in writing by the Employer to act on its behalf under this Agreement and shall include any person or persons having Employer to exercise any rights or perform and fulfil any obligations of the Employer under this Agreement;

1.1.41 "**Encumbrances**" means, in relation to the Project Works, any encumbrances such as mortgage, charge, pledge, lien, hypothecation, security interest, assignment, privilege or priority of any kind having the effect of security or other such obligations, and shall include any designation of loss payees or beneficiaries or any similar arrangement under any insurance policy pertaining to the Project Works, where applicable herein but excluding utilities referred to in the recitals;

1.1.42 "" means Engineering, Procurement and Construction;

1.1.43 "**DBO**" means Design Build and Operate

1.1.44 "**Final Payment Certificate**" shall have the meaning set forth in the recitals;

1.1.45 "**Final Payment Statement**" shall have the meaning set forth in the recitals;

1.1.46 "**Force Majeure**" or "**Force Majeure Event**" shall have the meaning ascribed to it in the recitals;

1.1.47 "**GOI**" or "**Government**" means the Government of India;

1.1.48 "**Good Industry Practice**" means the practices, methods, techniques, designs, standards, skills, diligence, efficiency, reliability and prudence which are generally and reasonably expected from a reasonably skilled and experienced contractor engaged in the same type of undertaking as envisaged under this Agreement;

1.1.49 "**Government Instrumentality**" means any department, division or subdivision of the Government or the State Government and includes any commission, board, Employer, agency or municipal and other local Employer or statutory body including panchayat under the control of the Government or the State Government, as the case may be, and having jurisdiction over all or any part of the Project Works or the performance of all or any of the services or obligations of the Contractor under or pursuant to this Agreement;

1.1.50 "**Indemnified Party**" means the Party entitled to the benefit of an indemnity pursuant to the recitals;

1.1.51 "**Indemnifying Party**" means the Party obligated to indemnify the other Party pursuant to the recitals;

1.1.52 "**Insurance Cover**" means the aggregate of the maximum sums insured under the insurances taken out by the Contractor pursuant to Clause 12, and includes all insurances required to be taken out by the Contractor under relevant sub clauses of Clause 12 but not actually taken, and

when used in the context of any act or event, it shall mean the aggregate of the maximum sums insured and payable or deemed to be insured and payable in relation to such act or event;

1.1.53 "**Intellectual Property**" means all patents, trademarks, service marks, logos, get-up, trade names, internet domain names, rights in designs, blue prints, programmes and manuals, drawings, copyright (including rights in computer software), database rights, semi-conductor, topography rights, utility models, rights in know-how and other intellectual property rights, in each case whether registered or unregistered and including applications for registration, and all rights or forms of protection having equivalent or similar effect anywhere in the world;

1.1.54 "**Interim Payment Certificate**" or "**IPC**" means the interim payment certificate issued by the Employer's Engineer for payment to the Contractor in respect of Contractor's claims for payment raised in accordance with the provisions of this Agreement;

1.1.55 "**LOA**" or "**Letter of Award**" means the letter of award referred to in Recital (E);

1.1.56 "**Material Adverse Effect**" means a material adverse effect of any act or event on the ability of either Party to perform any of its obligations under and in accordance with the provisions of this Agreement and which act or event causes a material financial burden or loss to either Party;

1.1.57 "**Major Materials and Minor Materials**" are all the supplies used by the Contractor for incorporation in the Works or for the maintenance of the Project Works;

1.1.58 "**Parties**" means the parties to this Agreement collectively and "Party" shall mean any of the parties to this Agreement individually;

1.1.59 "**Performance Security**" shall have the meaning set forth in the recitals;

1.1.60 "**Plant**" means the apparatus and machinery intended to form or forming part of the Works;

1.1.61 "**PMNC**" shall mean Project/Program Management Consultant appointed by Employer

1.1.62 "**Programme**" shall have the meaning set forth in the recitals;

1.1.63 "**Project**" means the Supply, installation, Testing & commissioning of 33 KV single circuit overhead line as stated in contract data sheet in accordance with the provisions of this Agreement, and includes all works, services and equipment relating to or in respect of the Scope of the Project;

1.1.64 "**Project Assets**" means all physical and other assets relating to (a) tangible assets such as civil works and equipment including foundations, civil tanks and structures, buildings, process control hardware and software, electro-mechanical equipment, piping, valves, electrical equipment, cables and motor control centres, field instruments and control system, drainage works (b) Project Facilities situated on the Site;

1.1.65 "**Project Completion Date**" means the date on which the Provisional Certificate is issued and, in the event, no Provisional Certificate is issued, the date on which the Completion Certificate is issued;

1.1.66 "**Project Completion Schedule**" means the progressive Project Milestones set forth in Bid Documents for completion of the Project Works on or before the Scheduled Completion Date;

1.1.67 "**Quality Assurance Plan**" or "**QAP**" shall have the meaning set forth in the recitals;

1.1.68 "**Re.", "Rs.**" or "**Rupees**" or "**Indian Rupees**" means the lawful currency of the Republic of India;

1.1.69 "**Retention Money**" shall have the meaning set forth in Clause3.6;

1.1.70 "**Right of Way**" means the constructive possession of the Site free from encroachments and encumbrances, together with all way leaves, easements, unrestricted access and other rights of way, howsoever described, necessary for construction and maintenance of the Project Works in accordance with this Agreement;

1.1.71 "**Scheduled Completion Date**" shall have the meaning set forth in the recitals;

1.1.72 "**Scope of the Project**" shall have the meaning set forth in Clause 1.6; "Section" means a part of the Project Works;

1.1.73 "**Site**" shall have the meaning set forth in Clause 1.7;

1.1.74 "**Specifications and Standards**" means the specifications and standards relating to the quality, quantity, capacity and other requirements for the Project Works, as set forth in, Volume-2– Technical Specifications, Volume-3- Drawings, Volume-4 – Bill of Quantities (BOQ) and other relevant parts of the tender and any modifications thereof, or additions thereto, as included in the design and engineering for the Project Works submitted by the Contractor to, and expressly approved by the Employer;

1.1.75 "**Subcontractor**" means any person or persons to whom a part of the Works or the Maintenance has been assigned for completion/execution/operation by the Contractor and the permitted legal successors in title to such person, but not an assignee to such person;

1.1.76 "**Taxes**" means any Indian taxes including GST (Goods and service tax), excise duties, customs duties, value added tax sales tax, local taxes, cess and any impost or surcharge of like nature (whether Central, State or local) on the goods, Materials, equipment and services incorporated in and forming part of the Project Works charged, levied or imposed by any Government Instrumentality, but excluding any interest, penalties and other sums in relation thereto imposed on any account whatsoever. For the avoidance of doubt, Taxes shall not include taxes on corporate income;

1.1.77 "**Termination**" means the expiry or termination of this Agreement as per Clause 10 [Termination];

1.1.78 "**Termination Notice**" means the communication issued in accordance with this Agreement by one Party to the other Party terminating this Agreement;

1.1.79 "**Termination Payment**" means the amount payable by either Party to the other upon Termination in accordance with Clause 10.8 [Termination Payment] ;

1.1.80 "**Tests**" means the tests set forth in Volume-2 – Technical Specifications to determine the completion of Works in accordance with the provisions of this Agreement;

1.1.81 "**Time Extension**" shall have the meaning set forth in Clause 4.6 [Extension of time for completion];

1.1.82 "**User**" means a person who uses or intends to use on the Project Works or any part thereof;

1.1.83 "**Valuation of Unpaid works**" shall have the meaning set forth in the recitals;

1.1.84 "MLDB" means Main Lighting Distribution Board.

1.2 Order of Precedence

The documents forming the Contract are to be taken as mutually explanatory of one another. For the purposes of interpretation, the priority of the documents shall be in accordance with the following sequence:

a) the Contract Agreement (if any),

b) the Letter of Award,

c) the Form of Bid,

d) the Contract Data Sheet,

e) the Conditions of Contract,

f) the Technical Specifications

g) the Tender Drawings,

h) the Bill of Quantities

i) the Schedules and any other documents listed in the Contract Data as forming part of the Contract.

If an ambiguity or discrepancy is found in the documents, the Engineer shall issue any necessary clarification or instruction.

1.3 Employer's Use of Contractor's Document

1.3.1 Contractor shall retain the copyright and other intellectual property rights in the Contractor's Documents and other design documents made by (or on behalf of) the Contractor.

1.3.2 The Contractor shall be deemed (by signing the Contract) to give to the Employer a non-terminable transferable non-exclusive royalty-free licence to copy, use and communicate the Contractor's Documents, including making and using modifications of them. This licence shall:

a) apply throughout the actual or intended working life (whichever is longer) of the relevant parts of the Works,

b) entitle any person in proper possession of the relevant part of the Works to copy, use and communicate the Contractor's Documents for the purposes of completing, operating, maintaining, altering, adjusting, repairing and demolishing the Works, and

c) in the case of Contractor's Documents which are in the form of computer programs and other software, permit their use on any computer on the Site and other places as envisaged by the Contract, including replacements of any computers supplied by the Contractor.

1.3.3 All the rights to the Construction Documents and other design documents are to be assigned to the Employer.

1.4 Contractor's Use of Employer's Document

1.4.1 Employer shall retain the copyright and other intellectual property rights in the Specification, the Drawings and other documents made by (or on behalf of) the Employer. The Contractor may, at his cost, copy, use, and obtain communication of these documents for the purposes of the Contract. They shall not, without the Employer's consent, be copied, used or communicated to a third party by the Contractor.

1.5 Confidentiality

1.5.1 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 Employer.

1.6 Scope of the Project

1.6.1 Under this Agreement, the scope of the Project (the "Scope of the Project") shall mean and include the relevant section described in the Volume-1-Part-1-Instruction to Bidders, Section 1.1 Project Information

1.7 Site

1.7.1 The site of the Project Works (the "Site") shall comprise the site described in Volume-1-Part-1-Instruction to Bidders, Section 1.1 Project Information

1.8 Inspections and Audit

1.8.1 The Employer or any representative authorized by the Employer in this behalf may inspect and review the progress and quality of the construction of Project Works and issue appropriate directions to the Employer's Engineer and the Contractor for taking remedial action in the event the Works are not in accordance with the provisions of this Agreement.

1.8.2 At any time during construction, the Employer 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 Employer, shall be notified to the Contractor and the Employer'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 1.8, the external technical audit shall not affect any obligations of the Contractor or the Employer's Engineer under this Agreement.

2. THE ENGINEER

2.1 Appointment of the Employer's Engineer

2.1.1 The Employer (MITL) shall appoint a the "**Employer's Engineer or Engineer-in-charge**"

2.1.2 The Employer's Engineer may exercise the authority attributable to the Engineer as specified or implied from the Contract. However, under no circumstances the Employer's Engineer shall have authority to modify or amend the Contract.

2.1.3 Except as otherwise stated in these Conditions, whenever carrying out duties or exercising authority, specified in or implied by the Contract, the Engineer shall be deemed to act for the Employer;

2.1.4 Except as otherwise stated in these Conditions, the Engineer has no authority to relieve the contractor of any duties, obligations or responsibilities under the Contract;

2.1.5 Except as otherwise stated in these Conditions, any approval, consent, test, inspection, authorisation or absence of approval shall not relieve the Contractor from any responsibility he has under the Contract, including responsibility for errors, defect liability, omissions, discrepancies and non-compliances.

2.1.6 The staff of the Employer's Engineer shall include suitably qualified engineers and other professionals who are competent to assist the Employer's Engineer to carry out its duties.

2.2 Duties and Authority of the Employer's Engineer

2.2.1 The Employer's Engineer may exercise the authority attributable to the Engineer as specified in or necessarily to be implied from the Contract. The Employer's Engineer shall perform the duties and exercise the Authority in accordance with the provisions of this Agreement.

2.3 Instructions of the Employer's Engineer

2.3.1 The instructions issued by the Employer's Engineer shall be in writing. All approvals/rejections of materials any plant visit etc carried out by the engineer or any changes w.r.t the scope of work shall be communicated to employer and approved by the employer.

However, if the Employer's Engineer issues any oral instructions to the Contractor, it shall confirm in writing the oral instructions within 2 (two) working days of issuing them.

2.3.2 In case the Contractor does not receive the confirmation of the oral instruction within the time specified in Clause 2.4.2, the Contractor shall seek the written confirmation of the oral instructions from the Employer's Engineer. The Contractor shall obtain acknowledgment from the Employer's Engineer of the communication seeking written confirmation. In case of failure of the Employer's Engineer or its delegated assistant to reply to the Contractor within 2 (two) days of the receipt of the communication from the Contractor, the Contractor may not carry out the instruction.

2.3.3 In case of any dispute on any of the instructions issued by the delegated representative, the Contractor may refer the dispute to the Employer's Engineer, who shall then confirm, reverse or vary the instructions within 5 (five) business days of the dispute being referred.

2.4 Determination by the Employer's Engineer

2.4.1 The Employer's Engineer shall consult with each Party in an endeavour to reach agreement wherever this Agreement provides for the determination of any matter by the Employer's Engineer. If such agreement is not achieved, the Employer's Engineer shall make a fair determination in accordance with this Agreement having due regard to all relevant

circumstances. The Employer's Engineer shall give notice to both the Parties of each agreement or determination, with supporting particulars.

2.4.2 Each Party shall give effect to each agreement or determination made by the Employer's Engineer in accordance with the provisions of this Agreement. Provided, however, that if any Party disputes any instruction, decision, direction or determination of the Employer's Engineer, the Dispute shall be resolved in accordance with the Dispute Resolution Procedure.

2.5 Remuneration of the Employer's Engineer

The remuneration, cost and expenses of the Employer's Engineer shall be paid by the Employer.

2.6 Termination of the Employer's Engineer

The Employer may, in its discretion, replace the Employer's Engineer at any time, in accordance with Clause 2.1.

3.THE CONTRACTOR

3.1 Contractor's General Obligations

3.1.1 The Contractor shall Investigate, execute and complete the Works and subsequently maintain it in during DLP accordance with the Contract and as per the Engineer-in-charge's instructions. The Contractor shall also remedy any defects whatsoever in the Works to the satisfaction of Engineer-in-charge and in accordance with the Contract.

3.1.2 The Contractor shall provide the Plant, Equipment, Services and Contractor's Documents specified in the Contract, and all Contractor's Personnel, Goods, consumables and other things and services, whether of a temporary or permanent nature, required in and for this design, execution, completion and remedying of defects.

3.1.3 The Contractor shall be responsible for the adequacy, stability and safety of all Site operations and of all methods of construction. Except to the extent specified in the Contract, the Contractor shall be responsible for all Contractor's Documents, Temporary Works, and such design of each item of Plant and Materials as is required for the item to be in accordance with the Contract.

3.1.4 The Contractor shall, whenever required by the Engineer, submit details of the arrangements and methods which the Contractor proposes to adopt for the execution of the Works. No significant alteration to these arrangements and methods shall be made without this having previously been notified to the Engineer.

3.1.5 If the Contract specifies that the Contractor shall design any part of the Permanent Works, then unless otherwise stated in the Particular Conditions:

a) the Contractor shall submit to the Engineer the Contractor's Documents for this part in accordance with the procedures specified in the Contract;

b) these Contractor's Documents shall be in accordance with the Specification and Drawings, shall be written in the language for communications as specified, and shall include additional information required by the Engineer-in-charge to add to the Drawings;

c) the Contractor shall be responsible for this part and it shall, when the Works are completed, be fit for such purposes for which the part is intended as are specified in the Contract; and

d) prior to the commencement of the Tests on Completion, the Contractor shall submit to the Engineer-in-charge the "as-built" documents and other documents as required in accordance with the Specification and in sufficient detail for the Employer to operate, maintain, dismantle, reassemble, adjust and repair this part of the Works. Such part shall not be considered to be completed for the purposes of taking-over until these documents have been submitted to the Engineer-in-charge for review and approval thereof.

3.2 Performance Security

3.2.1 The Contractor shall, for the performance of its obligations hereunder during the Construction Period, provide to the Employer, within time limit specified in the Contract Data Sheet, an irrevocable and unconditional guarantee from a Bank in the format set forth in Tender Forms for an amount equal to a percentage of the Contract Price as specified in the Contract Data Sheet.

3.2.2 The Performance Security shall be valid and enforceable the Contractor till he has executed and completed the Works and remedied any defects or until 60 (sixty) days after the Defects Liability Period.,.

3.2.3 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 Employer shall release the Bid Security to the Contractor. 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 this Clause 3.2 and within the time specified therein or such extended period as may be provided by the Employer, in accordance with the provisions of Clause , the Employer 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.

3.2.4 In the event the Contractor fails to provide the Performance Security within 15 (fifteen) days of this Agreement, it may seek extension of time for a period not exceeding 20 (twenty) days on payment of Damages for such extended period in a sum calculated at the rate of 0.05% (zero point zero five per cent) of the Contract Price for each day until the Performance Security is provided.

3.3 Extension of Performance Security

3.3.1 The Contractor shall initially provide the Performance Security for a period of 5 (five) years; provided that it shall procure the extension of the validity of the Performance Security, as necessary, at least 28 days prior to the date of expiry thereof.

3.3.2 If the terms of the Performance Security specify its expiry date, and the Contractor has not become entitled to receive the Performance Certificate by the date 28 days prior to the expiry date, the Contractor shall extend the validity of the Performance Security until the Works have been completed and any defects have been remedied.

3.3.3 Upon the Contractor providing an extended Performance Security, the previous Performance Security shall be deemed to be released and the Employer 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.

3.4 Appropriation of Performance Security

3.4.1 Upon occurrence of a Contractor's Default, the Employer 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.

3.4.2 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 Employer shall be entitled to terminate the Agreement in accordance with Clause titled 'Termination'. 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 Employer shall be entitled to encash and appropriate such Performance Security as Damages, and to terminate this Agreement in accordance with Clause 10 titled '**Termination'.**

3.5 Release of Performance Security

3.5.1 The Employer shall return the Performance Security to the Contractor within 60 (sixty) days of the later of the expiry of Defect Liability period (DLP) under this Agreement. Notwithstanding the aforesaid, the Parties agree that the Employer shall not be obliged to release the Performance Security until all Defects identified during the Defects Liability Period have been rectified. If the contractor fails to rectify the defect by itself due to any reason then the same will be carried out by the employer and amount required will be deducted from the above amount

3.6 Retention Money

3.6.1 The Employer shall retain from each payment due to the Contractor the proportion as stated in the Contract Data until Completion of the whole of the Works under Construction Contract 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 as stated in the Contract Data Sheet.

3.6.2 Upon occurrence of a Contractor's Default, the Employer 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.

3.6.3 Release of Retention Money

The retention money deducted from each RA Bills shall be released ‘without interest’ within 15 days of issue of Final Completion Certificate of the project by the Employers’ Engineer.

3.6.4 The Parties agree that in the event of Termination of this Agreement, the Retention Money and the bank guarantees specified in this Clause 3.6 shall be treated as if they are Performance Security and shall be reckoned as such for the purposes of Termination Payment under Clause 10.8.

3.7 Site Data

3.7.1 the Contractor shall be deemed to have obtained all necessary information as to risks, contingencies, site conditions and other circumstances which may influence or affect the Tender or Works. To the same extent, the Contractor shall be deemed to have inspected and examined the site, its surroundings, the above data and other available information, and to have been satisfied before submitting the Tender as to all relevant matters, including (without limitation):

a) the form and nature of the Site, including sub-surface conditions,

b) the hydrological, geotechnical, topographical and climatic conditions,

c) the extent and nature of the work and goods necessary for the execution and completion of the works and the remedying of any defects,

d) the Laws, procedures and labour practices of the Country, and

e) the Contractor’s requirements for access, accommodation, facilities, personnel, power, transport, water and other services.

3.8 Electricity, Water and Gas

The Contractor shall be responsible for procuring of all Power, Water and other services that it may require.

Contractor shall arrange and provide at his own cost electric connection of suitable load from local electricity supply agency and will also keep ready Generators of adequate capacity as stand by arrangement in case of electric failure during construction for running pump sets, vibrators, mixer, needle sets and electric set and other electrically operated Construction equipment etc. at his own cost.

The cabling for electric connection for Construction and testing shall be arranged by the Contractor himself at his own cost. The non-availability /sanction of electric connection shall be no excuse for delay in completion of work.

The Water required for all purposes including construction, testing purpose shall be arranged by Contractor at his cost.

3.9 Progress Reports

3.9.1 During the Construction Period, the Contractor shall, no later than 10 (ten) days after the close of each month, furnish to the Employer and the Engineer-in-charge a monthly report on progress of the Works and shall promptly give such other relevant information as may be required by the Engineer-in-charge. Soft copies of the reports also to be submitted.

3.9.2 Reporting shall continue until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.

3.9.3 Each report shall include:

a) charts and detailed descriptions of progress, including each stage of Contractor's Documents, procurement, manufacture, delivery to Site, construction, erection and testing; and including these stages for work by each nominated Subcontractor,

b) photographs/video showing the progress on the Site and status of manufacture;

c) for the manufacture of each main item of Plant and Materials, the name of the manufacturer, manufacture location, percentage progress, and the actual or expected dates of:

i. commencement of manufacture,

ii. Contractor's inspections,

iii. tests, and

iv. shipment and arrival at the Site;

d) copies of quality assurance documents, test results and certificates of Materials;

e) list of claims by any party;

f) Comparisons of actual and planned progress, with details of any events or anticipated risks that may inhibit the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome delays.

g) safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations;

3.10 Security of the Site

Unless otherwise stated:

a) the Contractor shall be responsible for keeping unauthorised persons off the Site, and

b) authorised persons shall be limited to the Contractor's Personnel and the Employer's Personnel; and to any other personnel notified to the Contractor, by the Employer or the Engineer, as authorised personnel of the Employer's other contractors on the Site.

3.11 Fossils

All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the Site shall be placed under the care and authority of the Employer. The Contractor shall take reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any of these findings.

The Contractor shall, upon discovery of any such finding, promptly give notice to the Engineer, who shall issue instructions for dealing with it. If the Contractor suffers delay and/or incurs Cost from complying with the instructions, the Contractor shall give a further notice to the Engineer and shall be entitled subject to claims for:

a) an extension of time for any such delay, if completion is or will be delayed, and

b) payment of any such Cost, which shall be included in the Contract Price.

4 CONSTRUCTIONS OF THE PROJECT WORKS

4.1 Obligations prior to commencement of Works

4.1.1

1. Contractor's organization for the Project, the general methods and arrangements for Construction, Quality Assurance Plan including, Safety Plan covering Safety of users and workers during Construction, Contractor's key personnel and equipment.
2. Programme for completion of all stages of Construction and Project milestones. The Programme shall include:

a. the order in which the Contractor intends to carry out the Works, including the anticipated timing of construction, Supply, Installation, Erection, Testing, Commissioning and various packages and stages of Works;

b. the periods for reviews;

c. the sequence and timing of inspections and tests specified in this Tender.

d. The Contractor shall submit a revised programme whenever the previous programme is inconsistent with the actual progress or with the Contractor's obligations.

3. Monthly Cash Flow Forecast
4. The Contractor shall appoint a qualified safety Officer with minimum 10 years' experience to carry out safety audit at the design stage of the Project Works in accordance with the Applicable Laws and Good Industry Practice.

4.1.2 The safety audit shall be carried out by the Safety officer in respect of all such design details that have a bearing on safety of Users as well as pedestrians and animals involved in or associated with accidents. The recommendations of the Safety Officer shall be incorporated in the design of the Project Works and the Contractor shall forward to the Employer's Engineer a certificate to this effect together with the recommendations of the Safety Officer.

4.2 Construction of the Project Works

4.2.1 The Contractor shall construct the Project Works as specified in Schedules and Datasheets in conformance Good For Construction (GFC) Drawings and Technical Specifications, Bill of Quantities (BOQ) and applicable standards prepared by him as per the requirement. The Contractor shall be responsible for the correct positioning of all parts of the Works, and shall rectify any error in the positions, levels, dimensions or alignment of the Works. The Contractor agrees and undertakes that the construction shall be completed within the Time for Completion of Works as indicated in Contract Data Sheet, including any extension thereof.

4.3 Scheduled Completion date

4.3.1 The Scheduled Completion Date for the construction of works shall occur on the last day of Time for Completion as indicated in the Contract Data Sheet. The progress shall be monitored as per time line given in the Contract Data Sheet. A grace period of 30 days shall be given for evaluating the work done. If the contractor does not achieve the milestones for the reasons attributable to him, then the Delay Damages shall be applicable as per the Contract data Sheet.

4.3.2 If the contractor completes the above said work within 60 days from the issuance of LoA the employer may give incentive up to 1% of contract value.

4.4 Extension of time for completion

4.4.1 Without prejudice to any other provision of this Agreement for and in respect of extension of time, the Contractor shall be entitled to extension time for Completion of Works (the "**Time Extension**") to the extent that completion of any Project Milestone is or will be delayed by occurrence of any of the following conditions, namely:

c) change of Scope (unless an adjustment to the Scheduled Completion Date has been agreed under Clause 4.6);

d) occurrence of a Force Majeure Event;

e) any delay, impediment or prevention caused by or attributable to the Employer, the Employer's personnel or the Employer's other contractors on the Site; and

4.4.2 The Contractor shall, no later than 15 (fifteen) business days from the occurrence of an event or circumstance specified in Clause 4.4.1, inform the Engineer-in-charge by notice in writing, with a copy to the Employer, 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.

4.4.3 In the event of the failure of the Contractor to issue to the Engineer-in-charge a notice in accordance with the provisions of Clause 4.4.2 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 4.4.2, the Employer shall be discharged from all liability in connection with the claim.

4.4.4 The Engineer-in-charge shall, on receipt of the claim in accordance with the provisions of Clause 4.4.2, examine the claim expeditiously within the time frame specified herein. In the event the Engineer-in-charge requires any clarifications to examine the claim, the Engineer-in-charge 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 Engineer-in-charge requesting for clarification, furnish the same to the Engineer-in-charge within 10 (ten) days thereof. The Engineer-in-charge shall, within a period of 60 (sixty) days from the date of receipt of such clarifications, forward in writing to the Contractor its determination of Time Extension.

Provided that when determining each extension of time under this Clause 4.4.2, the Engineer-in-charge shall review previous determinations and may increase, but shall not decrease, the total Time Extension.

4.4.5 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 Engineer-in-charge 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 Engineer-in-charge shall examine the same in accordance with the provisions of Clause 4.4.2 within a period of 60 (sixty) days of the receipt thereof.

4.5 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 Employer in accordance with the provisions 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 Employer under this Agreement including the right to termination under Clause 10 [Termination].

4.6 Change of Scope

4.6.1 The Employer 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 Clause

4.6.2 Change of Scope shall mean:

1. change in specifications of any item of Works; and/or
2. any additional work, Materials or services which are not included in the Scope of the Project

4.6.3 For the avoidance of doubt, the Parties agree that the Contractor shall not undertake any Change of Scope without the express consent of the Employer, save and except any Works necessary for meeting any Emergency which shall also be communicated to the employer/employers engineer prior starting the works.

4.6.4 In the event of the Employer determining that a Change of Scope is necessary, he will issue to the Contractor a notice specifying in reasonable detail the works and services contemplated there under (the "Change of Scope Notice").

4.6.5 Upon receipt of a Change of Scope Notice, the Contractor shall, with due diligence, provide to the Employer and the Employer'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. breakdown 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 Works.

4.6.6 Contractor's quotation of costs for the Change of Scope shall be determined on the following principles:

a) the latest available edition of MIDC Schedule of Rates applicable to Nanded Region & Aurangabad PWD rates will be adopted for the valuation of any works which are not already covered by the items included in Price Schedules. Payments for the Variations Items shall be made in INR only.

b) In the event that items are not covered in the MIDC Schedule of rates applicable to Nanded Region, then the latest edition of the Maharashtra Water Supply and Sewerage Board rates applicable for Aurangabad and then the schedule of rates related to Aurangabad PWD will be used in that order.

c) If from above (a) & (b) the specific items rates are not present only then as a last option, the market rates substantiated with 3 quotations, followed by work order and/ or Tax Invoice shall be considered only when the executed variation items are not covered under Price Schedule or the above referred schedule of rates. A fixed percentage of 15% shall be added to cover the Contractor's Overhead and Profit for the rates evaluated under this category

For the avoidance of doubt, the Parties expressly agree that, subject to the provisions of Clause 4.8, the Contract Price shall be increased or decreased, as the case may be, on account of Change of Scope.

4.6.7 Upon reaching an agreement, the Employer shall issue an order (the "Change of Scope Order") requiring the Contractor to proceed with the performance thereof.

4.6.8 Payment for Change of Scope shall be made in accordance with the payment schedule specified in the Change of Scope Order.

4.7 Restrictions to Change of Scope

4.7.1 No Change of Scope shall be executed unless the Employer has issued the Change of Scope Order save and except any Works necessary for meeting any Emergency.

4.7.2 Notwithstanding anything to the contrary in this Clause 4, 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.

4.8 Power of the Employer to undertake works

4.8.1 In the event the Parties are unable to agree to the proposed Change of Scope in accordance with Clause 4.8, the Employer may, after giving notice to the Contractor and considering its reply thereto, award such works or services to any third party or agency as deemed suitable.

4.8.2 It is also agreed that the Contractor shall provide assistance and cooperation to the person or agency who undertakes the works or services hereunder, and will be responsible for rectification of any Defects and/ or maintenance of works carried out by other agencies.

4.8.3 Notwithstanding anything contrary to this Clause 4.8, it will be Contractor's obligation to construct and maintain the Project Works in accordance with this Agreement.

5. STAFF AND LABOUR

5.1 Persons in the Service of Employer

The Contractor shall not recruit, or attempt to recruit, staff and labour from amongst the Employer's Personnel.

5.2 Labour Laws

The Contractor shall comply with all the relevant labour Laws applicable to the Contractor's Personnel, including Laws relating to their employment, health, safety, welfare, immigration and emigration, and shall allow them all their legal rights.

The Contractor shall require his employees to obey all applicable Laws, including those concerning safety at work.

5.3 Working Hours

No work shall be carried out on the Site on locally recognised days of rest, or outside the normal working hours as indicated in Contract Data Sheet, unless:

a) otherwise stated in the Contract,

b) the Engineer-in-charge gives consent, or

c) the work is unavoidable, or necessary for the protection of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Engineer-in-charge

5.4 Facilities for Staff and Labour

Except as otherwise stated in the Specification, the Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor' Personnel.

The Contractor shall not permit any of the Contractor's Personnel to maintain any temporary or permanent living quarters within the structures forming part of the Permanent Works.

a) The Contractor shall appoint a duly qualified safety officer who shall be stationed at the site from the time the contractor mobilizes. These personnel or a suitable replacement, if required, and for which prior permission of Employer is to be obtained, shall be stationed at site till the end of the contract period.

b) The Contractor shall provide electricity, water and telephone connections to the site office at his own cost along with other required facilities.

c) Running expenses of the site office shall be borne by the Contractor.

d) The contractor shall submit the plan of labour camp stating number of labour occupancy and number of toilets provided along with the photographs of the same. Details about the food arrangement and health measures taken by the contractor keeping in mind the rules and regulations of state and central government as per the current pandemic situation shall be followed for the welfare of labours

e) The Contractor shall construct the labour camp within 7 days receiving the LOA. The area to establish the labour camp shall be identified and provided by the engineer in charge. The contractor shall not use any part of the project site or any adjoining/nearby site for labour camp or for accommodation/housing of any labour on his own.

5.5 Contractor's Superintendence

Throughout the execution of the Works, and as long thereafter as is necessary to fulfil the Contractor's obligations, the Contractor shall provide all necessary superintendence to plan, arrange, direct, manage, inspect and test the work.

Superintendence shall be given by a sufficient number of persons having adequate knowledge of the language for communications and of the operations to be carried out (including the methods and techniques required, the hazards likely to be encountered and methods of preventing accidents), for the satisfactory and safe execution of the Works.

Contractor shall appoint a Planning Engineer at project site with computer having M.S. Project/Primavera and CAD facility. The role and purpose of the Engineer shall be mainly to maintain weekly reporting to Employer (besides monthly Progress Report) on an approved format through E-mail facility kept by the Contractor at site. Also, CAD drafting facility is required to incorporate necessary details/variation on drawings or the As-built drawings time - to- time during construction process and to avoid any discrepancies therein.

5.6 Measures against Insects and Pest Nuisance

The Contractor shall at all times take the necessary precautions to protect all staff and labour employed on the Site from insect and pest nuisance, and to reduce the dangers to health and general nuisance occasioned by the same. The Contractor shall provide his staff and labour with suitable prophylactics for the prevention of malaria and take steps to prevent the formation of the stagnant pools of water. The Contractor shall comply with all the regulations of the local health authorities and shall arrange to spray thoroughly with approved insecticide in all.

5.7 Epidemics

In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the Government, or the local medical or sanitary authorities, for the purpose of dealing with and overcoming the same.

5.8 Burial or Cremation of the Dead

The Contractor shall make all necessary arrangements for the transport, to anyplace as required for burial/cremation, of any of his expatriate employees or members of their families who may die at the works. The Contractor shall also be responsible, to the extent required by local regulations, for making any arrangements with regard to burial/cremation of any of his local employees who may die while engaged upon the Works.

5.9 Alcoholic Liquor or Drugs

The Contractor shall not, otherwise than in accordance with the Laws of the Country import, sell, gift, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale gift, barter or disposal by Contractor's Personnel. Also, any contractors' personnel shall not be under the influence of the same during the work and in the premises.

5.10 Arms and Ammunition

The Contractor shall not give, barter or otherwise dispose of to any person or persons, any arms or ammunition of any kind or permit or allow Contractor's personnel to do so.

5.11 Festivals and Religious Customs

The Contractor shall respect the Country's/Locally recognized festivals, days of rest and religious or other customs.

5.12 Foreign Staff and Labour

The Contractor may appoint any personnel who are necessary for the execution of the Works. The contractor must ensure that these personnel are provided with the required residence visas and work permits. The Contractor shall be responsible for the return to the place where they were recruited or to their domicile of imported Contractor's Personnel. The Contractor shall be responsible for such personnel who are to return until they shall have left the Site or, in the case of foreign nationals who have been recruited outside the country, shall have left it.

6. PLANT, MATERIALS AND WORKMANSHIP

6.1 Quality of Materials and Workmanship

The Contractor shall ensure that all the Construction, Materials and workmanship are in accordance with the requirements specified in this Agreement, Employer's Requirements, General Specifications and Standards and Good Industry Practice.

6.2 Quality Control System

The Contractor shall establish a quality control mechanism to ensure compliance with the provisions of this Agreement (the "Quality Assurance Plan" or "QAP").

The Contractor shall, within a week (seven) day of the Appointed Date, submit to the Engineer-in-charge its Quality Assurance Plan which shall include the following:

a) Organization including Quality Control Manager and Engineers, 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 Indian standards, relevant specifications and Good Industry Practice; and

c) internal quality audit system.

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.

The cost of testing of Construction, Materials and workmanship under this clause 6 shall be borne by the Contractor.

As a part of process all materials to be part of permanent works shall be inspected by Contractor along with AITL/PMNC Engineer before dispatch and the contractor to detect any damage after delivery at site.

The Contractor shall not interfere in any way with any existing works, whether the property of the Employer or of a third party, whether or not the position of such works is indicated to the Contractor by the Engineer, except where such interference is specifically described as part of the Works, either in the Contract or in an instruction from the Engineer. He shall also be expected to seek independently the approval from such a 'Third party' in case the need for interference arises. All material shall comply with appropriate Standard Specifications unless otherwise required hereinafter.

The Contractor shall, before placing any order of materials, manufactured articles or machinery for incorporation in the Works, submit for the information to the Engineer the names of the suppliers from whom he proposes to obtain such materials, manufactured articles or machinery, together with a list of the same, giving the origin, quality, weight, quality, weight, strength, description and other relevant details. No materials, manufactured articles or machinery shall be used before passing the quality check and submitted the same to the engineer/employer.

All materials shall be delivered to the Site a sufficient period of time before they are required for use in the Works, to enable the Engineer to take such samples as he may wish for testing and approval.

Notwithstanding the fact that approval has been given to the source of supply, the Engineer may forbid the use of any materials if, upon delivery, they are found to be defective with proper reasoning and checking, or he considers them unsuitable for incorporation in the Works. Such rejected materials shall be removed from the site forthwith.

The Contractor may propose alternative materials of equivalent quality to those specified, and subject to the approval, such materials may be used in the Works.

The Contractor shall have no claim against the Employer in respect of any financial loss which he may suffer as a result of the rejection of any such materials, and he shall also bear the cost of removing them from the Site.

The Engineer shall have the right to inspect materials and plant for the permanent works during the course of manufacture. The Contractor shall arrange for the right of access to manufacturing premises for the Engineer and his staff during normal working hours. The Engineer shall be given sufficient notice by the Contractor to allow him to observe the testing of any materials for the works at the place of manufacture. The Engineer shall also be given the opportunity to inspect any material or plant in their completed state prior to packing for transport to the site.

If requested by the Engineer, the Contractor shall provide to the Engineer copies of orders for the supply of goods or materials required in connection with the works.

Material such as all type of pipes (of all sizes) & other equipment like pump, motor including power equipment like transformers, switch gear, cables, panels etc., all type of valves (of all sizes), flow meters any other materials as per requirements which are supplied by the contractor under this contract are subject to approved Third party inspection. The charges for such inspection shall be paid by the contractor. All the arrangements for inspection i.e. measuring tools, testing equipment and tools, labour required for handling materials during testing etc. shall be made available / arranged by the manufacturer /Vendor / contractor in their premises at their own costs. This cost shall be deemed included in contractor's price bid and nothing extra shall be paid to the said account. If any particular testing facility is not available at the premises /location of Factory, then the test shall be arranged by the factory owner /Vendor at his own cost at other locations / test laboratory. All expenses in this regard shall also have to be borne by the contractor/ manufacturer/vendor /contractor only. If the material inspected fails during test on no fault of the inspecting agency, fees are payable to the inspecting agency for the said inspection and for any further re-inspection of the same material.

The name of the agency for third party inspection shall be informed to Employers Engineer.

If it is subsequently observed that there are defects in the quality of material, the contractor shall replace the material without any extra cost. In addition to third party inspection, the Employers Engineer or his representative may conduct inspection intermittently.

Third Party Inspection Report: The third-party inspection report merely in the certificate form stating that "pipes/valves/specials or any other material inspected are found satisfactory" will not be accepted, but it should be in the form of detailed report stating the parameters checked & observations made with comments of the Inspecting Officer in accordance with the respective Specifications/detailed item wise specifications / as per Tender notice.

AITL has right to appoint a third-party agency to inspect the work that are undertaken by the contractor the details of the same shall be stated in the work order given to that party and it same will be binding the contractor

6.3 Methodology

The Contractor shall, at least 15 (fifteen) days prior to the commencement of the construction, submit to the Engineer-in-charge for review and approval the methodology with detailed risk assessment proposed to be adopted for executing the Works and measures for ensuring safety.

6.4 Inspection and Technical Audit by the Employer

The Employer or any representative authorized by the Employer in this behalf may inspect and review the progress and quality of the construction of Project Works and issue appropriate directions to the Engineer-in-charge and the Contractor for taking remedial action in the event the Works are not in accordance with the provisions of this Agreement.

6.5 External Technical Audit

At any time during construction, the Employer 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 Employer, shall be notified to the Contractor and the Engineer-in-charge 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 6.5, the external technical audit shall not affect any obligations of the Contractor or the Engineer-in-charge under this Agreement.

6.6 Inspection of Construction Records

The Employer shall have the right to inspect the records of the Contractor relating to the Works. The Contractor shall hand over to the MITL\Employer's Engineer a copy of all its quality control records and documents before the Completion Certificate is

issued.

6.7 Inspection

The Engineer-in-charge and its authorized 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.

The Contractor shall give the Engineer-in-charge and its authorized agents access, facilities and safety equipment for carrying out their obligations under this Agreement.

For the avoidance of doubt, such inspection or submission of Inspection Report by the Engineer-in-charge shall not relieve or absolve the Contractor of its obligations and liabilities under this Agreement in any manner whatsoever.

6.8 Samples

The Contractor shall submit the following samples of Materials and relevant information to the Engineer-in-charge for pre-construction review:

a) manufacturer's test reports and standard samples of manufactured Materials; and

b) samples of such other Materials as the Engineer-in-charge may require.

6.9 Tests

For determining that the Works conform to the Specifications and Standards, the Engineer-in-charge 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 Engineer-in-charge 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.

In the event that results of any tests conducted under this Clause 6.9 establish any Defects or deficiencies in the Works, the Contractor shall carry out remedial measures and furnish a report to the Engineer-in-charge in this behalf. The Engineer-in-charge 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.

6.10 Examination of Work Before Covering Up

In respect of the work which the Engineer-in-charge 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 Engineer-in-charge whenever any such work is ready and before it is covered up.

The Engineer-in-charge shall then either carry out the examination, inspection or testing without unreasonable delay. Provided, however, that if any work is of a continuous nature where it is not possible or prudent to keep it uncovered or incomplete, then 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 Engineer-in-charge 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 Engineer-in-charge within a period of 3 (three) business days from the date on which the Contractor's notice hereunder is delivered to the Engineer-in-charge, the Contractor shall be entitled to assume that the Engineer-in-charge would not undertake the said inspection.

6.11 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 Engineer-in-charge shall reject the Plant, Materials, design or workmanship by giving notice to the Contractor, with reasons with approval of AITL management. The Contractor shall then promptly make good the Defect and ensure that the rejected item complies with the requirements of this Agreement.

If the Engineer-in-charge 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 Employer to incur any additional costs, such cost shall be

recoverable by the Employer from the Contractor; and may be deducted by the Employer from any monies due to be paid to the Contractor.

6.12 Remedial work

Notwithstanding any previous test or certification, the Engineer-in-charge 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, Good For Construction (GFC) Drawings and the Technical Specification and applicable Standards; and
c) Execute any work which is urgently required for the safety of the Project Works, 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 13 shall apply.

If the Contractor fails to comply with the instructions issued by the Engineer-in-charge under this Clause 6.12.1, within the time specified in the Engineer-in-charge's notice or as mutually agreed, the Engineer-in-charge may advise the Employer to have the work executed by another agency. The cost so incurred by the Employer for undertaking such work shall, without prejudice to the rights of the Employer to recover Damages in
accordance with the provisions of this Agreement, be recoverable from the Contractor and may be deducted by the Employer from any monies due to be paid to the Contractor.

6.13 Royalties

Unless otherwise stated in the Specification, the Contractor shall pay all royalties, rents and other payments for:
a) natural Materials obtained from outside the Site, and
b) the disposal of material from demolitions and excavations and of other surplus material (whether natural or man-made), except to the extent that disposal areas within the Site are specified in the Contract.
c) Any bill which have been submitted for payment where it needs the royalty to be paid to the government. While submitting the subsequent Running account bill the contractor shall furnish/submit the receipt/challan of royalty paid to the respective authority.

6.14 Suspension of unsafe Construction Works

Upon recommendation of the Engineer-in-charge to this effect by giving intimation to the employer, the Employer may by notice require the Contractor to suspend forthwith the whole or any part of the Works if, in the reasonable opinion of the Engineer-in-charge, such work threatens the safety of the Users and pedestrians.

The Contractor shall, pursuant to the notice under this Clause 6.15.1, suspend the Works or any part thereof for such time and in such manner as may be specified by the Employer and thereupon carry out remedial measures to secure the safety of suspended works, the Users and pedestrians. The Contractor may by notice require the Engineer-in-charge to inspect such remedial measures forthwith and make a report to the Employer recommending whether or not the suspension hereunder may be revoked. Upon receiving the recommendations of the Engineer-in-charge, the Employer 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 Employer, and the procedure set forth in this Clause 6.15.1, shall be repeated until the suspension hereunder is revoked.
Subject to the provisions of Clause 13 [Force Majeure], 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 Employer, the Preservation Costs shall be borne by the Employer.

If suspension of Works is for reasons not attributable to the Contractor, the Engineer-in-charge shall determine any Time Extension to which the Contractor is reasonably entitled.

7.0 COMMENCEMENT, DELAYS AND SUSPENSION

7.1 Commencement of Work

The commencement date shall be within the time specified in the Contract Data Sheet.

7.2 Time for Completion

The commencement date shall be within the time specified in the Contract Data Sheet.

The Contractor shall complete the whole of the Works, and each Section complete in itself (if any), within the Time for Completion for the Works or Section (as the case may be), including:

a) achieving the passing of the Tests on Completion, and

b) completing all work which is stated in the Contract as being required for the Works or Section to be considered to be completed for the purposes of taking over.

7.3 Delay Damages

7.3.1 If the Contractor fails to comply with time for completion of project, the Contractor shall subject to penalty as specified per delay damages to the Employer for this default. These delay damages shall be the sum stated in the Contract Data Sheet, which shall be paid for every day which shall elapse between the relevant Time for Completion and the date stated in the Taking-Over Certificate. However, the total amount due under this Sub-Clause shall not exceed the maximum amount of delay damages as stated in the Contract Data Sheet.

7.3.2 These delay damages shall be the only damages due from the Contractor for such default, other than in the event of termination prior to completion of the Works. These damages shall not relieve the Contractor from his obligation to complete the Works, or from any other duties, obligations or responsibilities which he may have under the Contract.

7.4 Tests on Completion

7.4.1 At least 15 (fifteen) days prior to the likely completion of the Project Works, or a Section thereof, the Contractor shall notify the Engineer-in-charge of its intent to subject the Project Works or a Section thereof, to Tests. The date and time of each of the Tests shall be determined by the Contractor in consultation with the Engineer-in-charge and notified to the Employer who may designate its representative to witness the Tests.

7.4.2 Contractor shall submit the testing plan and procedure for Engineer-in-charge's approval one months before the scheduled tests.

7.4.3 Provisioning of all electricity, equipment, fuel, instruments, labour, materials, water and suitably qualified and experienced staff for the execution of works shall be made available by the Contractor.

7.4.4 Contractor shall carry out the tests properly and maintain formal test records of start, duration, finish, test pressure, witness along with weather conditions and observations.

7.4.5 The Engineer-in-charge shall witness, observe, monitor and review the Tests conducted by the Contractor and review the results of the Tests to determine compliance of the Project Works or a Section there of, with Specifications and Standards and submit the report to the management.

7.4.6 If it is reasonably anticipated or determined by the Engineer-in-charge during the course of any Test that the performance of the Project Works 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.

7.4.7 For the avoidance of doubt, it is expressly agreed that the Engineer-in-charge 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 Works or Section thereof with the Specifications and Standards.

7.5 Delayed Tests

7.5.1 If the Tests on Completion are being unduly delayed by the Contractor, the Engineer may by notice require the Contractor to carry out the Tests within 21 days after receiving the notice. The Contractor shall carry out the Tests on such day or days within that period as the Contractor may fix and of which he shall give notice to the Engineer. All tests shall be carried out at Govt Labs in the state of Maharashtra

7.5.2 If the Contractor fails to carry out the Tests on Completion within the period of 21 days, the Employer's Personnel may proceed with the Tests at the risk and cost of the Contractor. The Tests on Completion shall then be deemed to have been carried out in the presence of the Contractor and the results of the Tests shall be accepted as accurate.

7.6 Retesting

7.6.1 If the Works, or a Section, fail to pass the Tests on Completion, the Engineer or the Contractor may require the failed Tests, and Tests on Completion on any related work, to be repeated under the same terms and conditions.

7.7 Failure to Pass Tests on Completion

7.7.1 In the event Tests on Completion demonstrate that the Work has failed to pass Tests on Completion, the Contractor shall have 3 months from the date of expiry of the relevant Time for Completion (unless such period is extended in accordance with this Contract) to achieve Required Output Standards or, at a minimum, the minimum permissible Output Standards from the facilities.

7.7.2 If the Works, or a Section, again fail to pass the Tests on Completion repeated under Clause 7.7 [*Retesting*], the Engineer shall be entitled to:

a) order further repetition of Tests on Completion.

b) reject the Works or Section (as the case may be) if the failure deprives the Employer of substantially the whole benefit of the Works or Section.

7.8 Liquidated Damages

7.8.1 In the event that the Works fail to pass any or all of the Tests on Completion as defined in Technical Specifications and applicable standards, then the Employer shall levy Liquidated Damages, based on the extent of such failure, in accordance with the following formulae, subject to the condition that the total amount of Delay Damages for Works and/or Liquidated Damages for failure to pass the Tests on Completion shall not exceed the Maximum Amount of Delay Damages as defined in this Contract Data Sheet.

8.0 EMPLOYER'S TAKING OVER

8.1 Taking Over

"Taking Over" shall not mean physical taking over of the works by the Employer. The Employer shall be deemed to have taken over the Works on the date when the commissioning of the scheme after the trial run and the Tests on Completion would have been completed and duly informed so by the Contractor to the Employer in writing unless refuted by the Employer within 14 days. Also, post SITC the contractor shall handover the same to MITL and completion/taking over certificate received from MITL.

9. CONTRACT PRICE AND PAYMENT

9.1 The Contract Price

9.1.1 Payment for the Works shall be made on a lump sum basis according to below major work categories as follows:

1. Design and documentation, including all necessary Designs and documentation required for the Works;

2. Civil works, Installation, Testing, Commissioning and other services required for the different plant components in accordance with the payment units as set out in the Schedule of Prices and/or as proposed by the Contractor and approved by the Engineer;

3. Plant and Equipment, whether manufactured or fabricated outside or within the Employer's country, including supply of all electrical and instrumentation equipment, etc., for the different plant components according to the payment units as set out in the Schedule of Prices and/or as proposed by the Contractor and approved by the Engineer; and

9.1.2 The Contract Price shall be adjusted for changes in the cost of labour and materials in accordance with the provisions of Clause 9.2 [Adjustments for Changes in Cost];

9.1.3 The Contractor shall pay all the duties, fees and taxes including GST in consequence of his obligations under the Contract, and the Contract Price shall not be adjusted for such costs, except as stated in Clause 9.2 [Adjustments for Changes in Legislation];

9.1.4 Any quantities which may be set out in the Schedule are only estimated quantities and are not to be taken as the actual and correct quantities of the Works to be executed by the Contractor in fulfilment of his obligations under the Contract. The Contractor is responsible to assess the exact requirements and quantities for all items for the purpose of quoting his rates, and no variation in rates will be allowed on account of any variation in the estimated quantities unless specifically provided elsewhere in the Bid Document.

9.1.5 Any quantities, prices or rates of payment per unit quantity which may be set out in the Schedule are only to be used for the purposes stated in the Schedule and may be inapplicable for other purposes.

9.1.6 The cost of any taxes incurred in India on the supply of Plant and equipment listed under specific Schedules of Schedule of Prices, whether manufactured or fabricated outside or within the Employer's country, shall be reimbursed at actual cost, not at the estimated cost listed in the Schedule of Prices."

9.1.7 Progressive payments shall be made for the work completed by the Contractor in accordance with the provisions of Clause 10.2 [Payment Schedule for Interim Valuation]."

9.2 Application for Interim Payment Certificates

9.2.1 Prior to commencing construction of the Works, the Contractor shall submit a Bill of Principal Quantities of the Permanent Works (here in referred as "BPQPW") including provision for construction, installation, testing, trial run and commissioning together with such supporting information and calculations as the Engineer may reasonably require.

9.2.2 The BPQPW shall include the anticipated final quantities of the principal items of Permanent Works, which shall have been priced using all-in rates such that the total amount equals the Accepted Contract Amount.

9.2.3 The BPQPW shall not contain priced items for design (other than as may be specified in the Schedule of Prices) or for Temporary Works; the value of each element of such work, and of any other work elements not described in the BPQPW, shall each be included in the rates for Permanent Works to be constructed after such element is carried out.

9.2.4 The BPQPW shall be subject to the approval of the Engineer, who may require the Contractor to revise and reissue the BPQPW at any time before taking-over to reflect Variations or if the Engineer determines that the BPQPW will not fully represent the Permanent Works at taking-over. If the total amount of the BPQPW at any time differs from the Contract Price, the Contract Price shall prevail. During the Time for Completion of Part 1 - of the Works, the Contract Price for the purpose of sub-paragraph (a) of Clause 10.3 [Application for Interim Payment Certificates] shall not exceed the amount calculated from the current BPQPW, based on the quantities of Permanent Works which have been constructed in accordance with the Contract. The Contractor's interim statement shall be in the same form as that of the current BPQPW and shall be accompanied by the Contractor's signed statement that the current BPQPW attached thereto (including anticipated final quantities) and the as-constructed quantities are all correct; each such statement shall also be accompanied by a Construction Certificate, signed by the Contractor's Representative, certifying that the part of the Works constructed to date complies with the Contract. However, the Contractor may propose such lesser amount as is reasonable, supported with appropriate calculation on a similar basis to the procedure described in this Sub-Clause.

The contractor will be eligible for interim progressive payment on quarterly basis after successful completion of any activity described and satisfactory performance of the Contractor's obligations under the Contract as per mutually agreed milestones. However, the progressive quarterly payments after the completion of any activity as per milestone shall be done up to the limits indicated in the Table No.1.

Sr.No	Head	Percentage %	Remarks
A	Submission of Design and Drawings	5%	
B	Supply of material at site (Supply, Transportation and Testing at site) as per the quarterly activity	50%	
C	Execution of works (Includes Survey, excavation, laying, reinstatement of trench, Installation, Testing and commissioning) as per quarterly activity	30%	
D	Handing over asset to MITL with all reports	10%	
E	3 months after successful handover of asset	5%	

Table 1: Schedule of Interim Progressive Payment

9.3 Application of Interim Payments

For payments relating to Works, the Contractor shall submit a statement in Two (2) copies to the Engineer after the end of each month, in a form approved by the Engineer, showing the amounts to which the Contractor considers himself to be entitled together with supporting documents which shall include the detailed report on the progress of commissioned during the month in accordance with Clause 3.10 [Progress Reports].

The statement shall include the following items, as applicable, which shall be expressed in the various currencies in which the Contract Price is payable, in the sequence listed:

1. the estimated contract value, at base rates and prices, of the Contractor's Documents produced and the Works (including Variations) executed up the end of the month.
2. any amounts to be added and deducted for changes in cost in accordance with Clause 9.2 [Adjustments of Changes in Cost];
3. any amount to be deducted for retention, calculated by applying the percentage of retention stated in the Contract Data Sheet to the total of the above amounts, until the amount so retained by the Employer reaches the limit of Retention Money (if any) stated in the Contract Data Sheet;
4. any amounts to be added and deducted for the advance payments and repayments in accordance with Clause 10.4 [Advance Payment];
5. any other additions or deductions which may have become due in accordance with the Contract (including those under Clause 15 [Claims, Disputes and Arbitration]), other than under Sub-Clause 7.3 [Delay Damages]; and
6. the deduction of the amounts certified in all previous Interim Payment Certificates

9.4 Payment

9.4.1 The Employer shall pay to the Contractor:

1. the amount certified in each Interim Payment Certificate within 30 days from the date on which the Engineer receives the Statement and supporting documents; and
2. the amount certified in the Final Payment Certificate within 60 days from the date of issue of the Certificate.

Payments shall be made in Indian Rupees, into a bank account nominated by the Contractor, in India.

9.5 Currencies of Payment

The currency of account shall be the Local Currency i.e. INR (Indian National Rupees) and all payments made in accordance with the Contract shall be in Local Currency.

9.6 Change in laws

9.6.1 The Contract Price is subject to adjustment for any increase or decrease in Cost due to any significant change in the Laws of the Country (including the introduction of new Laws and the repeal or modification of existing Laws) made after the date of issue of Letter of Award, which affect the Contractor in the performance of obligations under the Contract.

9.6.2 If as a result of Change in Law, the Contractor suffers any additional costs in the execution of the Works or in relation to the performance of its other obligations under this Agreement, the Contractor shall, within 15 (fifteen) days from the date it becomes reasonably aware of such addition in cost, notify the Employer with a copy to the Engineer-in-charge of such additional cost due to Change in Law. If as a result of Change in Law, the Contractor benefits from any reduction in costs for the execution of this Agreement or in accordance with the provisions of this Agreement, either Party shall, within 15 (fifteen) days from the date it becomes reasonably aware of such reduction in cost, notify the other Party with a copy to the Engineer-in-charge of such reduction in cost due to Change in Law. The Engineer-in-charge shall, within 30 (thirty) days from the date of receipt of the notice from the Contractor or the Employer, determine any addition or reduction to the Contract Price, as the case may be, due to the Change in Law.

10.TERMINATION

10.1 Corrupt or Fraudulent Practices

The Employer may terminate this Contract, by not less than thirty (30) days' written notice of termination to the Contractor, in the case if the Contractor, in the judgment of the Employer has engaged in Corrupt or Fraudulent Practices in competing for or in executing the Contract.

For the purpose of this clause:

"Corrupt Practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the selection process or in contract execution.

"Fraudulent Practice" means a misrepresentation of facts in order to influence a selection process or the execution of a contract to the detriment of the Employer, and includes collusive practice among contractors (prior to or after submission of proposals) designed to establish prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.

10.2 Notice to Correct

If the Contractor fails to carry out any obligation under the Contract, the Engineer may issue a notice to the Contractor to make good the failure and to remedy it within a specified reasonable time

10.3 Termination for Contractor Default

10.3.1 The Employer shall be entitled to terminate the Contract under any of the following conditions:

1. the Contractor fails to provide, extend or replenish, as the case may be complying with Clause 3.2 [Performance Security] or take adequate action as per notice under Clause 10.2 [Notice to Correct]
2. the Contractor abandons the Works or otherwise plainly demonstrates the intention not to continue performance of his obligations under the Contract,
3. the Contractor does not achieve the latest outstanding Project Milestone due in accordance with the project schedule approved by Employer, subject to any Time Extension, and continues to be in default for 45 (forty-five) days;
4. 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 Engineer-in-charge;
5. the Contactor subcontracts the whole or any part of the Works or assigns the Contract or the Maintenance without prior consent of the Engineer-in-charge;
6. the Contractor becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit of his creditors, or if any act is done or event occurs which (under applicable Laws) has a similar effect to any of these acts or events
7. the Contractor creates any Encumbrance in breach of this Agreement;

8. 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 Employer, a Material Adverse Effect;

9. 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;

10. the Contractor submits to the Employer any statement, notice or other document, in written or electronic form, which has a material effect on the Employer's rights, obligations or interests and which is false in material particulars;

11. the Contractor has failed to fulfil any obligation, for which failure Termination has been specified in this Agreement;

12. 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 Employer.

10.3.2 Save as otherwise provided in this Agreement, in the event that any of the defaults specified above shall have occurred, 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 Employer or due to Force Majeure.

10.3.3 Without prejudice to any other rights or remedies which the Employer may have under this Agreement, upon occurrence of a Contractor Default, the Employer shall be entitled to terminate this Agreement by issuing a Termination Notice to the Contractor; provided that before issuing the Termination Notice, the Employer 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.

10.4 Termination for Employer Default

10.4.1 In the event that any of the defaults specified below shall have occurred, and the Employer 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 Employer shall be deemed to be in default of this Agreement (the "Employer 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 Employer has failed to make payment of any amount due and payable to the Contractor within the period specified in this Agreement;

b) the Employer has failed to provide, within a period of 180 (one hundred and eighty) days from the Award Date, the environmental clearances required for construction of the Project Works;

c) the Employer repudiates this Agreement or otherwise takes any action that amounts to or manifests an irrevocable intention not to be bound by this Agreement; or

d) the Engineer-in-charge fails to issue the relevant Interim Payment Certificate within 60 (sixty) days after receiving a statement and supporting documents.

Without prejudice to any other right or remedy which the Contractor may have under this Agreement, upon occurrence of an Employer's Default, the Contractor shall be entitled to terminate this Agreement by issuing a Termination Notice to the Employer; provided that

before issuing the Termination Notice, the Contractor shall by a notice inform the Employer of its intention to issue the Termination Notice and grant 15 (fifteen) days to the Employer 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.

10.5 Termination for Employer's Convenience

10.5.1 Notwithstanding anything stated herein above, the Employer may terminate this Agreement for convenience. The termination shall take effect 30 (thirty) days from the date of notice hereunder.

10.6 Requirements after Termination

10.6.1 Upon Termination of this Agreement Contractor shall deliver to the Employer all Plant and Materials which shall have become the property of the Employer.

10.6.2 After termination of this Agreement for Contractor Default, the Employer may complete the Works and/or arrange for any other entities to do so. The Employer and these entities may then use any Materials, Plant and Equipment, drawings and other design documents made by or on behalf of the Contractor.

10.6.3 Upon Termination of this Agreement for Contractor Default, the Contractor shall then vacate the Site within one week and deliver any required Goods, all Contractor's Documents and other design documents (including all relevant records, reports, Intellectual Property and other licenses 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) made by or for him, to the Engineer-in-charge. However, the Contractor shall use his best efforts to comply immediately with any reasonable instructions included in the notice (i) for the assignment of any subcontract, and (ii) for the protection of life or property or for the safety of the Works. The contractor shall transfer and/or deliver all Applicable Permits to the extent permissible under Applicable Law.

10.6.4 Upon Termination of this Agreement for Contractor Default, the Employer shall then give notice that the Contractor's Equipment and Temporary Works will be released to the Contractor at or near the Site. The Contractor shall promptly arrange their removal, at the risk and cost of the Contractor. However, if by this time the Contractor has failed to make a payment due to the Employer, these items may be sold by the Employer in order to recover this payment. Any balance of the proceeds shall then be paid to the Contractor.

10.7 Valuation of Unpaid Works

10.7.1 After a notice of termination under Clause 10.3 Termination for Contractor Default], the Employer may:

a) Within a period of 45 (forty-five) days after Termination under applicable sub-clauses of clause 10, as the case may be, the Engineer-in-charge shall proceed in accordance with Clause 2.5 [Determination by the Employer's Engineer] to determine as follows the valuation of unpaid Works (the "Valuation of Unpaid Works"):

b) value of the completed stage of the Works, less payments already made;

c) 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

d) 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.

The Valuation of Unpaid Works shall be communicated to the Employer, with a copy to the Contractor, within a period of 45 (forty five) days from the date of Termination.

10.8 Termination Payment

10.8.1 Upon Termination on account of Contractor's Default under Clause 10.3, the Employer shall:

a) withhold further payments to the Contractor until the costs of execution, completion and remedying of any defects, damages for delay in completion (if any), and all other costs incurred by the Employer, have been established, and/or recover from the Contractor any losses and damages incurred by the Employer and any extra costs of completing the Works.

b) encash and appropriate the Performance Security and Retention Money, or in the event the Contractor has failed to replenish or extend the Performance Security

c) encash and appropriate the bank guarantee, if any, for and in respect of the outstanding liquidated and interest thereon; and 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.

10.8.2 Upon Termination on account of an Employer Default under Clause 10.4[Termination for Employer Default] or Clause 10.5 [Termination for Employer's Convenience for Employer's convenience], the Employer 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 Engineer-in-charge, of the Plant and Materials procured by the Contractor and transferred to the Employer 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 Engineer-in-charge; and

Termination Payment shall become due and payable to the Contractor within 45 (forty five) days of a demand being made by the Contractor to the Employer with the necessary particulars. For the avoidance of doubt, it is expressly agreed that Termination Payment shall constitute full discharge by the Employer of its payment obligations in respect thereof hereunder.

The Contractor expressly agrees that Termination Payment under this Clause 10.8 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.

10.9 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 Works shall, as between the Contractor and the Employer, vest in the Employer in whole; provided that the foregoing shall be without prejudice to Clause 10.8 [Termination Payment]

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 Employer; and

c) the Employer 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 Employer in accordance with the provisions of this Agreement.

10.10 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.

11. RISK AND RESPONSIBILITY

11.1 General indemnity

The Contractor will indemnify, defend, save and hold harmless the Employer and its officers, servants, agents, Government Instrumentality and Government owned and/or controlled entities/enterprises, (the "Employer Indemnified Persons") against any and all suits, proceedings, actions, demands and third party claims for any loss, damage, cost and expense of whatever kind and nature, whether arising out of any breach by the Contractor of any of its obligations under this Agreement or from any negligence under the Agreement, including any errors or deficiencies in the design documents, or tort or on any other ground whatsoever, except to the extent that any such suits, proceedings, actions, demands and claims have arisen due to any negligent act or omission, or breach or default of this Agreement on the part of the Employer Indemnified Persons.

11.2 Indemnity by the Contractor

Without limiting the generality of Clause 11 [Risk and Responsibility], the Contractor shall fully indemnify, hold harmless and defend the Employer and the Employer Indemnified Persons from and against any and all loss and/or damages arising out of or with respect to:

a) bodily injury, sickness, disease or death, of any person whatsoever arising out of or in the course of or by reason of the Contractor's design (if any), the execution and completion of the Works and the remedying of any defects, unless attributable to any negligence, wilful act or breach of the Contract by the Employer, the Employer's Personnel, or any of their respective agents, and

b) damage to or loss of any property, real or personal (other than the Works), to the extent that such damage or loss:

i. arises out of or in the course of or by reason of the Contractor's design (if any), the execution and completion of the Works and the remedying of any defects, and

ii. is attributable to any negligence, wilful act or breach of the Contract by the Contractor, the Contractor's Personnel, their respective agents, or anyone directly or indirectly employed by any of them

c) failure of the Contractor to comply with Applicable Laws and Applicable Permits;

d) payment of taxes required to be made by the Contractor in respect of the income or other taxes of the Sub-contractors, suppliers and representatives; or

e) non-payment of amounts due as a result of Materials or services furnished to the Contractor or any of its Sub-contractors which are payable by the Contractor or any of its Sub-contractors.

f) any demands, claims, suits or proceedings arising out of claims of infringement of any domestic or foreign patent rights, copyrights or other intellectual property, proprietary or confidentiality rights with respect to any materials, information, design or process used by the Contractor or by the Sub-contractors in performing the Contractor's obligations or in any way incorporated in or related to the Project. If in any such suit, action, claim or proceedings, a temporary restraint order

or preliminary injunction is granted, the Contractor shall make every reasonable effort, by giving a satisfactory bond or otherwise, to secure the revocation or suspension of the injunction or restraint order. If, in any such suit, action, claim or proceedings, the Project Works, or any part thereof or comprised therein, is held to constitute an infringement and its use is permanently enjoined, the Contractor shall promptly make every reasonable effort to secure for the Employer a license, at no cost to the Employer, authorizing continued use of the infringing work. If the Contractor is unable to secure such license within a reasonable time, the Contractor shall, at its own expense, and without impairing the Specifications and Standards, either replace the affected work, or part, or process thereof with non-infringing work or part or process, or modify the same so that it becomes non- infringing.

11.3 Indemnity by the Employer

11.3.1 The Employer shall indemnify and hold harmless the Contractor, the Contractor's Personnel, and their respective agents, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of (1) bodily injury, sickness, disease or death, which is attributable to any negligence, wilful act or breach of the Contract by the Employer, the Employer's Personnel, or any of their respective agents, and (2) the matters for which liability may be excluded from insurance cover as described in relevant sub-clauses of Clause 12 [Insurance].

11.4 Notice and contest of claims

11.4.1 In the event that either Party receives a claim or demand from a third party in respect of which it is entitled to the benefit of an indemnity under this Clause 11 [Risk and Responsibility], (the "Indemnified Party") it shall notify the other Party (the "Indemnifying Party") within 15 (fifteen) days of receipt of the claim or demand and shall not settle or pay the claim without the prior approval of the Indemnifying Party, which approval shall not be unreasonably withheld or delayed. In the event that the Indemnifying Party wishes to contest or dispute the claim or demand, it may conduct the proceedings in the name of the Indemnified Party, subject to the Indemnified Party being secured against any costs involved, to its reasonable satisfaction.

11.5 Defense of claims

The Indemnified Party shall have the right, but not the obligation, to contest, defend and litigate any claim, action, suit or proceeding by any third party alleged or asserted against such Party in respect of, resulting from, related to or arising out of any matter for which it is entitled to be indemnified hereunder, and reasonable costs and expenses thereof shall be indemnified by the Indemnifying Party. If the Indemnifying Party acknowledges in writing its obligation to indemnify the Indemnified Party in respect of loss to the full extent provided by this Clause 11 [Risk and Responsibility], the Indemnifying Party shall be entitled, at its option, to assume and control the defence of such claim, action, suit or proceeding, liabilities, payments and obligations at its expense and through the counsel of its choice; provided it gives prompt notice of its intention to do so to the Indemnified Party and reimburses the Indemnified Party for the reasonable cost and expenses incurred by the Indemnified Party prior to the assumption by the Indemnifying Party of such defense. The Indemnifying Party shall not be entitled to settle or compromise any claim, demand, action, suit or proceeding without the prior written consent of the Indemnified Party, unless the Indemnifying Party provides such security to the Indemnified Party as shall be reasonably required by the Indemnified Party to secure the loss to be indemnified hereunder to the extent so compromised or settled.

If the Indemnifying Party has exercised its rights under Clause 11.4 [Notice and contest of claims], the Indemnified Party shall not be entitled to settle or compromise any claim, action, suit or proceeding without the prior written consent of the Indemnifying Party (which consent shall not be unreasonably withheld or delayed).

If the Indemnifying Party exercises its rights under Clause 11.4 [Notice and contest of claims], the Indemnified Party shall nevertheless have the right to employ its own counsel, and such counsel may participate in such action, but the fees and expenses of such counsel shall be at the expense of the Indemnified Party, when and as incurred, unless:

a) the employment of counsel by such party has been authorized in writing by the Indemnifying Party; or

b) the Indemnified Party shall have reasonably concluded that there may be a conflict of interest between the Indemnifying Party and the Indemnified Party in the conduct of the defense of such action; or

c) the Indemnifying Party shall not, in fact, have employed independent counsel reasonably satisfactory to the Indemnified Party, to assume the defence of such action and shall have been so notified by the Indemnified Party; or

d) the Indemnified Party shall have reasonably concluded and specifically notified the Indemnifying Party either:

i. that there may be specific defences available to it which are different from or additional to those available to the Indemnifying Party; or

ii. that such claim, action, suit or proceeding involves or could have a material adverse effect upon it beyond the scope of this Agreement:

Provided that if Sub-clauses (b), (c) or (d) of this Clause 11.4 shall be applicable, the counsel for the Indemnified Party shall have the right to direct the defense of such claim, demand, action, suit or proceeding on behalf of the Indemnified Party, and the reasonable fees and disbursements of such counsel shall constitute legal or other expenses hereunder.

11.6 Limitation of Liability

11.6.1 Notwithstanding anything to the contrary contained in this Clause 11 [Risk and Responsibility], neither Party shall be liable to the other Party for loss of use of any Works, loss of profit, loss of any contract or for any indirect or consequential loss or damage which may be suffered by the other Party in connection with the Contract.

11.6.2 The total liability of the Contractor to the Employer, under or in connection with the Contract shall not exceed the sum stated in the Contract Data Sheet.

11.6.3 This Clause 11.6 [Limitation of Liability] shall not limit liability in any case of fraud, deliberate default or reckless misconduct by the defaulting Party.

12. INSURANCE

12.1 Insurance for Works and Maintenance

12.1.1 The contractor shall obtain insurance policy from Directorate of insurance, Govt of Maharashtra a State Government owned Insurance Company. The Contractor shall effect and maintain at its own cost the insurances specified in Clause 12 and as per the requirements under the Applicable Laws.

12.1.2 Subject to the relevant provisions of Clause 13 [Force Majeure], the Employer 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 Clause 12 [Insurance] or cannot be recovered from the insurers.

12.1.3 Subject to the exceptions specified in Clause 12.1.4 below, the Contractor shall, save and except as provided for in this Agreement, fully indemnify, hold harmless and defend the Employer 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.

12.1.4 Notwithstanding anything stated above in Clause 12.1.3, the Employer 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 Employer;

b) the right of the Employer 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 Employer, 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 Employer 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 Employer, its servants or agents or other contractors not associated with the Contractor in such injury or damage.

12.1.5 Without prejudice to the obligations of the Parties as specified under Clauses 12.1.3 and 13.1.4, the Contractor shall maintain or effect such third party insurances as may be required under the Applicable Laws.

12.1.6 The Contractor shall provide to the Employer, within 30 days of the Appointed Date, evidence of professional liability insurance maintained by its Project Manager 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.

12.2 Insurance for Works and Contractor's Equipment

12.2.1 The Contractor shall effect and maintain at its own cost, from the Date of Letter of Award till the date of issue of the last Completion Certificate, the following insurances for a minimum amount as indicated in the Contract Data Sheet for any loss or damage occurring on account of Force Majeure event 1, malicious act, accidental damage, explosion, fire and terrorism:

a) insurance of Works, Plant and Materials, replacement cost to cover any additional costs of and incidental to the rectification of loss or damage including professional fees and the cost of demolishing and removing any part of the Works and of removing debris of whatsoever nature; and

b) Insurance for the Contractor's equipment and Documents brought onto the Site by the Contractor, for a sum sufficient to provide for their replacement at the Site.

12.2.2 The insurance under Clause 12.2 above shall cover the employer and the contractor against all loss or damage from whatsoever cause arising other than risks which are not insurable at commercial terms.

"All risks of loss including theft of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the Exceptional Risks are the responsibility of the Contractor. Any loss not insured or not recovered (including policy excesses etc.) from insurers shall be borne by the Contractor. All insurances shall be in the joint name of contractor and the Employer. The contractor shall maintain a Contractors All Risk Policy (CAR) for the entire duration of the contract including DLP period for the entire facility" The Contractor shall also take additional covers (Add-On covers) insurance like Third Party Liability, Surrounding properties, Clearance and Removal of debris, Cross liability, Express Freight, Extended Maintenance Cover up to Final Takeover, etc. The sum insured for such Add-On covers shall be decided by the CONTRACTOR based on his assessment and risk involved in the contract. Risks to be covered by insurance shall not be limited merely to the items mentioned above. The CONTRACTOR shall arrange for insurance of any other risks he may deem prudent, but the expenses thereof shall be to the account of the contractor only full plant. If necessary, Transit and storage (all risks) insurance coverage for additional transit involved for sending equipment/material to Sub-Contractor/Fabricator's shop for fabrication/ reprocessing and receiving back at site shall be taken.

The Contractor shall, save and except as provided for in this Agreement, fully indemnify, hold harmless and defend the Employer 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.

Notwithstanding anything stated in above Clause, the Employer 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 Employer;

(b) the right of the Employer 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 Employer, 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 Employer 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 Employer, its servants or agents or other contractors not associated with the Contractor in such injury or damage.

Without prejudice to the obligations of the Parties as specified under above Clauses, the Contractor shall maintain or effect such third party insurances as may be required under the Applicable Laws.

The Contractor shall provide to the Employer, within 30 days of the Letter of Award , 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.

12.3 Insurance for Contractor's Defects Liability

The Contractor shall effect and maintain Insurance cover for the works from the date of issue of the Completion Certificate until the end of the Defects Liability Period for any loss or damage for which the Contractor is liable and arises from a cause occurring prior to the issue of Completion Certificate. The Contractor shall also maintain other insurances for maximum sums as may be required under the Applicable Laws and in accordance with Good Industry Practice.

12.4 Insurance to be in Joint Names

The Insurance under headings 12.2 and 12.3 above shall be in the joint names of the Contractor and the Employer.

12.5 Notice to the Employer

No later than 15 (fifteen) days after the date of this Agreement, the Contractor shall by notice furnish to the Employer, in reasonable detail, information in respect of the insurances that it proposes to effect and maintain in accordance with this Clause 12 [Insurance]. Within 15 (fifteen) days of receipt of such notice, the Employer 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.

12.6 Evidence of Insurance Cover

All insurances obtained by the Contractor in accordance with this Clause 12 [Insurance] shall be maintained with insurers on terms consistent with Good Industry Practice. Within 10 (ten) days from the Letter of Award, the Contractor shall furnish to the Employer notarized true copies of the certificate(s) of insurance, copies of insurance policies and premium 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 Employer. The Contractor shall act in accordance with the directions of the Employer. Provided that the Contractor shall produce to the Employer the insurance policies in force and the receipts for payment of the current premium. The Contractor shall ensure the adequacy of the insurances at all times in accordance with the provisions of this Agreement.

12.7 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 Employer shall have the option to either keep in force any such insurances, and pay such premium 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.

12.8 Waiver of Subrogation

All insurance policies in respect of the insurance obtained by the Contractor pursuant to this Clause 12 [Insurance] shall include a waiver of any and all rights of subrogation or recovery of the insurers thereunder against, inter alia, the Employer, 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.

12.9 Contractor's Waiver

The Contractor hereby further releases, assigns and waives any and all rights of subrogation or recovery against, inter alia, the Employer 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.

12.10 Cross liabilities

Any such insurance maintained or effected in pursuance of this Clause 12 [Insurance] shall include a cross liability clause such that the insurance shall apply to the Contractor and to the Employer as separately insured.

12.11 Accident or Injury to Workmen

Notwithstanding anything stated in this Agreement, it is hereby expressly agreed between the Parties that the Employer 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 Employer, its agents or servants. The Contractor shall indemnify and keep indemnified the Employer 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 Employer shall be liable.

12.12 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 Site from and against any liability incurred in pursuance of this Clause 12 [Insurance]. Provided that for the purposes of this Clause 12.12, 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 shall be discharged if the Sub-contractor shall have insured against any liability in respect of such persons in such manner that the Employer is indemnified under the policy. The Contractor shall require such Sub-contractor to produce before the Employer, within 2 days of appointment with the policy of insurance and the receipt for payment of the current premium within 10 (ten) days of such demand being made by the Employer.

12.13 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 Works 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.

12.14 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.

13. FORCE MAJEURE

13.1 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 Force Majeure Event1 , Force Majeure Event 2 as defined in Clauses 13.2, 13.3 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.

13.2 Force Majeure Event 1

A 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, Subcontractors or their respective employees/representatives, or attributable to any act or omission of any of them) interrupting supplies and services to the Project works 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 Event set forth in Clause 13.3;

c) any failure or delay of a Sub-contractor but only to the extent caused by another Non-Event stated above;

d) any judgement or order of any court of competent jurisdiction or statutory Employer 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 Employer;

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;

13.3 Force Majeure Event 2

An 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 Works 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 Event stated above;

13.4 Duty to Report Force Majeure Event

13.4.1 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 Clause 13 [Force Majeure] 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.

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.

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 13.5.1, and such other information as the other Party may reasonably request the Affected Party to provide.

13.5 Effect of Force Majeure Event on the Agreement

Upon the occurrence of any Force Majeure after the Letter of Award, 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 Force majeure Event 1, 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 Force majeure Event 2, all Force Majeure costs attributable to such Force majeure Event 2 , and not exceeding the Insurance Cover for such 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 Employer to the Contractor for the Force Majeure events; and

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.

Save and except as expressly provided in this Clause 13 [Force Majeure], 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.

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.

13.6 Termination Notice for Force Majeure Event

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 Clause 13 [Force Majeure], 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.

13.7 Termination Payment for Force Majeure Event

In the event of this Agreement being terminated on account of a Force Majeure Event 1, the Termination Payment shall be an amount equal to the sum payable under Clause 10.7 [Valuation of Unpaid Works].

Provided that in the event Termination occurs during the Maintenance Period, the Employer's Engineer shall only determine the value of Works associated with Maintenance.

If Termination is on account of an Force Majeure Event 2, the Termination Payment shall include:

a) any sums due and payable under Clause 10.7 [Valuation of Unpaid Works]; and

b) the reasonable cost, as determined by the Employer's Engineer, of the Plant and Materials procured by the Contractor and transferred to the Employer for use in Construction or Maintenance, only if such Plant and Materials are in conformity with the Specifications and Standards;

13.8 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.

13.9 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.

14.0 CLAIMS, DISPUTES AND ARBITRATION

14.1 Dispute Resolution

14.1.1 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 14.2.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.

14.2 Conciliation

In the event of any Dispute between the Parties, either Party may call upon the Employer'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 Managing Director of the Employer 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 14.1.1 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 14.3.

14.3 Arbitration

14.3.1 Any Dispute which is not resolved amicably by conciliation, as provided in Clause 14.2, shall be finally decided by reference to arbitration by a Board of Arbitrators appointed in accordance with Clause 14.3.2. Such arbitration shall be held in accordance with the Rules of Arbitration of the International Centre for Alternative Dispute Resolution, New Delhi (the "Rules"), or such other rules as may be mutually agreed by the Parties, and shall be subject to the provisions of the Arbitration Act. The venue of such arbitration shall be [Mumbai], and the language of arbitration proceedings shall be English.

14.3.2 There shall be a Board of three arbitrators, of whom each Party shall select one, and the third arbitrator shall be appointed by the two arbitrators so selected and in the event of disagreement between the two arbitrators, the appointment shall be made in accordance with the Rules.

14.3.3 The arbitrators shall make a reasoned award (the "Award"). Any Award made in any arbitration held pursuant to this Clause 14 [Claims, Disputes And Arbitration] shall be final and binding on the Parties as from the date it is made, and the Contractor and the Employer agree and undertake to carry out such Award without delay.

14.3.4 The Contractor and the Employer agree that an Award may be enforced against the Contractor and/or the Employer, as the case may be, and their respective assets wherever situated.

14.3.5 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.

14.3.6 In the event the Party against whom the Award has been granted challenges the Award for any reason in a court of law, it shall make an interim payment to the other Party for an amount equal to 75% (seventy-five per cent) of the Award, pending final settlement of the Dispute. The aforesaid amount shall be paid forthwith upon furnishing an irrevocable Bank Guarantee for a sum equal to 120 % (one hundred and twenty per cent) of the aforesaid amount. Upon final settlement of the Dispute, the aforesaid interim payment shall be adjusted and any balance amount due to be paid or returned, as the case may be, shall be paid or returned with interest calculated at the rate of 10% (ten per cent) per annum from the date of interim payment to the date of final settlement of such balance.

14.4 Adjudication by Regulatory Employer, Tribunal or Commission

In the event of constitution of a statutory regulatory Employer, tribunal or commission, as the case may be, with powers to adjudicate upon disputes between the Contractor and the Employer, all Disputes arising after such constitution shall, instead of reference to arbitration under Clause 14.3[Arbitration], be adjudicated upon by such regulatory authority, tribunal or commission in accordance with the Applicable Law and all references to Dispute Resolution Procedure shall be construed accordingly. For the avoidance of doubt, the Parties hereto agree that the adjudication hereunder shall not be final and binding until an appeal against such adjudication has been decided by an appellate tribunal or court of competent jurisdiction, as the case may be, or no such appeal has been preferred within the time specified in the Applicable Law.

Request for Qualification cum Request for Proposal (RFQ cum RFP)

Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar.

VOLUME 1

PART 5 TENDER FORMS

November 2026

Managing Director
Maharashtra Industrial Township Limited
Udyog Sarathi, MIDC Office, Marol Industrial Area,
Andheri (East), Mumbai, Maharashtra State, India - 400093

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ANNEXURE I: FORM OF BID

To

Managing Director,
Maharashtra Industrial Township Limited,
Udyog Sarathi, MIDC Office,
Marol Industrial Area, Andheri (East),
Mumbai, Maharashtra, India – 400093

Sub: RFQ cum RFP dated [date] for selection of contractor for **"Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar"**

Dear Sir,

With reference to your RFQ cum RFP Document dated _____[date], we have examined the Instruction to bidders, Conditions of Contract, Technical Specification, Tender Drawings and all relevant documents including addendum and clarifications. We have understood their contents and have not found any errors in them. We hereby submit our Technical Proposal for selection of contractor for the project **"Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar"**

We confirm the proposal to be unconditional and unqualified.

We are submitting our Proposal as a single entity _____ [full name and address of bidder].

If negotiations are held during the period of validity of the Proposal, we undertake to negotiate in accordance with the RFQ cum RFP. Our Proposal is binding upon us, subject only to the modifications resulting from negotiations in accordance with the RFQ cum RFP.

We understand you are not bound to accept any Proposal you receive.

Further:

1. We acknowledge that Employer will be relying on the information provided in the Proposal and the documents accompanying the Proposal for selection of the Contractor, and we certify that all information provided in the Proposal and in the supporting documents is true and correct, nothing has been omitted which renders such information misleading; and all documents accompanying such Proposal are true copies of their respective originals.
2. This statement is made for the express purpose of appointment as the Contractor for the aforesaid Project.
3. We shall make available to Employer any additional information it may deem necessary or require for supplementing or authenticating the Proposal.
4. We acknowledge the right of Employer to reject our application without assigning any reason or otherwise and hereby waive our right to challenge the same on any account whatsoever.

5. We certify that in the last 5 (Five) years, we have neither failed to perform on any contract, as evidenced by imposition of a penalty by an arbitral or judicial authority or a judicial pronouncement or arbitration award against the Applicant, nor been expelled from any project or contract by any public authority nor have had any contract terminated by any public authority for breach on our part.

6. We declare that:

a) We have examined and have no reservations to the RFQ cum RFP, including any Addendum issued by the Authority;

b) We do not have any conflict of interest in accordance with the terms of the RFQ cum RFP;

c) 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 RFQ cum RFP document, in respect of any tender or request for proposal issued by or any agreement entered into with Employer or any other public sector enterprise or any government, Central or State; and

d) We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice.

7. We understand that you may cancel the selection process at any time and that you are neither bound to accept any Proposal that you may receive nor to select the Contractor, without incurring any liability to the Applicants.

8. We declare that we are not a member of any other Bidder applying for selection as a Contractor.

9. We certify that in regard to matters other than security and integrity of the country, we have not been convicted by a court of law or indicted or adverse orders passed by a regulatory authority which would 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.

10. We further certify that in regard to matters relating to security and integrity of the country, we have not been charge-sheeted by any agency of the Government or convicted by a court of law for any offence committed by us or by any of our affiliates. We further certify that we have not been barred by the central government, any state government, a statutory body or any public sector undertaking, as the case may be, from participating in any project or bid, and that any such bar, if any, does not subsist as on the date of this RFQ cum RFP.

11. We further certify that no investigation by a regulatory authority is pending either against us or against our affiliates or against our CEO or any of our Directors/ Managers/ employees.

12. 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 Employer in connection with the selection of Contractor or in connection with the selection process itself in respect of the above-mentioned Project.

13. We agree and understand that the proposal is subject to the provisions of the RFQ cum RFP document. In no case, shall we have any claim or right of whatsoever nature if the contract for the Project is not awarded to us or our proposal is not opened or rejected.

14. In the event of our being selected as the Contractor, we agree to enter into a Contract in accordance with the contract prescribed in the RFQ cum RFP. We agree not to seek any changes in the aforesaid form and agree to abide by the same.
15. We have studied RFQ cum RFP and all other documents carefully. We understand that except to the extent as expressly set forth in the Contract, we shall have no claim, right or title arising out of any documents or information provided to us by Employer or in respect of any matter arising out of or concerning or relating to the selection process including the award of contract.
16. The Financial Proposal is being submitted in a separate cover. This Technical Proposal read with the Financial Proposal shall be binding on us.
17. We agree and undertake to abide by all the terms and conditions of the RFQ cum RFP Document.

We remain,

Yours sincerely,

Authorized Signature [In full and initials]:

Name and Title of Signatory:

Name of Firm:

Address:

(Name and seal of the Applicant/Member in Charge)

ANNEXURE II: POWER OF ATTORNEY FOR SIGNING THE BID

Know all men by these presents, We, _____[name of organization and address of the registered office] do hereby constitute, nominate, appoint and authorise Mr / Ms _____[name], son/ daughter/ wife of _____[name], and presently residing at_____ [address], who is presently employed with/ retained by us and holding the position of _____[designation] as our true and lawful attorney (hereinafter referred to as the -Authorised Representative), with power to sub- delegate to any person, 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 Proposal for and selection as contractor for **"Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar."**, to be developed by the Employer (the —Authority) including but not limited to signing and submission of all applications, proposals and other documents and writings, participating in pre-bid and other conferences and providing information/ responses to the Authority, representing us in all matters before the Authority, signing and execution of all contracts and undertakings consequent to acceptance of our proposal and generally dealing with the Authority in all matters in connection with or relating to or arising out of our Proposal for the said Project and/or upon award thereof to us until the entering into of the Contract with the Authority.

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

IN WITNESS WHEREOF WE, _____[name of organization], THE ABOVE NAMED PRINCIPAL HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS _____[date in words] DAY OF [month] [year in yyyy' format].

For [name and registered address of organization]

[Signature]

[Name]

[Designation]

Witnesses:

1. [Signature, name and address of witness]

2. [Signature, name and address of witness]

Accepted

Signature]

[Name]

[Designation]

[Address]

Notes:

1. 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 seal affixed in accordance with the required procedure.
2. Wherever required, the Applicant should submit for verification the extract of the charter documents and other documents such as a resolution/power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Applicant.
3. 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 Applicants 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 Apostille certificate.

On a C.A. Firm Letterhead

ANEXURE III: FINANCIAL CAPACITY QUALIFICATION INFORMATION – ANNUAL TURNOVER

S. No.	Financial Years	Turnover from Electrical Distribution Business	Turnover from Other Business	Total Annual turnover	Net worth	Profit
1	2020-2021					
2	2021-2022					
3	2022-2023					
4	2023-2024					
5	2024-2025					

Certificate from the Chartered Accountant.

This is to certify that details stated herein above pertains to M/s _____full name of company] having registered address as [registered address]

Further, it is also certified that M/s _____full name of company] has also not applied for **Corporate Debt Restructuring (CDR**) as on date.

For _____ (Name of CA Firm)

Signature of Authorized Signatory:

Name of Authorized Signatory:

Designation:

Membership No.:

UDIN:

Date:

Seal of CA / Audit firm

Note: **The Contractor shall provide the certificate from its Chartered Accountant.**

ANNEXURE IV: BANK CERTIFICATE FOR ACCESS TO LINES OF CREDIT

This is to certify that M/s_____is a reputed company with a good financial standing.

If the contract for the work, namely **"Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar"** is awarded to the above firm, we shall be able to provide overdraft/credit facilities to the extent of Rs_____to meet their working capital requirements for executing the above contract.

Sd/

Name of Bank

Senior Bank Manager

Address of the Bank

ANNEXURE V: FINANCIAL CAPACITY – MINIMUM PROJECT VALUE.

Bidder's Project References

Bidder's Project References shall be related to the similar works, as defined in the tender documents i.e. "Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar"

Sl.	Project Name & Location Details with respect to 1(i)	Project Start Date	Project Completion Date	Client Name	Value of Project	Type of Project	Client Certificate Enclosed
1							Yes/No
2							Yes/No
3							Yes/No
4							Yes/No
5							Yes/No

Note: Bidder to provide minimum five and maximum ten number of relevant references meeting the qualification criteria as indicated in ITB.

ANNEXURE VI: TECHNICAL CAPACITY - PROJECT QUALIFICATION INFORMATION

Bidder's Project References

Bidder's Project References shall be related to the similar works, as defined in the tender documents i.e. " Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar."

Sl.	Project Name & Location	Project Start and Completion Date	Client Name	Area of Project	Contract Value of the completed Project (Rs Lakhs)	Contracts completed for the Quantities	Details of work done (all separately to be added)	Client Certificate Enclosed
1								Yes/No
2								Yes/No
3								Yes/No
4								Yes/No
5								Yes/No

Note: Bidder to provide minimum five and maximum ten number of relevant references meeting the qualification criteria as indicated in ITB.

ANEXURE VII: LITIGATION/ ARBITRATION HISTORY

S. No.	Award for or Against Applicant	Name of Employee, Cause of Litigation and Matter in Dispute	Contract Value	Disputed Amount	Status of Litigation As on Bid Due Date
1					
2					
3					
4					

Note:

1. Bidder to provide litigation/arbitration history for last 5 years
2. Providing any false or misleading information, or hiding any information, may result in disqualification of the applicant

ANNEXURE VIII: LIST OF DEVIATIONS

7.1 Deviations (if any)

S. No.	Tender Reference	Tender Condition	Bidder's Deviation	Bidder's Comment
1.				
2.				
3.				

ANNEXURE IX: ENGINEERING AND CONSTRUCTION CAPACITY

ENGINEERING CAPACITY

S. No.	Name of Person	Designation	Qualification	Years of Relevant Experience	Area / Domain of Expertise	Proposed Role on the Project
1.						
2.						
3.						

Note: Contractor to indicate only the names of persons on permanent employment for at least last 02 years. Also, names of those persons should be indicated who will be directly associated / working on the Project.

CONSTRUCTION CAPACITY

S. No.	Name of Equipment	Numbers of Equipment proposed to be deployed on this Project	Equipment Capacity	Age of equipment as on date of Bidding	Owned / Leased
1.					
2.					
3.					

Note: Contractor to indicate equipment only related to work specified in the Contract and proposed to be deployed on the Project. Details of the equipment to be deployed during the construction period shall be submitted by the Contractor for review and approval by Engineer In-charge. Not deploying the equipment at the project as stated in plan will invoke penalty charges by the employer.

ANNEXURE X: LIST OF MAJOR AND MINOR MATERIALS

Major Materials List:

1. All 11 KV/0.4KV or above voltage level distribution substations
2. All 11 KV or above voltage level Ring Main Units (RMUs)
3. All HT/LT, XLPE/PVC cables
4. All LT Feeder Pillars
5. All Heat Shrinkable Straight Through HT/LT cable joints
6. All Heat Shrinkable, Touch Proof HT cable terminations
7. All GI Chain Link Fencing, along with its door, of RMUs
8. All civil foundations made for CSS, RMUs and Feeder Pillars

Minor Material List:

All other materials, pertaining to this tender works, not covered in Major Material List

Appendix A & B

APPENDIX A: FORM OF BID SECURITY (BANK GUARANTEE)

To:

Managing Director,
Maharashtra Industrial Township Limited,
Udyog Sarathi, MIDC Office,
Marol Industrial Area,Andheri (East),
Mumbai, Maharashtra State, India – 400093

WHEREAS _____[name and address of Contractor] (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No. _____ dated _____ to execute **"Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar."** (hereinafter called "the Contract").

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized Nationalised/Scheduled bank for the sum specified therein as security for compliance with its obligations in accordance with the Contract.

AND WHEREAS we have agreed to give the contractor such a Bank Guarantee;

NOW THEREFORE we agree unconditionally and irrevocably to guarantee as primary obligator and not as Surety merely, on behalf of the contractor, a total of up to _____ [amount of Guarantee] _____ [in words], such sum being payable in the types and proportion of currencies in which the Contract Price is payable, and we undertake to pay you, upon first written demand and without cavil or argument, any sum or sums within the limits of _____ [amount of Guarantee] as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until the date of issue of the Performance Certificate. We are liable to pay up to the guarantee amount upon receipt of written claim or demand from you of (Name of Bank with Branch Address in Mumbai) not later than (60 Days) i.e. inclusive of further 60 Days from the date of expiry.

Notwithstanding anything to the contrary contained herein –

i. Our liability under this Guarantee shall not exceed **Rs. ……**

ii. This Guarantee shall be valid up to **……** (Being the date of expiry date of the Guarantee)

iii. The beneficiary's right as well the Bank's liability under this Guarantee shall stand extinguished unless a written claim or demand is made under this Guarantee on or before completion of one year from expiry date i.e**. ……**

iv. This Guarantee shall be encashable at Mumbai Branch of which address is given below:

Name of Bank _____

Address _____

_____

DATE _____ SIGNATURE OF THE BANK _____

WITNESS _____ SEAL _____

[Signature, Name, and Address]

APPENDIX B: FORM OF PERFORMANCE SECURITY (BANK GUARANTEE)

To:

Managing Director,
Maharashtra Industrial Township Limited,
Udyog Sarathi, MIDC Office,
Marol Industrial Area,Andheri (East),
Mumbai, Maharashtra State, India – 400093

WHEREAS _____[name and address of Contractor] (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No. _____ dated _____ to execute **"Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar"** (hereinafter called "the Contract").

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized Nationalised/Scheduled bank for the sum specified therein as security for compliance with its obligations in accordance with the Contract.

AND WHEREAS we have agreed to give the contractor such a Bank Guarantee;

NOW THEREFORE we agree unconditionally and irrevocably to guarantee as primary obligator and not as Surety merely, on behalf of the contractor, a total of up to _____ [amount of Guarantee] _____ [in words], such sum being payable in the types and proportion of currencies in which the Contract Price is payable, and we undertake to pay you, upon first written demand and without cavil or argument, any sum or sums within the limits of _____ [amount of Guarantee] as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until the date of issue of the Performance Certificate. We are liable to pay up to the guarantee amount upon receipt of written claim or demand from you of **(Name of Bank with Branch Address in Mumbai)** not later than (60 Days) i.e. inclusive of further 60 Days from the date of expiry,

Notwithstanding anything to the contrary contained herein –

i. Our liability under this Guarantee shall not exceed …….. /-

ii. This Guarantee shall be valid up to …….. (Being the date of expiry date of the Guarantee)

iii. The beneficiary's right as well the Bank's liability under this Guarantee shall stand extinguished unless a written claim or demand is made under this Guarantee on or before completion of one year from expiry date i.e. ……..

iv. This Guarantee shall be encashable at Mumbai Branch of which address is given below:

Name of Bank _____

Address _____

Date _____ **Signature & Seal of the Guarantor**

APPENDIX C: BID SECURITY FORM (FOR INSURANCE SURETY BOND)

(To be stamped in accordance with Stamp Act of India)

Insurance Surety Bond No.: ……
Date: ……..

"Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar"

To:
Managing Director,
Maharashtra Industrial Township Limited,
Udyog Sarathi, MIDC Office,
Marol Industrial Area,Andheri (East),
Mumbai, Maharashtra State, India – 400093

WHEREAS M/s. …. (Insert name of Bidder)…… having its Registered/Head Office at ….. (Insert address of the Bidder) …….. (Hereinafter called "the Bidder" which expression shall include its successors, administrators, executors and assigns) has submitted its Bid for the performance of the Contract for '……..', under Specification No.: …….. (Hereinafter called "the Bid")

KNOW ALL PERSONS by these present that WE …….. *(insert name & address of the **Insurer**)* …… having its Registered/Head Office at …..…….*(insert address of registered office of the **Insurer**)*…….. (hereinafter called "**the Insurer** " which expression shall include its successors, administrators, executors and assigns), are bound unto ……*(insert name of Employer)*….. (hereinafter called "the Employer") in the sum of .....*(insert amount of Bid Security in figures & words)*..... .....……. for which payment well and truly to be made to the said Employer, the **Insurer** binds itself, its successors and assigns by these presents.

Sealed with the Common Seal of the said **Insurer** this ..... day of ..... 20....

THE CONDITIONS of this obligation are:

(1) If the Bidder withdraws its bid during the period of bid validity specified by the Bidder in the Bid Form; or

(2) In case the Bidder does not withdraw the deviations proposed by him, if any, at the cost of withdrawal stated by him in the bid and/or accept the withdrawals/rectifications pursuant to the declaration/confirmation made by him in Attachment – Declaration of the Bid; or

(3) If the Bidder does not accept the corrections to arithmetical errors identified during preliminary evaluation of his bid or

(4) If, as per the requirement of Qualification Requirements the Bidder is required to submit a Deed of Joint Undertaking and he fails to submit the same, duly attested by Notary Public of the place(s) of the respective executants (s) or registered with the Indian Embassy/High Commission in that Country, within ten days from the date of intimation of post – bid discussion; or

(5) In the case of a successful Bidder, if the Bidder fails within the specified time limit

(i) To sign the Contract Agreement, or

(ii) To furnish the required performance security.
or

(6) In any other case specifically provided for in Tender documents.

WE undertake to pay to the Employer up to the above amount upon receipt of its first written demand, without the Employer having to substantiate its demand, provided that in its demand the Employer will note that the amount claimed by it is due to it, owing to the occurrence of any of the above-named CONDITIONS or their combination, and specifying the occurred condition or conditions.

This guarantee will remain in full force up to and including …….. *(insert date)*……., and any demand in respect thereof must reach the **Insurer** not later than the above date.

Notwithstanding anything contained herein:

1. Our liability under this **Insurance Surety Bond** shall not exceed _____ (*value in figures*)_____ [_____ (*value in words*)_____].

2. This **Insurance Surety Bond** shall be valid upto _____*(validity date)*_____*.(1 Year)*

3. We are liable to pay the guaranteed amount or any part thereof under this **Insurance Surety Bond** only & only if we receive a written claim or demand on or before _____ (*validity date*) _____ (1 Year + 6 months) at our office in Mumbai located at _____(Address).

For and on behalf of the **Insurer**

[*Signature of the authorised signatory(ies)*]

Signature_____

Name_____

Designation_____

Contact Number(s): Tel._____Mobile_____

Fax Number_____

email _____

Common Seal _____

Witness:

Signature_____

Name_____

Address_____

Contact Number(s): Tel._____Mobile_____

email _____

Note:

1. **In case the bid is submitted by a Joint Venture, the bid security shall be in the name of the Joint Venture and not in the name of the Lead Partner or any other Partner(s) of the Joint Venture.**

2. The Insurance Surety Bond shall be from an Insurer as per guidelines issued by Insurance Regulatory and Development Authority of India (IRDAI) as amended from time to time.

3. The Employer shall be the Creditor, the Bidder shall be the Principal debtor and the Insurance company/Insurer shall be the Surety in respect of the Insurance Surety Bond to be issued by the Insurer.

4. The Insurance Surety Bond should be on Non-Judicial stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the state(s) where the Insurance Surety Bond is submitted or is to be acted upon or the rate prevailing in State where the Insurance Surety Bond is executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Bidder/Insurer issuing the Insurance Surety Bond.

5. While getting the Insurance Surety Bond issued, Bidders are required to ensure compliance to the points mentioned in Form of Insurance Surety Bond.

APPENDIX D: PERFORMANCE SECURITY FORM (FOR INSURANCE

SURETY BOND INITIALLY VALID FOR 5 YEARS)

(*TO BE SUBMITTED BY THE CONTRACTOR OPTING FOR SUBMISSION OF PERFORMANCE SECURITY WITH INITIAL VALIDITY OF 5 YEARS)*

(To be stamped in accordance with Stamp Act of India)

Insurance Surety Bond No.: ……
Date: ……..

LOA/Contract No.....
"Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar"

To:
Managing Director,
Maharashtra Industrial Township Limited,
Udyog Sarathi, MIDC Office,
Marol Industrial Area,Andheri (East),
Mumbai, Maharashtra State, India – 400093

Dear Ladies and/or Gentlemen,

We refer to the Contract ("the Contract")

vide letter of award issued on ..... (insert date of the notification of award)….by you to M/s ..... (Name of Contractor) .....,

(or)

signed on ……(insert date of the Contract)…….. between you and M/s ..... (Name of Contractor) .....,

having its Principal place of business at ……..(Address of Contractor) ..... and Registered Office at ……..(Registered address of Contractor) ..... ("the Contractor") concerning …….. (Indicate brief scope of work) ..... for the complete execution of the …… (insert name of Package alongwith name of the Project)…….. [Applicable for **Insurance Surety Bond** issued by Contractor/Associate for those Contracts awarded to them]

Or

We refer to the Contract

signed on ……(insert date of the Contract)…….. between you and M/s ..... (Name of Contractor) .....,
(or)

vide notification of award issued on …….(insert date of the notification of award)….. by you to M/s ..... (Name of Contractor) .....

having its Principal place of business at ……..(Address of Contractor) ..... and Registered Office at ……..(Registered address of Contractor) ..... ("the Contractor") and the Contract ("the Contract") signed on .....(insert date of the Contract)…..... between you and M/s ..... (Name of Associate) ....., having its Principal place of business at ……..(Address of Associate) ..... and Registered Office at ……..(Registered address of Associate) ....., the Associate of the Contractor for executing the Facilities concerning …… (Indicate brief scope of work) ..... for the complete execution of the …… (insert name of Package alongwith name of the Project)…….. [Applicable for **Insurance Surety Bond** to be issued by Contractor against those Contracts awarded to their Associate]

By this letter we, the undersigned, ……(insert name & address of the issuing **Insurer**) ……, a **Insurer** (which expression shall include its successors, administrators, executors and assigns) organized under the laws of ..... and having its Registered/Head Office at ……(insert address of registered office of the **Insurer**)…….. do hereby irrevocably guarantee payment to you up to …….. i.e., Five percent (5%) of the Contract Price until 60 months i.e., upto and inclusive of …… (dd/mm/yy).

We undertake to make payment under this **Insurance Surety Bond** upon receipt by us of your first written demand signed by your duly authorized officer declaring the Contractor to be in default under the Contract and without cavil or argument any sum or sums within the above named limits, without your need to prove or show grounds or reasons for your demand and without the right of the Contractor to dispute or question such demand.

Our liability under this **Insurance Surety Bond** shall be to pay to you whichever is the lesser of the sum so requested or the amount then guaranteed hereunder in respect of any demand duly made hereunder prior to expiry of the Letter of Guarantee, without being entitled to inquire whether or not this payment is lawfully demanded.

This **Insurance Surety Bond** shall remain in full force and shall be valid from the date of issue until 60 months i.e. upto and inclusive of ……. (dd/mm/yy) and shall be extended from time to time for such period, as may be desired by M/s. …… on whose behalf this Letter of Guarantee has been given.

Except for the documents herein specified, no other documents or other action shall be required, notwithstanding any applicable law or regulation.

Our liability under this **Insurance Surety Bond** shall become null and void immediately upon its expiry, whether it is returned or not, and no claim may be made hereunder after such expiry or after the aggregate of the sums paid by us to you shall equal the sums guaranteed hereunder, whichever is the earlier.

All notices to be given under shall be given by registered (airmail) posts to the addressee at the address herein set out or as otherwise advised by and between the parties hereto.

We hereby agree that any part of the Contract may be amended, renewed, extended, modified, compromised, released or discharged by mutual agreement between you and the Contractor, and this security may be exchanged or surrendered without in any way impairing or affecting our liabilities hereunder without notices to us and without the necessity for any additional endorsement, consent or guarantee by us, provided, however, that the sum guaranteed shall not be increased or decreased.

No action, event or condition which by any applicable law should operate to discharge us from liability hereunder shall have any effect and we hereby waive any right we may have to apply such law so that in all respects our liability hereunder shall be irrevocable and, except as stated herein, unconditional in all respects.

Notwithstanding anything contained herein:

1. Our liability under this **Insurance Surety Bond** shall not exceed _____ (*value in figures*) _____ [_____ (*value in words*) _____].

2. This **Insurance Surety Bond** shall be valid upto _____*(validity date)* _____ *(5 years)*

3. We are liable to pay the guaranteed amount or any part thereof under this **Insurance Surety Bond** only & only if we receive a written claim or demand on or before _____ (*validity date*) _____ (5+1=6 years) at our office in Mumbai located at _____(Address).

For and on behalf of the **Insurer**

[*Signature of the authorised signatory(ies)*]

Signature_____

Name_____

Designation_____

Contact Number(s): Tel._____Mobile_____

Fax Number_____

email _____

Common Seal of the Insurer _____

Witness:

Signature_____

Name_____

Address_____

Contact Number(s): Tel._____Mobile_____

email _____

Note:

1. **The Insurance Surety Bond should be on Non-Judicial stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the state(s) where the Insurance Surety Bond is submitted or is to be acted upon or the rate prevailing in State where the Insurance Surety Bond is executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Bidder/Insurer issuing the Insurance Surety Bond.**

2. **The Insurance Surety Bond shall be signed on all the pages by the Insurer Authorities and should invariably be witnessed.**

3. **The Insurance Surety Bond shall be from an Insurer as per guidelines issued by Insurance Regulatory and Development Authority of India (IRDAI) as amended from time to time.**

4. **The Employer shall be the Creditor, the Bidder shall be the Principal debtor and the Insurance company/Insurer shall be the Surety in respect of the Insurance Surety Bond to be issued by the Insurer.**

5. **While getting the Insurance Surety Bond issued, Contractors/ Suppliers are required to ensure compliance to the points mentioned in Form of Insurance Surety Bond.**

Request for Qualification cum Request for Proposal (RFQ cum RFP)

for

Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar.

VOLUME 1

PART 6- TECHNICAL SPECIFICATION FOR CABLE

November 2026

Managing Director
Maharashtra Industrial Township Limited
Udyog Sarathi, MIDC Office, Marol Industrial Area,
Andheri (East), Mumbai, Maharashtra State, India - 400093

TECHNICAL SPECIFICATION

OF

HT XLPE POWER CABLE

1.00 SCOPE HT CABLE

The specification covers design, manufacture, shop testing, stage inspection at works, testing before dispatch, supply and delivery of ISI marked 11kV and LT multi core, cross linked polyethylene insulated power cables to the designated Store Centers in the State of Maharashtra. These cables shall be suitable for the AC Three Phase 50 Hz system with the nominal voltage of 11 KV which may reach maximum of 12 kV. These cables shall primarily be designed for effectively earthed neutral system.

The cable shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to purchaser, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble-free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in the specification and / or the commercial order or not.

2.00 SERVICE CONDITIONS

Equipment to be supplied against the specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

2.01 Maximum ambient temperature	50^0 C
2.02 Maximum temperature in shade	45^0 C
2.03 Minimum temperature of Air in Shade	3.5^0 C
2.04 Relative Humidity	10 to 100 %
2.05 Maximum annual rain fall	1450 mm
2.06 Maximum wind pressure	150 Kg/mm^2
2.07 Maximum altitude above mean sea level	1,000 Metres
2.08 Isoceraunic level	50 days/year
2.09 Seismic level (Horizontal Acceleration)	0.3 g

2.10 Moderately hot and humid tropical climate Conducive to rust and fungus growth

3.00 STANDARDS TO WHICH CABLE SHALL CONFORM

Unless otherwise specified elsewhere in this specification, the rating as well as performance and testing of the HT XLPE power cables shall conform to the latest revisions available at the time of placement of order of all the relevant standards as listed in, but not limited to following.

IS: 8130 / 2013 – Specification for Conductors for insulated electric cables and flexible cords.

IS: 7098 (Part 2) / 1985 - Specification for crosslinked polyethylene insulated PVC sheathed cables for working voltages from 3.3 kV upto and including 33 kV. IS: 5831 / 1984 - Specification for PVC insulation and sheath of electric cables.

IS: 3975 / 1988 – Low carbon galvanized steel wires, Formed wires and tapes for Armoring of cables – Specification

IS 3961 part (7) for Recommended Current Ratings for Crosslinked Polyethylene Insulated thermoplastic Sheathed Cables

IS: 10462 (Part I) / 1991 – Fictitious calculation method for determination of dimensions of protective coverings of cables.

4.00 GENERAL TECHNICAL REQUIREMENTS

4.01 6.35/11 kV earthed, multi core power cables shall normally be with stranded compacted H2/H4 grade aluminum conductor as per IS: 8130 /2013 provided with conductor screening (of extruded semi-conducting cross link material) and shall be insulated with Nitrogen Dry cure and Dry cool technology XLPE of natural color. Identification of cores shall be by color, as per provision of clause 13.1 of IS: 7098 (Part 2) / 1985. The insulation (XLPE) screening shall be provided consisting of extruded semi- conducting cross link material in combination with a metallic layer of copper tape. Three such screened cores shall be laid up together with fillers and/or binder tapes where necessary and provided with extruded inner sheathing of heat resistant PVC conforming to type ST2 of IS: 5831 / 1984. The maximum continuous operating temperature shall be 90°C under normal operation and 250°C under short circuit condition.

Armoring shall be provided consisting of galvanized round steel wires conforming to IS: 3975 / 1988 (amended up to date) and over the armoring a tough outer sheath of PVC compound shall be extruded.

The PVC compound for the outer sheath shall conform to type ST2 of IS: 5831 - 1984 (amended upto date). The colour of the outer sheath shall be black. The cable shall be manufactured strictly conforming to IS: 7098 (Part 2) - 1985 amended upto date and shall bear ISI mark

4.02 SEQUENTIAL MARKING ON LENGTH ON HT CABLE

Non erasable Sequential Marking of length shall be provided by embossing on outer sheath of the cable for each meter length.

The quality of insulation shall be good and insulation shall not be deteriorated when exposed to the climatic conditions.

4.02.1 DISCHARGE FREE CONSTRUCTION

Inner conductor shielding, XLPE insulation and outer core shielding shall be extruded in one operation by special process (viz. Triple Extrusion Process) to ensure that the insulation is free from contamination and voids and perfect bonding of inner and outer shielding with insulation is achieved. The bidders are requested to elaborate the manufacturing technique adopted by their manufacturers to achieve this motive.

The Company will order the verification of triple extrusion process at manufacturer's works as a pre-qualification, if it is technically accepting the bid. During verification if it is found that the firm is not manufacturing the cable with triple extrusion process the offer shall be rejected.

4.03 CONTINUOUS AC CURRENT CAPACITY.

Continuous AC current capacity shall be as per Table given below.

11,22 & 33 KV Three CORE AL COND,XLPE INSULATED , ARMORED CABLE IS 3961 (part 7) Table 10 & 12						
Cross-sectional area (Sq MM)	Normal Current Rating in Amps					
	11kV Aluminums Conductor			22kV,33kV Aluminums Conductor		
	Ground	Duct	Air	Ground	Duct	Air
3X70	161	139	184	159	142	189
3X95	190	165	222	189	169	227
3X120	216	188	256	215	192	262
3X150	242	209	288	239	214	294
3X185	273	240	330	270	245	336
3X240	315	278	387	312	282	393
3X300	354	312	441	351	317	448
3X400	404	356	512	400	361	519
3X500	457	403	590	454	408	598

4.04 SHORT CIRCUIT CURRENT

Short circuit current of 11 kV XLPE cable shall be as per Table given below.

Duration of Short Circuit in sec	Area of Al. Conductor	Short circuit current in kA
T	A	I=0.094 x A/sq.rt (t)
1	70 mm^2	6.58
1	95 mm^2	8.93
1	120 mm^2	11.28
1	150 mm^2	14.10
1	185 mm^2	17.39
1	240 mm^2	22.56
1	300 mm^2	28.20
1	400 mm^2	37.60
1	500 mm^2	47.00
1	630 mm^2	59.20

5.00 TESTS

5.01 TYPE TESTS:

The cable offered shall have successfully passed all type tests described in the IS: 7098 (Part- 2) / 1985 (amended upto date). The Type Test Certificate shall clearly indicate the constructional features of the type- tested cable. The Type Test Certificate of the cable shall be same as the cable offered. Separate Type Test Certificate for each offered size of cable shall be submitted.

All the Type Tests shall be carried out from any Laboratories which are accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, ERDA, ERTL, etc. to prove that the cable meets the requirements of specification. Type Test conducted in manufacturers own laboratory and

Certified by testing institute shall not be acceptable.

The valid Type Test Certificate as per IS: 7098 (Part- 2) -1985, (amended upto date) shall be submitted along with the offer. The Type Test Certificate carried out during last five years shall be valid.

Further, purchaser reserves the right to pick up cable at random from the lots offered / supplied and get the cable tested for some or all the Type Tests in presence of purchasers' representative at third party NABL lab at the sole discretion of the purchaser. For this purpose, the tenderer shall quote unit rates for carrying out each Type Test. However, such unit rates will not be considered for evaluation of the offer. The supplier shall have no right to contest the test results of the third party lab for additional tests. In case the cable fails in any of the type tests, the complete supply shall be rejected. The supplier has to replace / take corrective action at the cost of the supplier.

It shall be the responsibility of the supplier to arrange such tests and purchaser shall be informed of the date and time of conduction of tests well in advance to enable him to witness such tests. Test charges of the testing authority, for such successful repeat type tests, shall be reimbursed at actual by the purchaser.

5.02 ROUTINE TESTS:

All the Routine tests as per IS: 7098 (Part 2) / 1985 amended upto date shall be carried out on each and every delivery length of cable. The results shall be given in test report. Partial discharge test must be carried out in a fully screened test cell. It is, therefore, absolutely

essential that the manufacturer shall have the appropriate type of facility to conduct this test which is routine test. The details of facility available in the manufacturer's works in this connection shall be given in the bid

5.03 ACCEPTANCE TESTS:

All Acceptance tests as per IS: 7098 (Part 2) / 1985 as modified upto date including the optional test as per clause no 18.4 and Flammability Test shall be carried out on sample taken from the delivery lot.

5.04 SHORT CIRCUIT TEST:

5.04.1 The bidder shall carry out short circuit type tests on each size & each voltage grade HT XLPE cables at the Laboratories which are accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, ERDA, ERTL, etc. at the cost of the supplier and should submit along with the offer.

The short circuit tests carried out at the manufacturer own works/laboratory shall not be acceptable.

5.04.2 The short circuit test shall be preceded and followed by the following tests so as to ensure that the characteristics of the cable remain within the permissible limits even after it is subjected to the required short circuit rating.

a) Partial Discharge Test.

b) Conductor Resistance Test.

c) High Voltage Test as a Routine Test.

5.04.3 The manufactured cable will be acceptable only after such a sample test is successfully carried out at NABL Labs as above or at suppliers works and approved by the Purchaser.

6.00 TESTING FACILITIES:

The supplier / tenderer shall clearly state as to what testing facilities are available in the works of manufacturer and whether the facilities are adequate to carry out type, routine and acceptance tests mentioned in specified IS. The facilities shall be provided by the bidder to purchaser's representative for witnessing the tests in the manufacturer's works. If any test cannot be carried out at manufacturer's works reason shall be clearly stated in the tender.

7.00 PRE DESPATCH INSPECTIONS:

All the type tests in accordance with IS: 7098 (Part 2) / 1985 (amended upto date) and acceptance tests as per specification shall be performed on a sample of each size of cable ordered from the first lot of supply at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase. The sample for type tests of each size of cable ordered from the first lot of supply shall be drawn by purchaser representative.

The manufacturer shall offer to the inspector representing the purchaser, all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification.

The MITL's representative / Engineer attending the above testing will carry out testing in accordance with IS: 7098 (Part 2) / 1985 (amended upto date) and acceptance tests and additional acceptance test as per this specification and issue test certificate approval to the manufacturer and give clearance for dispatch.

8.00 PERFORMANCE GUARANTEE:

The cable offered shall be guaranteed for satisfactory performance for a period of 60 months from the date of satisfactory commissioning. In case of failure within this period, the supplier shall make good the faulty cable at no extra cost to the purchaser.

9.00 PACKING AND MARKING:

9.01 IDENTIFICATION MARKS ON CABLE:

The following particulars shall be properly legible embossed on the cable sheath at the intervals of not exceeding one meter throughout the length of the cable. The cables with poor and illegible embossing shall be liable for rejection.

(a) Manufactures name and / or Trade name.

(b) Voltage grade.

(c) Year of manufacture.

(d) MITL

(e) Successive Length.

(f) Size of cable

(g) ISI mark

(h) Electric

(i) IS & CML No

9.02 The cable shall be supplied in continuous standard length of 500 running meters with plus minus 5% tolerance wound on non-returnable wooden drum of good quality and non-standard lengths not less than 100 meters upto 5% of the ordered quantity shall be accepted. Alternately cable can be supplied wound on non-returnable steel drum without any extra cost to the purchaser. The ends of the cable shall be sealed by means of non-hygroscopic sealing material.

9.03 Packing and marking shall be as per clause No. 21 of IS: 7098 (Part 2) / 1985 amended up to date.

The following additional information shall be furnished on with the consignment.

- Name of the consignee, i.e. MITL
- Destination
- Company's Supply order no. and date

9.04 Supplier shall provide statistical data regarding cables of all sizes viz.-

(a) Weight of one meter of finished product of cable of various sizes and ratings.

(b) Weight of one meter of bare conductor used for cables of various sizes and ratings.

10.00 QUALITY CONTROL

10.1 The purchaser shall send a team of experienced engineers for assessing the capability of the firm for manufacturing of cable as per this specification.

10.2 The team shall be given all assistance and co-operation for inspection and testing at the bidder's works.

10.03 The cable supplied shall give service for a long period without drifting from the original calibration & performance must be near to zero percent failure

11.00 Manufacturing Facility:

The HT cable manufacturer should have CCV (Catenary Continuous Vulcanizing) line for dry cure and dry cooling in Nitrogen gas medium. The bidder should submit certificate of CCV line facility installation, commissioning with offer. The purchaser has right to depute inspector to ensure manufacturing process for the offered HT cables at any time without prior intimation and if HT Cable not manufactured with the specified process i.e. through CCV line with nitrogen gas medium, the purchase order will be liable for cancellation and bidder's firm will be blacklisted as per MITL blacklist policy.

12.00 QUALITY ASSURANCE PLAN

A detailed list of bought out items which got into the manufacture of cables shall be furnished indicating the name of the firms from whom these items are procured. The bidder shall enclose the quality assurance plan invariably along with offer followed by him in respect of the bought out items, items manufactured by him & raw materials in process as well as final inspection, packing & marking.

The Company may at its option order the verification of these plans at manufacturer's works as a pre-qualification for technically accepting the bid. During verification if it is found that the firm is not meeting with the quality assurance plan submitted by the firm, the offer shall be liable for rejection.

Guaranteed Technical Particular			
Sr.no	**DESCRIPTION**	**Reference Documents**	**To be filled by Bidder**
1	Name of Manufacturer & Address		
2	Cable Type		
2.1	Description		
3	Applicable Standards (IS)		
4	No of cores (Nos)		
5	Cable Size (sq.mm)		
6	Voltage Grade (kV)		
7	Permissible Voltage & Frequency variations for satisfactory operation		
8	Maximum conductor temperature under normal operating conditions		
9	Maximum conductor temperature at the termination of short circuit		
10	Continuous Current carrying capacity in air (Amp) 40 Deg C		
11	Continuous Current carrying capacity in ground (Amp) 30 Deg C		
12	**Conductor**		
(i)	Material		
(ii)	Shape		
(iii)	Nominal Cross-sectional Area (Sq. mm)		
(iv)	No of Wire (mm)	IS:8130:2013-Table 2	
(v)	Dia of Individual wire (mm)		
(iv)	Nominal Conductor Diameter	mm	
13	**Conductor Screen**	IS 7098 (Part2)/2011	
(i)	Material		
(ii)	Nominal Thickness (mm)		
14	**Insulation**		
(i)	Material		
(ii)	Nominal Thickness (mm)		
15	**Insulation Screening**		
(i)	Material	IS 7098 (Part2)/2011 as per Clause 6.1	
(ii)	Nominal Thickness (mm)		

16	Core Identification	IS 7098 (Part2)/2011 as per Clause 14.1	
17	Calculated Laid up dia (mm)		
18	**Inner Sheath**		
(i)	Material	IS 7098 (Part2)/2011 as per Clause 7.1	
(ii)	Extruded or wrapped		
(iii)	Min. Thickness (in mm)	IS 7098 (Part2)/2011 as per Table 5	
(iv)	Calculated Dia over I/Sh (mm)		
	Filler material		
19	**Armor**		
(i)	Material	IS 3975	
(ii)	**Types of Armoring**		
(iii)	Nominal size of wire (mm)	IS 7098 (Part2)/2011	
(iv)	Calculated Dia over Armor (mm)		
20	**OUTER SHEATH**		
(i)	Material	IS 7098 (Part2)/2011	
(ii)	Minimum Thickness (mm)	IS 7098 (Part2)/2011	
(iii)	Colour		
21	Approximate Overall Diameter. (mm)		
22	Approximate Weight of cable. (Kg/Km.)		
23	Drum Material		
24	Standard Drum Length (mtr)		
25	Minimum Bending Radius		
26	Safe pulling Force	As IS 1255	
27	Short Current Rating of Conductor - Duration of 1 Sec in (KA)	IEC:60949	
28	Maximum DC resistance of conductor at 20^{o}C (Ohm/km)	As IS 8130:2013	
29	Approx. AC resistance 90^{o}C (Ohm/km)		
30	Approx. Reactance of cable at 50 HZ (Ohm/km)		
31	Approx. capacitance (Micro F/Km)		
32	Marking Detail (by embossing)		
33	Sequential marking of length		
34	Technology use for insulation curing (CCV Line)	Dry cure Dry cooling (Nitrogen)	

TECHNICAL SPECIFICATION

OF

LT XLPE POWER CABLE

1.00 SCOPE

This specification covers design, manufacture, testing, packing and delivery of 1100 Volts grade, Aluminium conductor, XLPE insulated multi core power cables by road/rail to the designated Stores in the State of Maharashtra.

The cable shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to purchaser, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in these specifications and / or the commercial order or not.

2.00 SERVICE CONDITIONS

The cable to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

Maximum ambient temperature (Degree C)	50
Maximum temperature in shade (Degree C)	45
Minimum temperature of Air in Shade (Degree C)	3.5
Relative Humidity (Percent)	10 to 100
Maximum annual rain fall (mm)	1450
Maximum wind pressure (Kg/sq.mm.)	150
Maximum altitude above mean sea level (Metre)	1000
Isoceraunic level (days per year)	50
Seismic level (Horizontal Acceleration)	0.3 g

Climate: Moderately hot and humid tropical climate and fungus growth.conducive to rust and fungus growth.

3.00 STANDARDS

Unless otherwise specified elsewhere in this specification, the rating as well as performance and testing of the LT XLPE power cables shall conform to the latest revisions available at the time of placement of order of all the relevant standards as listed in, but not limited to standards as below.

IS: 7098 (Part 1) / 1988 (amended upto date) suitable for working voltages upto and including 1100 Volts.

IS: 5831 / 1984 modified upto date in all respects with regard to PVC insulation and sheath of electric cables

IS: 8130 / 2013 - PVC insulated for conductors for insulated electric cables and flexible cords.

IS: 3975 / 1988 for Mild Steel wires, formed wires and tapes for armouring of cables

IS 3961 part (6) for Recommended Current Ratings for Crosslinked Polyethylene Insulated PVC Sheathed Cables

IS: 10462 (Part I) / 1991 - Fictitious calculation method for determination of dimensions of protective covering of cables.

4.00 GENERAL TECHNICAL REQUIREMENT

System Voltage

The cable shall be suitable for operation on three phase, 440 Volts, 50 Hz, solidly earthed system.

For the above system, the cable shall be suitable for continuous 10% over-voltages.

The cable shall bear ISI mark.

5.00 CONSTRUCTION

5.01 ARMOURED CABLES

1100 Volts Grade L.T. cable with stranded H2/H4 grade aluminium conductor, XLPE insulated, colour coded, laid up with fillers and / or binder tape wherever necessary provided with extruded PVC inner sheath (Type ST-2), with armouring as per Table No.6 of IS 7098 part -1 as follows

i. **Single Galvanized steel strip shall be used for multicore LT XLPE cables**

ii. Aluminium armored shall be used for single core LT XLPE cables.

Note:- Round wire armoured shall be used for LT XLPE cables having calculated diameter under armored below 13 sq.mm

Further, shall be provided with extruded PVC outer sheath (Type ST-2). The cable shall conform to IS: 7098 (Part 1) / 1988 (amended upto date) and must bear ISI mark.

5.02 INSULATION, INNER SHEATH AND OUTER SHEATH

Insulation, inner sheath and outer sheath shall be applied by separate extrusion. Inner sheath shall be applied by extrusion only. Bedding of PVC tape for inner sheath is not acceptable. Colour of outer sheath shall be black. The quality of insulation shall be good and insulation shall not be deteriorated when exposed to the climatic conditions.

5.03 SEQUENTIAL MARKING ON THE LENGTH OF CABLE

Non erasable sequential marking of length shall be provided by embossing on outer sheath of the cable for each meter length as brought out elsewhere in this specification.

5.04 CONTINUOUS AC CURRENT CAPACITY

The continuous ac current capacity shall be as per Table given below.

1.1 KV SINGLE CORE AL/COPPER COND,XLPE INSULATED CABLES as per IS 3961 part (6) Table 2

Cross-sectional area (Sq MM)	ARMOURED CABLE								
	Overall Diameter (mm)	Normal Current Rating in Amps						Short Circuit Current Rating for 1Sec.duration in KA	
		Aluminum Conductor			Copper Conductor			Aluminum	Copper
		Ground	Duct	Air	Ground	Duct	Air		
1cX4	10	37	34	33	47	43	41	0.376	0.572
1cX 6	11	47	43	43	58	53	52	0.56	0.858
1cX10	12	59	54	55	77	70	71	0.94	1.43
1cX16	13	76	69	72	98	89	94	1.50	2.29
1cX25	14	98	89	98	126	114	126	2.35	3.58
1cX 35	15	116	106	119	150	136	154	3.29	5.01
1cX50	17	137	124	145	177	160	187	4.70	7.15
1cX70	19	168	151	185	216	195	238	6.58	10.01
1cX 95	22	202	181	235	260	233	303	8.93	13.59
1cX120	24	230	206	276	295	264	354	11.28	17.16
1cX150	25	256	229	314	329	294	403	14.10	21.45
1cX185	28	290	258	366	371	330	468	17.39	26.46
1cX240	30	335	298	434	427	379	553	22.56	34.32
1cX300	33	376	333	500	477	422	634	28.20	42.90
1cX400	38	429	378	589	537	473	737	37.60	57.20

1.1 KV Two CORE AL/COPPER COND,XLPE INSULATED as per 3961 part 6 (Table 3)									
Cross-sectional area (Sq MM)	ARMOURED CABLE								
	Overall Diameter (mm)	Normal Current Rating in Amps						Short Circuit Current Rating for 1Sec.duration in KA	
		Aluminum Conductor			Copper Conductor			Aluminum	Copper
		Ground	Duct	Air	Ground	Duct	Air		
2cX4	15	42	36	38	54	45	48	0.376	0.572
2cX 6	16	55	46	50	67	56	61	0.564	0.858
2cX10	18	68	57	64	89	75	83	0.940	1.430
2cX16	19	89	74	83	115	96	108	1.50	2.29

1.1 KV Three & Half CORE AL/COPPER COND,XLPE INSULATED As per IS 3961 (Part-6) Table 4.									
Cross-sectional area (Sq MM)	ARMOURED CABLE								
	Overall Diameter (mm)	Normal Current Rating in Amps						Short Circuit Current Rating for 1Sec.duration in KA	
		Aluminum Conductor			Copper Conductor			Aluminum	Copper
		Ground	Duct	Air	Ground	Duct	Air		
3.5X25	25	95	79	93	122	102	119	2.35	3.58
3.5X35	27	114	94	114	146	122	147	3.29	5.01
3.5X50	30	134	112	138	173	144	179	4.70	7.15
3.5X70	35	164	137	115	212	177	226	6.58	10.01
3.5X95	38	197	164	216	254	212	279	8.93	13.59
3.5X120	42	223	187	244	287	240	320	11.28	17.16
3.5X150	46	249	209	284	321	269	365	14.10	21.45
3.5X185	51	282	238	329	362	304	422	17.39	26.46
3.5X240	56	327	276	392	418	352	500	22.56	34.32
3.5X300	60	369	312	452	469	396	514	28.20	42.90
3.5X400	71	420	356	426	528	442	662	37.60	57.20
3.5X500	79	478	412	612	593	511	760	47.00	71.50
3.5X630	88	542	468	712	661	571	870	59.22	90.09

1.1 KV Four CORE AL/COPPER COND,XLPE INSULATED CABLES As per IS 3961 (Part-6) Table 4									
Cross-sectional area (Sq MM)	ARMOURED CABLE								
	Overall Diameter (mm)	Normal Current Rating in Amps						Short Circuit Current Rating for 1Sec.duration in KA	
		Aluminum Conductor			Copper Conductor			Aluminum	Copper
		Ground	Duct	Air	Ground	Duct	Air		
4cX4	18	35	30	32	45	38	41	0.376	0.572
4cX 6	19	46	38	42	56	47	52	0.564	0.858
4cX 10	21	57	48	54	74	62	70	0.940	1.430
4cX16	22	74	61	69	95	79	89	1.50	2.29

6.00 TESTS

6.01 TYPE TESTS

The cable offered shall have successfully passed all type tests described in the IS: 7098 (Part 1) / 1988 (amended upto date).

The Type Test Certificate shall clearly indicate the constructional features of the type-tested cable. The Type Test Certificate of the cable shall be same as the cable offered. Separate Type Test Certificate for each offered size of cable shall be submitted.

All the Type Tests shall be carried out from any Laboratories which are accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, ERDA, ERTL, etc. to prove that the cable meets the requirements of specification.

Type Test conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

The valid Type Test Certificate as per IS: 7098 (Part 1) / 1988 (amended upto date) shall be submitted along with the offer. The Type Test Certificate carried out during last ten years shall be valid.

Further purchaser reserves the right to pick up cable at random from the lots offered / supplied and get the cable tested for some or all the Type Tests in presence of purchasers' representative at third party NABL lab at the sole discretion of the purchaser. For this purpose, the tenderer shall quote unit rates for carrying out each Type Test. However, such unit rates will not be considered for evaluation of the offer. It shall be the responsibility of the supplier to arrange such tests and purchaser shall be informed of the date and time of conduction of tests well in advance to enable him to witness such tests. Test charges of the testing authority, for such successful repeat type tests, shall be reimbursed at actual by the Purchaser. The supplier shall have no right to contest the test results of the third party lab for additional tests. In case the cable fails in the type tests, the complete supply shall be rejected. The supplier has to replace / take corrective action at the cost of the supplier.

6.02 ROUTINE TESTS

All the Routine tests as per IS: 7098 (Part 1) - 1988 amended upto date shall be carried out on each and every delivery length of cable. The result shall be given in test report.

The details of facility available in the manufacturer's works in this connection shall be given in the bid.

6.03 ACCEPTANCE TESTS

All Acceptance tests as per IS: 7098 (Part-I) 1988 as amended upto date including the optional test as per clause no 15.4 and Flammability Test as per clause No. 16.3 shall be carried out on sample taken from the delivery lot.

6.04 ADDITIONAL ACCEPTANCE TESTS

The following additional acceptance test shall be carried out on PVC compounds used for outer sheath as per IS: 5831 / 1984 (amended upto date).

1. Hot Deformation Test.

7.00 PURCHASER'S AND MANUFACTURER'S IDENTIFICATION

The manufacturer and the Company shall be identified throughout the length of cable by embossing the manufacturer's name, the Company's name on the P.V.C. sheath. The manufacturer's name/ trade mark and MITL. shall be embossed at least once on every meter length of cable, along with sequential marking for each meter length.

8.00 SIZE OF CABLE

The size of cables with voltages grade shall be as per schedule of requirement.

9.00 TESTING FACILITIES AND DETAILS OF EQUIPMENT

The supplier / tenderer shall clearly state as to what testing facilities are available in the works of manufacturer and whether the facilities are adequate to carry out type, routine and acceptance tests mentioned in IS: 7098 (Part-1) / 1988 (amended upto date) on the cable including test as per clause No. 6.04 of specification.

The facilities shall be provided by the bidder to purchaser's representative for witnessing the tests in the manufacturer's works.

If any test cannot be carried out at manufacturer's works reason shall be clearly stated in the tender.

10.00 PRE DESPATCH INSPECTIONS

All the type tests in accordance with IS: 7098 (Part-1) - 1988 (amended upto date) and additional acceptance test as per specification shall be performed on a sample of each size of cable ordered from the first lot of supply at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase.

The sample for type tests of each size of cable ordered from the first lot of supply shall be drawn by purchaser representative.

The manufacturer shall offer to the inspector representing the purchaser, all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification.

The MITL's representative / Engineer attending the above testing will carry out testing in accordance with IS: 7098 (Part 1) - 1988 (amended upto date) and additional acceptance test as per this specification and issue test certificate approval to the manufacturer and give clearance for dispatch.

11.00 PACKING AND MARKING

11.01 UPTO 120 SQ. MM. SIZE

Cables shall be supplied in continuous standard length of 500 meters with plus minus 5% (five percent) tolerance wound on non returnable wooden drums of good quality or on non-returnable steel drums without any extra cost to the purchaser.

11.02 ABOVE 120 SQ.MM. SIZE

Cables shall be supplied in continuous standard length of 250 meters with plus minus 5% (five percent) tolerance wound on non-returnable wooden drums of good quality or on non-returnable steel drums without any extra cost to the purchaser.

11.03 NON STANDARD LENGTH

5% (five percent) of the ordered quantity of respective size shall be acceptable in non-standard length which shall not be less than 100 meters in length.

11.04 In addition to the requirement as per IS, the following particulars shall be properly legibly embossed on the cable sheath at the intervals of not exceeding one meter throughout the length of the cable. The cables with

poor and illegible embossing shall be liable for rejection.

(a) Electric
(b) Manufactures name.
(c) Voltage grade.
(d) Year of manufacture.

(e) Name of purchaser: MITL.
(f) Successive Length.
(g) Size of cable
(h) ISI mark
(i) CML no.
(j) IS

11.05 Packing and marking shall be as per clause No. 18 of IS 7098 (Part I) / 1988 amended up to date.
11.06 Supplier shall provide statistical data regarding cables of all sizes viz.-

(i) Weight of one meter of finished product of cable of various sizes and ratings.
(j) Weight of one meter of bare conductor used for cables of various sizes and ratings.

12.00 PERFORMANCE GUARANTEE:

The cable offered shall be guaranteed for satisfactory performance for a period of 30 months from the date of receipt of complete cable at site in good condition or 24 months from the date of satisfactory commissioning, whichever is earlier. In case of failure within this period, the supplier shall make good the faulty cable at no extra cost to the purchaser.

13.00 QUALITY CONTROL

The purchaser shall send a team of experienced engineers for assessing the capability of the firm for manufacturing of cable as per this specification. The team shall be given all assistance and co-operation for inspection and testing at the bidder's works. The cable supplied shall give service for a long period without drifting from the original calibration & performance must be near to zero percent failure.

14.00 QUALITY ASSURANCE PLAN

A detailed list of bought out items which got into the manufacture of cables shall be furnished indicating the name of the firms from whom these items are procured. The bidder shall enclose the quality assurance plan invariably along with offer followed by him in respect of the bought out items, items manufactured by him & raw materials in process as well as final inspection, packing & marking. The Company may at its option order the verification of these plans at manufacturer's works as a pre qualification for technically accepting the bid. During verification if it is found that the firm is not meeting with the quality assurance plan submitted by the firm, the offer shall be liable for rejection.

GUARANTEED TECHNICAL PARTICULARS **(Multi Core Cable)**		
	DESCRIPTION	…… (Size) sq. mm. Stranded shaped aluminium conductor (Class-2), Extruded cross linked polyethylene insulated cores laid-up, Extruded PVC (Type ST-2) Inner sheathed, Galvanised steel strips armoured and overall extruded PVC (Type ST-2) Outer sheathed, 1.1 kv Grade LT XLPE Power Cable conforming to IS 7098 (Part-1) 1988 updated Code : "A2XFY"
1	GENERAL	
	Name of Manufacturer	
	Address	
	Brand	
	Applicable Standards	As per IS-7098 (P-1) 1988 Amended up to date
	Voltage Grade in (KV)	
2	CONDUCTOR (Phase)	As per IS :8130:2013 - Amended up to date
	Material	
	grade	
	Shape	
	Cross sectional Area (SQ MM)	
	No. Of Cores	
	Minimum No of Strand (Nos)	
	Single strand Dia Before stranding (mm)	
	Max.D.C.resistance at 20 deg.c (ohm/km)	
3	CONDUCTOR (Neutral)	As per IS :8130:2013 - Amended up to date
	Material	
	grade	
	Shape	
	Cross sectional Area (SQ MM)	
	Minimum No of Strand (Nos)	
	Single strand Dia Before stranding (mm)	
	Max.D.C.resistance at 20 deg.cohm/km(Neutral) (ohm/km)	
4	INSULATION (Phase)	As per IS-7098 (P-1) 1988 Amended up to date
	Material	
	Nominal THICKNESS (MM)	
	Colour	
5	INSULATION (Neutral)	As per IS-7098 (P-1) 1988 Amended up to date
	Material	
	Nominal THICKNES (MM)	
	Colour	

6	INNER SHEATH	As per IS : 5831 -1984 - Amended up to date
	Material	
	Minimum Thickness (MM)	
7	ARMOURING	As per IS -3975 - 88 Amended up to date
	Material	
	Types of Armouring	
	Nominal size of Armouring (MM)	
8	OUTER SHEATH	As per IS : 5831 -1984 - Amended up to date
	Material	
	Minimum Thickness (MM)	
	Colour	
9	Approximate Overall Diameter (MM)	
10	Approximate Net Weight of cable. (Kg/Km)	
11	Embossing/Printing on cable at regular interval along its length	ELECTRIC, Manufacture/ Trade Name, 1100V GRADE, IS:7098(Part-1)-1988, CM/L No-…….. Size ……SQ.MM, A2XFY, MITL, year of manufacturing, ISI Mark , Successive Length
12	Standard Drum Length (Mtr)	
13	Drums Type	IS: 10418 (Non-Returnable Wooden Drums)
14	Continous AC Current Carrying Capacity (Amp)	As per IS - 3961 (6) Amended up to date
	When laid in ground (30 Deg.C) (Amp)	
	When laid in air (40 deg.c) (Amp)	
15	Short Current Raiting Of Conductor KA For -Duaration of 1 Sec (KA)	
16	Minimum Bending Radius	

GUARANTEED TECHNICAL PARTICULARS **(Single core)**		
	DESCRIPTION	…….. sq.mm. aluminium stranded circular conductor (Class-2), Extruded cross linked polyethylene insulated, Aluminium Strips Armoured and overall Extruded PVC (Type-ST 2) outhersheathed,1.1 kv Grade LT LXPE Power Cable conforming to IS 7098 (Part-1) 1988 - updated.
1	GENERAL	
	Name of Manufacturer	
	Address	
	Brand	
	Applicable Standards	As per IS-7098 (P-1) 1988 Amended up to date
	Voltage Grade in (KV)	
2	CONDUCTOR (Phase)	As per IS :8130 - 2013 Amended up to date
	Material	
	grade	
	Shape	
	Cross sectional Area (Sq.mm)	
	No. Of Cores	
	Minimum No of Strand (Nos)	
	Single strand Dia Before stranding (mm)	
	Max.D.C.resistance at 20 deg.c (Ohm/Km)	
3	INSULATION (Phase)	As per IS :7098 (part - 1) 1988 Amended up to date
	Material	
	Nominal THICKNES (MM)	
	Colour	
4	ARMOURING	As per IS : 3975 - 88 Amended up to date
	Material	
	Types of Armouring	
	Nominal size of Armouring (MM)	
5	OUTER SHEATH	As per IS : 5831 -1984 Amended up to date
	Material	
	Minimum Thickness (MM)	
	Colour	
6	Approximate Overall Diameter (MM)	
7	Approximate Net Weight of cable. (Kg/Km)	
8	Embossing/Printing on cable at regular interval along its length	ELECTRIC, Manufacture/ Trade Name, 1100V GRADE, IS:7098(Part-1)-1988, CM/L No-…….. Size ……SQ.MM, A2XFY, MITL, year of manufacturing, ISI Mark , Successive Length
9	Standard Drum Length(Mtr)	

10	Drums Type	As per IS: 10418 (Non Returnable Wooden Drums)
11	Continious AC Current Carrying Capacity (Amp)	As per IS - 3961 (6) Ammended up to date
	When laid in ground (30 Deg.C} (Amp)	
	When laid in air (40 deg.c) (Amp)	
12	Short Current Raiting Of Conductor KA For -Duaration of 1 Sec (KA)	
13	Minimum Bending Radius	

Request for Qualification cum Request for Proposal (RFQ cum RFP)

for

Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar.

VOLUME 1

PART 7- TECHNICAL SPECIFICATION

A. 11 kV, 630 Amps RMU.
B. Straight Through/Termination Jt.Kit.
C. 6 Way LT Feeder pillar.
D. 4 Way LT Feeder pillar.
E. 11kV/0.433kV Compact Substation (CSS).

November 2026

Managing Director
Maharashtra Industrial Township Limited
(Formerly Known as AITL)
Udyog Sarathi, MIDC Office, Marol Industrial Area,
Andheri (East), Mumbai, Maharashtra State, India - 400093

Technical Specification

Of

11 kV, 630 Amps, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

1.0 Scope:

i) This specification covers design, manufacture, assembly, Stage inspection, testing before supply, inspection, packing and delivery of SF6 gas filled 11 kV, 630 Amps, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker.

ii) The Ring Main Unit shall be complete with all the accessories and auxiliary equipment's required for their satisfactory operation in Distribution Network of MITL/MSEDCL in Maharashtra State, India.

iii) The Ring Main Unit should have compatibility with Open Protocol Control and data Acquisition system. The Ring Main Units capable of being monitored and controlled by the Supervisory Control and data Acquisition (SCADA)/ Distribution Management System (DMS). The Ring Main Units should have the castell lock for avoiding dual supply and safety purpose.

iv) The Ring Main Unit shall be complete with various combinations of Load Break Isolators & Circuit Breaker for Distribution transformers center and feeders.

v) The Ring Main Units to be supplied against this specification are required for vital installations where continuity of service is very important. The design, materials and manufacture of the Ring Main Unit shall, therefore, be of the highest order to ensure continuous and trouble-free service over the years.

vi) It is not the intent to specify, completely here in all the details of design and construction of the Ring Main Unit. However, the Ring Main Unit shall conform, in all respects to high standards of engineering, design and workmanship as per recent Indian standards or International standards. It shall be capable of performing in continuous commercial operation up to the supplier's guaranteed life of Ring Main Unit in a manner acceptable to the purchaser who will interpret the meanings of drawings and specifications and shall have power to reject any work or material which, in his judgment, is not in accordance therewith. The Ring Main Unit offered shall be compact, maintenance free, easy to install reliable, safe and easy to operate and complete with all parts necessary for their effective and trouble-free operation. Such components shall be deemed to be within the scope of supplier's supply, irrespective of whether those are specifically brought out in this specification and/or in the commercial order or not.

vii) Recommended spares: The bidder shall furnish in his offer a list of recommended spares with unit rates for each set of Ring Main Unit that may be necessary for satisfactory operation and maintenance of Ring Main Unit for a period of 5 years. The purchaser reserves right of selection of items and quantities of these spares to be ordered. The cost of such spares shall not be considered for tender evaluation.

viii) Erection and maintenance tools: The bidder shall submit a list and unit rates of all the special tools, equipment and instruments required for erection, testing, commissioning and maintenance of the Ring Main Unit. The purchaser shall decide the quantity of tools to be ordered. Prices of these tools shall not be considered for tender evaluation. However, the list of necessary tools/equipment which will be supplied free of cost with each Ring Main Unit may be furnished separately.

ix) The Bidder shall bind himself to abide by these considerations to the entire satisfaction of the purchaser and will be required to adjust such details at no extra cost to the purchaser over and above the tendered rates and prices.

2.0 System Particulars:

2.1 Nominal System Voltage	:	11kV
2.2 Voltage variation on supply side	:	±10 %
2.3 Corresponding Highest System Voltage	:	12kV
2.4 Frequency	:	50 Hz with ± 3 % tolerance
2.5 Transient condition	:	-20 % or + 10 % combined variation of voltage and frequency.
2.6 Number of Phase	:	3 Phases
2.7 Neutral earthling	:	Solidly earthed.
2.8 Fault level (minimum) kA /Sec	:	16/3
2.9 Lightning Impulse Withstand Voltage (kVp)	:	75, 125, 170
2.10 One minute dry/wet power frequency withstand voltage primary (kV rms)	:	28 50 70
2.11 Rated Dynamic Withstand Current for 1 second duration (kAp)	:	40.0

3.0 Service Conditions :

A) The SF6 gas filled 11 kV, 630 Amps, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

3.1	Maximum ambient temperature (Degree C)	50
3.2	Maximum temperature in shade (Degree C)	45
3.3	Minimum Temperature (Degree C)	3.5
3.4	Relative Humidity (percent)	10 to 95
3.5	Maximum Annual rain fall (mm)	1450
3.6	Maximum wind pressure (kg/sq.m)	150
3.7	Maximum altitude above mean sea level (Meter)	1000
3.8	Isoceranic level (days per year)	50

3.9 Seismic level (Horizontal Acceleration)	0.3 g
3.10 Climatic condition	Moderately hot and humid tropical climate conducive to rust and fungus growth

B) The climatic conditions are prone to wide variations in ambient conditions and hence the SF6 gas filled 11 kV, 630 Amps, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker shall be of suitable design to work satisfactorily under these conditions.

4.0 Objective of Work & Tolerances:

It is intended to have

a) Enhanced safety and reliability.
b) Maintenance free Ring Main Units.
c) Reduction in space requirement
d) Integrated remote control and monitoring-SCADA compatible

Tolerances: Tolerances on all the dimensions shall be in accordance with provisions made in the relevant Indian/International standards amended up to date and in this specifications. Otherwise the same will be governed by good engineering practice in conformity with required quality of the product.

5.0 Auxiliary Power Supply:

a) A. C. supply shall be provided for Control & Protective devices, lighting fixtures, space heaters and motors.

b) D.C. supply shall be provided for alarm, control and protective device.

The rating, quality and location of electrical supply system that will be made available by the supplier for operation of the Ring Main units are described below:

i.	A. C. Supply	230 volts with ± 10% variation
Ii	D.C. Supply	24 V DC to 30 V DC with +10% to – 15% variation
Iii	Frequency	50 Hz with ± 3% variation

6.0 Applicable Standards:

a) The design, manufacture and performance of the Ring Main Units shall comply with all currently applicable statutes, regulations and safety codes.

Nothing in this specification shall be construed to relieve the bidder off his responsibilities.

b) Unless otherwise specified, the Ring Main Units offered shall conform to the latest applicable Indian, IEC, British, U.S.A. or International Standards and in particular, to the following:

Sr. No.	Standards	Particulars
1.	IEC 62271- 200/ IEC 60 298/ IS 12729 : 1988	General requirement for Metal Enclosed Switchgear
2.	IEC 265	Medium Voltage Switches
3.	IEC 60129/ IEC 62271 – 102/ IS 9921	Alternating Current disconnectors (Load Break Isolators) and earthing switch
4.	IEC 62271-100/IEC 60056/ IS 13118 : 1991	Specification for alternating current breakers
5.	IEC 62271 – 1/ IEC 60694	Panel design, SF6/ Vacuum Circuit Breakers
6.	IEC 60044 –1/ IEC 60185/ IS 16227 (Part-1)/(Part-2) /2016	Current Transformers
7.	IEC 60265/IS 9920 : 1981	High voltage switches
8.	IEC 376	Filling of SF6 gas in RMU
9.	IEC 60273/ IS : 2099	Dimension of Indoor & Outdoor post insulators with voltage > 1000 V
10.	IEC 60273/ IS 13947 (Part1)	Degree of protection provided by enclosures for low voltage Switchgear and control gear.
11.	IEC 60694	Common clauses for high voltage switchgear and control gear standards
12.	IEC 62271-103	High voltage switches for rated voltages above 1 KV and less than 52 KV.
13.	IEC 60137	Bushings for alternating voltages above1000 V
14.	IEC 60233	Tests for hollow insulators for use in electrical equipment
15.	IEC 60376	New Sulpher hexafluoride (SF6)
16.	IEC 60480	Guidelines for checking and treatment of Sulphar hexafluoride (SF6)
17.	IEC 61243-5	Voltage detection systems
18.	IEC 60044-2	Potential transformers
19.	IEC 62271-209	Cable connections for gas insulated switch gears
20.	IS:2544/1973	Porcelain Post Insulators / Resin cast insulators
21.	IS 8828/1996	MCB
22.	IS 12063/1987	Degree of protection provided for enclosures for electrical equipment.
23.	IS 5/2005	Colors for ready mixed paints and enamels.
24.	IS 5578/1984	Marking of insulated conductor.
25.	11353/1985	Guide for Uniform System of Marking and Identification of Conductors and Apparatus Terminals
26.	IS 1248/2003	Indicating instruments.
27.	IS 14697/1999 amended up to date & as per updated technical specifications of MITL/MSEDCL	HT Static tri vector TOD Energy meters
28.	IS 6875 amended up to date	Control switches.

29.	IS 3231/1986	Electrical Relays for Power System Protection.
30.	IEC 60255 amended up	Numerical protection relays.
31.	IS 8686/1977	Static protective relays.
32.	IS 4794/68 & 86	Push button.
33.	IS 9431/1979	Indoor post insulator of organic material
34.	IEC 60529 / EN 60529	Protection against accidental contact, foreign Objects and water.
35.	IEC 60529	Classification of degrees of protection provided enclosures of electrical equipment
36.	IEC 60298	A.C metal-enclosed switchgear and control gear for rated voltages above 1KV and up to and including 52Kv
37.	IEC 1330	High voltage/Low voltage prefabricated substations
38.	IEC 60801	Monitoring and control
39.	BS 159	Bus Bar
40.	CP 1013(British Code of Practice)	Earthing
41.	IEC 60255	Specification for Static Protective Relays
42.	BS 6231	Wires and wiring
43.	IEC 61000	Electromagnetic compatibility
44.	IEC 60129	Alternating current Disconnector (isolators) and earthing switches
45.	IEC 60060-1, BS 923	High Voltage test technique
46.	IEC 60947-4-1	Control Gears

All Indian Electricity Rules/ Bills amended up to date applicable for clearances, safety and operation of the equipment.

The Ring Main Unit meeting with the requirements of any other standards, which ensures equal or better quality than the standard mentioned above shall also be acceptable. If the Ring Main Unit, offered by the bidder conforms 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 in Hard Copy shall be furnished along with the offer.

7.0 General Requirement of Ring Main Unit:

The Ring Main Unit shall be installed at 11 kV junction points such as 200kVA, 315kVA, 630kVA distribution transformers centers or feeder branches to isolate faulty section. The Ring Main Unit shall be both Non extensible/Extensible. Two Load break isolators for incoming & outgoing cables and one Circuit breaker for transformer or feeder protection shall be enclosed in the main tank using SF6 gas as insulating and vacuum as arc quenching medium.

7.01 The Inner tank shall be stainless steel sheet of minimum 2mm thickness and robotically welded with a pressure relief arrangement.

7.02 Both the load break switches and circuit breaker shall be suitable for motorization.

The total breaking time for transient fault should not exceed 40-60 ms (CB + Relay+ trip coil).

7.03 The main tank (Inner enclosure of Circuit Breaker & Load break Isolators assembly) and all Switchboard assembly shall be housed in a single compact metal clad suitable for both indoor/outdoor applications.

The design of enclosure for Switchgear, Ring Main Unit & Switchboard housing shall be in accordance with IEC 298. The design of Ring Main Unit shall be in accordance with the Technical Specification.

The switchgear and switchboard shall be designed such that the position of the different devices shall be visible to the operator on the front of switchboard and easy to operate and prevent access to all live parts during operation without the use of tools. There shall be no access to exposed conductors.

7.04 Circuit Breaker supplied with each Ring Main Unit shall be Vacuum Circuit Breaker. Insulating media for Bus Bar, Load Break Isolator, Earth Isolator and other associated equipment in Inner enclosure should be SF6 Gas.

An absorption material such as activated alumina in the tank shall be provided to absorb the moisture from the SF6 gas to regenerate the SF6 gas following arc interruption. A temperature compensating gas pressure indicator offering a simple indication shall constantly monitor the SF6 insulating medium.

7.05 Each Ring Main Unit shall include its own power supply unit (including auxiliary transformer, batteries, and battery charger), which shall provide a stable power source for the Ring Main Unit. The auxiliary transformer of rating 500VA ,11kV/230 Volt shall be provide a stable power source which will supply **230V** AC for Remote Terminal unit (RTU).

The Ring Main Unit shall also provide the necessary space for housing the Remote Terminal unit (RTU). In addition, space must be provided for auxiliary power transformer, which shall serve as the AC power supply 230 V inputs, along with all other Ring Main Unit devices.

7.06 Within this context, the general requirements of the Ring Main Unit shall include, but shall not be limited to provision of the following monitoring and control features:

i) Positions of local/remote switches as used to control local and remote access to circuit breakers and load break switches.
ii) Power supply indications including battery failure and voltage alarms.
iii) Open/Closed position of load break switches, circuit breakers, and earthing switches.
iv) Enclosure door-open indications
v) SF6 gas-pressure low alarm
vi) Circuit breaker spring and load break switch charge (switch readiness) indications
vii) Circuit breaker relay indications
viii) Indications of fault current in the Ring Main Unit main feeder circuit as detected by the Fault Passage Indicator (FPI).
ix) Measurement of 11 kV voltages, current, power, energy, and power factor values as per voltage level.
x) Load break switch and circuit breaker open/close control
xi) Fault Passage Indicator (FPI) reset control
xii) Automatic Water Level Control
xiii) Relay settings control

The acceptance of the RMUs shall not be complete until they have been demonstrated on a point-to-point basis to be fully interopertable with the Remote Terminal unit (RTU).

7.07 The Ring Main Unit shall be provided with necessary take off terminal units for automations and all these units should be shielded in an outdoor metal-body enclosure for making them suitable for Outdoor / Indoor use. The insulation/dielectric media of Inner enclosure stainless steel tank should be SF6 gas.

7.08 The Ring Main Units shall be extensible on both sides.

The Ring Main Units should be motorized and suitable to be connected to Field / Feeder Remote Terminal unit (F-RTU) so as to be monitored and controlled through Supervisory Control and data Acquisition (SCADA)/ Distribution Management System (DMS).

7.09 A remote terminal unit (RTU) is a microprocessor-controlled electronic device that interfaces objects in the physical world to a distributed control system or SCADA (Supervisory Control and Data Acquisition) system by transmitting telemetry data to a master system, and by using messages from the master supervisory. The Supervisory Control and Data Acquisition (SCADA) system is the heart of Distribution Management System (DMS).

7.10 The Ring Main Unit shall be equipped with main-line load break switches and a fault passage indicator (FPI). Furthermore, to protect each of its transformer / feeders, it shall be equipped with a corresponding set of circuit breakers and self-powered numerical relays. The Ring Main Unit shall include potential-free contacts and control contacts so as to connect to SCADA/DMS via FRTUs, so as to:

i) Monitor and control the open/closed status of the Ring Main Unit circuit breakers and load break switches.

ii) Monitor the local/remote position of Ring Main Unit motorized (in case if failure of motor) manually-operated switches that can be used to enable and disable remote monitoring.

iii) Monitor the health of the power supply, which will include battery failure and low voltage indications.

iv) Monitor the open/closed status of Ring Main Unit earthing switches.

v) Monitor the open/closed status of RMU enclosure doors in case of Hinge doors. FRTU, Modem, Power and I/O cable interface between FRTU and Control panel of Ring Main Unit /sectionaliser are included in the scope of supply.

8.0 Principal Technical Parameters of Ring Main Unit and accessories:

The Ring Main Unit and accessories covered under this specification shall conform to specific parameters given below:

Sr. No.	Description	11 kV Ring Main Unit
A)Ring Main Unit Assembly		
1	Indoor / Out door	Indoor / Out door
2	Configurations(Type)	3 Way, M+LLV+
		4 Way, +LLLL+
		4 Way, M+LLLV+
		4 Way, M+LLVV+
		5 Way, M+LLVVV+
		6 Way, +LLVVV+V+
		L= Isolator.
		V= VCB.
		M=Metering
3	Reference Standard	IEC-62271-100, 200, 103 and IEC-60694

4	Rated Voltage in Kv	11
5	Highest System Voltage in kV, Max.	12
6	Number of Phase	3
7	Frequency in HZ.	50 Hz
		+ -
8	Short Circuit rating	
	a) Breaking Symmetrical for 3 Sec. in KA	16
	b) Breaking Asymmetrical for 3 Sec. in KA	16
	c) Short time for 3 Sec. in KA.	16
9	Insulation Level	
	a) Impulse withstand in KV peak.	75
	b) 1 Minute 50 Hz. Voltage withstand in KV rms	28
10	Internal arc rating for 1 sec. in kV	16
11	Construction: Material and Size	
	Inner Enclosure	Main Stainless Steel Tank with 2 mm Thickness
	Outer Enclosure	CRCA Sheet of 2 mm thickness or Galvanized Sheet of 1.6 mm thickness
12	Degree of protection	
	Inner Enclosure	IP 67
	Outer Enclosure	IP 54 (Main Door close) and IP 41 (Main Door open)
13	The Ring Main Unit and accessories completely wire and tested at factory	Yes
14	Paint	Polyurethane based powder paint
15	Color	Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007
16	Thickness of coat, Min.	150 microns for CRCA Sheet and 80 microns for galvanized Sheet
B) Bus Bar		
17	Reference Standard	IS: 1897, 2008
18	Grade and Material	Electrolytic Grade Copper
19	Cross sectional area in mm2	400
20	Size in mm or as per design	40 x 10
21	Current Density in Amps/mm2, Max.	1.6

22	Continuous Current in Amps	630
23	Maximum temperature rise over an ambient temperature 50^{0}C.	55^{0}C
24	Short time current rating for 3 Sec in kA rms	16
25	Clearance in mm from bare bus bar or as per design	
	Phase to Phase for Isolator or as per design	60
	Phase to Phase for VCB	60
	Phase to Earth for Isolator or as per design	60
	Phase to Earth for VCB or as per design	60
26	Bus Supports	
	Reference Standard	IEC 60243-1,
		ASTM D 648
	Voltage Class in kV	11 kV
	Creepage distance in mm or as per design	115 in SF6 gas
	Bus Bar support spacing in mm or as per design	120
27	Filling SF6 gas pressure (Filling pressure at 20^{0}C), Min.	1.4 Bar
28	Operating SF6 gas pressure at 20^{0}C, Min.	0.5 Bar
C)Vacuum Circuit Breaker		
29	Reference Standard	IEC 62271-100
30	Rated Voltage in kV	11
31	Highest System Voltage in kV, Max.	12
32	Type	Vacuum Type
33	Rated Frequency in Hz.	50 Hz
		± 3%
34	No. of Poles	3
35	Rated Current	630A
36	Maximum temperature rise over an ambient temperature 50^{0}C.	55°C
37	Rated operating Duty	O-3min-CO-3min-CO
38	Rupturing capacity at rated voltage in MVA, Min.	As per design
39	Breaking Capacity at rated voltage & operating duty	
	Symmetrical in kA rms	16

	Asymmetrical in kA rms	16
40	Rated making current in kA peak	40
41	Short time current for 3 sec in kA rms	16
42	Transient Recovery Voltage	
	Rate of rise in kV/µs	0.34 kV/µs as per IEC 62271-100
	Peak Voltage in kV	28
43	Insulation Level	
	Impulse Voltage with stand on 1.2/50 µs full wave in kV	75
	1 minute power frequency voltage withstand in kV	28
44	Total breaking time for transient fault (CB + Relay+ trip coil) in ms	45-50 ms
45	Opening time No load condition in ms	45-50 ms
46	Opening time under SF6 gas low or vacuum loss condition in ms	45-50 ms
47	Number of breaks per pole	Single
48	No of breaker operations permissible without requiring inspection replacement of contacts and other Main parts	
	At 100% rated current	2000
	At 100% rated breaking current, Min.	20
49	Type of contacts	
	Main	Butt Type
	Arcing	Butt Type
50	Material of contacts	
	Main	Copper
	Arching	Copper
	Chromium / Silver plated	Chromium / Silver plated
51	Mechanical Endurance Test for Circuit Breaker, Number of operations	2000
52	Spring charging mechanism	Motor Operated
53	Operating mechanism for closing of Circuit Breaker	
	Type	Spring operated Mechanism

	No of breaker operations stored	One
	Trip free or fixed trip	Trip Free
	Earthing for operating mechanism and metal parts	Solidly Earthed
	Earth terminal size and material, Min.	Electrolytic grade Copper 25 x 3mm
54	Operating mechanism for tripping of Circuit Breaker	
	Type	Spring Operated Mechanism
	No of breaker operations stored	One
	Trip free or fixed trip (V)	Trip Free
	Earthing for operating mechanism and metal parts	Solidly Earthed
	Earth terminal size and material	Electrolytic grade Copper 25 x 3mm
55	Breaker Accessories	
	Mechanical safety Interlock	Provided
	Automatic safety Interlock	Provided
	Operational Interlock	Provided
	Emergency manual trip	Provided
	Operation counter	Provided
	Spring charge / discharge indicator	Provided
	Manual spring charging facility	Provided
D) **Isolators**		
56	Reference standard	IEC-62271-102 / IEC-62271-103
57	Nominal Voltage in KV	11
58	Highest System Voltage in kV, Max.	12
59	Rated Frequency in HZ	50 Hz
		± 3%
60	No. Of poles	3
61	Rated Current in Amps	630
62	Maximum temperature rise over an ambient temperature 50^0C.	60°C
63	Operation	Close-Open-Earth
64	Rupturing Capacity at rated voltage	630Amps at 11kV
65	Maximum over voltage factor when switching off Loaded feeder cable in Ka	40

66	No. of isolator operation permissible without requiring inspection,	
	replacement of contacts and other main parts	
	Mechanical Endurance in Number of operations	1000
	At 100% rated breaking current in Number of operations	100
67	Isolator provided with the following Mechanical safety	
	Mechanical ON and OFF Indication	Provided
	Cable Earth Indication	Provided
	Operational Counter	Provided
	Manual Spring Charging facility	Provided
E) Current Transformer		
68	Reference standard	IS:16227, I & II
69	Type	Ring Type, Resin Cast/Tape wound
70	Nominal Voltage in KV	11
71	Highest System Voltage in kV, Max.	12
72	Rated Frequency in HZ	50 Hz ± 3%
73	Current Transformer Ratio	200-100/1Amps
74	Short circuit withstand	
	i) Short time current for 1 sec. in kA rms	5
	Dynamic current in kA peak, Min.	7.5
75	Class of insulation	Class B
76	Basic insulation level in kV rms	3
77	Maximum temperature rise over an ambient temperature 50^{0}C.	60^{0}C
78	Class of Accuracy	
	Metering Core	0.5
	Protection Core	5P10
79	Rated Burden	2.5 VA
80	Over Current Rating in %	120
81	Continuous Over Load in %	120

F) Metering Voltage(Potential) Transformer		
82	Reference standard	IS:16227, I & III
83	Type	Resin Cast/Tape wound
84	Nominal Voltage in KV	11
85	Highest System Voltage in kV, Max.	12
86	Rated Frequency in HZ	50 Hz ± 3%
87	Voltage Transformer Ratio	11 kV/√3 /110V/√3
88	Rated Primary Voltage in kV	11 kV/√3
89	Rated Secondary Voltage in V	110V/√3
90	Rated Burden in VA	50
91	Accuracy Class	0.5
92	Insulation Class	B
93	Voltage Factor	1.2 Continuous and 1.9 for 8 hrs.
94	One Minute Power Frequency Dry Withstand Voltage Rating	
	Primary Winding Induced Test in kV rms	28
	Secondary Winding in kV rms	3
	Rated Impulse Voltage in kV peak	75
G) Auxiliary Voltage(Potential) Transformer		
95	Reference standard	IS:16227, I & III
96	Type	Resin Cast/Tape wound
97	Nominal Voltage in KV	11
98	Highest System Voltage in kV, Max.	12
99	Rated Frequency in HZ	50 Hz ± 3%
100	Voltage Transformer Ratio	11 kV / 230V
101	Rated Primary Voltage in kV	11 kV
102	Rated Secondary Voltage in V	230 V
103	Rated Burden in VA	500 VA
104	Voltage Regulation in %	5
105	Insulation Class	B
106	Voltage Factor	1.2
107	Application & Construction Type	Indoor, Single Phase/Two Pole
108	One Minute Power Frequency Dry Withstand Voltage Rating	
	Primary Winding Induced Test in kV rms	28

	Secondary Winding in kV rms	3
	Rated Impulse Voltage in kV peak	75
H) Numerical Protection Relay		
109	Reference Standard	IEC 60255
110	Type and Model	3 Over Current(O/C) and 1 Earth fault(E/F)
111	Current Transformer Secondary Input to Relay	1:00 AM
112	Operating Curve Type	Inverse Definite Minimum Time (IDMT)Relay
113	Auxiliary Supply	Self Powered relay for Protection
114	Rated Frequency in HZ	50 Hz ± 3%
115	Over Current Protection	
	Low set Over Current protection	20-200% of CT secondary rated current with increment/decrement by 1 %
	High set Over Current protection	100-2000% of CT secondary rated current with increment/decrement by 50%
116	Earth Fault Protection	
	Low set Earth Fault protection	5% to 80% of the CT rated current in steps of 1%
	High set Earth Fault protection	100-1000% of the CT rated current in steps of 50%
117	Mounting	Flush Mounted
118	Operational Indicator	LCD display and LED annunciation lamps
119	Contact Details	4 Binary Input(BI) and 6 Binary output(BO)
120	Self-diagnosis feature	Yes
121	Password protection	Yes
122	Communication Protocol	RS 232 or RS 485 Port for IEC 103, Communication Protocol
123	Event / fault record, Min.	10 Event and 5 Fault Records available
124	Setting groups	2 Groups available
125	Circuit Breaker control available	Yes, Only Trip
I) Tripping Coil II)		
126	DC Voltage in Volt	24
127	Maximum Tripping Current at rated voltage in Amps.	5
	Minimum Permissible voltage variation in %	85 to 110

J) HT three phase four wire CT / PT operated 1 Amps fully Static & AMR compatible TOD Tri - vector Energy Meter		
128	Reference Standard	IS: 14697, 1999
		IS: 15959, 2011
129	Make	Secure / L&T / other MSEDCL approved make
130	Auxiliary supply Voltage	110V/√3
131	Class of Accuracy	0.5S
132	Type of Display	Customized backlite liquid crystal display
133	Measuring Parameters as per MITL/MSEDCL Specification	
		Instantaneous parameters
		Block Load Profile parameters
		Billing Profile Parameters
		Name Plate details
		Programmable Parameters
		Event Conditions
		All logging parameters for each of the event condition for 3 Φ / 4W
K)Fault Passage Indicator (FPI) on Short Circuit and Earth fault		
134	Operating point/Current short circuit in Amp	Adjustable
		100/200/300
		/400/500
		/600/700
		/800/900/1000
		/1100/1200A (±15%)
135	Operating point/Current earth fault in Amp	Adjustable
		10/20/30/40
		/60/80/100A (±15%)
136	Response Time in ms	For Short Circuit Adjustable
		40/60/80/100/120
		/160/200/240 ms Sec(±100m Sec)
		For Earth Fault Adjustable
		40/60/80/160 ms (±100m Sec)
137	Auto Reset Time in Hrs	1/2/4/8 hrs (+ / - 1%) after fault
L) Battery Charger		
138	Input AC Voltage in V	230
139	Rated Frequency in Hz	50 Hz ± 3%
140	Output DC Voltage in V	24
141	Current Rating in Amps	10
142	Output DC Voltage for charger	
	Boost Mode in V	27 to 28
	Float Mode in V	27 to 28

143	Operating Temperature in ^{0}C	-25 to 60
144	Temperature Compensation	Junction temperature of SMPS crosses 142^{0}C, thermal shutdown occurs.
145	Short Circuit and Overload Protection	Provided
146	High Voltage Isolation	2 kV for 1 minute
147	Efficiency	Above 85 %
M) Battery		
148	Type	Dry Type
149	Ah Efficiency	> 95%
150	Self-Discharge	Self-Discharge
151	Operating Temperature	Normal : +20^{0}C to +30^{0}C &
		Limits : -20^{0}C to +50^{0}C
152	Voltage (V)	24V (2 x 12V)
153	Ah Capacity	7Ah / 12 Ah / 26 Ah
N) Manometer with Non Return Valve		
154	Type	Analogue
155	Material	Stainless Steel
156	Accuracy of calibration pressure	+/-1% at 20^{0}C
157	Pressure Element	Stainless Steel Welded
158	Dial	2''
159	Pointer	Dark
160	Window	Round
161	Gas pressure low signal	Indicated by Red Color Zone
162	Non Return Valve(NRV) Material	Stainless Steel
O) Indoor cable terminations kits		
163	Type	11 kV touch proof screened termination kit
164	Materials	Epoxy / EPDM / Silicon Rubber
165	Size	Up to 3 x 400 sq. mm 11 kV HT cables
166	Height of Bus bar / transformer / feeder Cable box from ground level	As per Manufacture design
167	Arrangement for mounting an extra cable at incoming and outgoing side box of Bus bar.	As per Manufacture design
168	Arrangement for mounting an extra cable at outgoing side box of transformer / feeder.	As per Manufacture design
P) Automatic Water Level Controller		
172	Position of Automatic Water Level Controller	200 mm below live contacts
173	Auxiliary contacts	4 NO + 4 NC

174	Breaker Tripping and Load break Isolator opening due to water level increases signals to Control room	Yes
Q) Name Plate		
175	Material	Anodized Aluminum / Stainless Steel
176	Thickness	18 swg / 1.00 mm
177	Size	145 mm x 116 mm
R) Painting		
178	Inside	Powder Coated
179	Outside	Polyurethane based powder paint. Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007.

9.0 Principle Requirement of Ring Main Unit:

9.1 Enclosure:

i) The Ring Main Unit enclosure (Outer) shall be made up of CRCA Sheet of 2 mm thickness or galvanized Sheet of 1.6 mm thickness. The rating of enclosure shall be suitable for operation on three phases, three wire, 11 kV, 50 cycles, A.C. System with short-time current rating of 16 kA for 3 seconds for 11kV with Panels. The complete Ring Main Unit Outer enclosure shall be of degree of protection IP 54 (Main Door close) and IP 41 (Main Door open).

ii) The enclosure shall provide full insulation, making the Switchgear insensitive to the environment like temporary flooding, high humidity etc. The active parts of the Switchgear shall be maintenance-free and the unit shall be minimum -maintenance.

iii) The Ring Main Unit Outer enclosure shall be painted with Polyurethane based powder paint. The color of Ring Main Unit Outer enclosure shall be Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007.

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

v) The Ring Main Unit metal parts shall be made of high thickness high tensile steel which must be grit/short blasted, thermally sprayed with Zinc alloy (not galvanized), phosphate and subsequently painted with Polyurethane based powder paint, the overall (Including outer and inner paint layer), the thickness of paint layer shall be not less than 150 microns for CRCA Sheet and 80 microns for galvanized Sheet.

9.2 Inner enclosure (Main tank):

i) The tank shall be robotically welded stainless steel sheet of minimum 2 mm thickness. The tank shall be sealed and no handling of gas is required throughout the 25 years of service life. However, the SF6 gas pressure inside the tank shall be constantly monitored by a temperature compensating gas pressure indicator offering a simple go, no-go indication. The gas pressure indicator shall be provided with green pressure and red pressure zones. There shall be one Non – return valve to fill up the gas. The manufacturer shall give guarantee for maximum leakage rate of SF6 gas will be lower than 0.1 % per year. An absorption material such as activated alumina in the tank shall be provided to absorb the moisture from the SF6 gas to regenerate the SF6

gas following arc interruption. The degree of protection of the inner enclosure shall be IP 67.

ii) Oil or Air filled Switchgear will not be considered. The temperature rise test shall be carried out on complete Ring Main Unit and test reports shall be submitted with the offer.

iii) The compact Ring Main Unit shall be provided with a pedestal made up of M.S. Angle to mount the unit on plain surface. The height of the bottom of cable box shall be 310 mm to provide the turning radius for the HT cable termination.

9.3 Configurations recommended:

The following configurations of Ring Main Units are recommended:

i) Non Extensible:

Non extensible Ring Main Unit with one number of 200A circuit breaker for transformer protection up to 630 kVA and two number of Load Break Isolators for network sectionalizing with earth isolator.

ii) Extensible:

Extensible Ring Main Unit with one number of 200A circuit breaker and two Load break isolators with earth isolator arrangement having provision for adding one number of 200A circuit breaker for one extensible and two 200 A circuit breakers for two extensible Ring Main Unit.

9.4 Bus bars:

The three numbers of continuous Bus bars made up of EC grade tinned copper of rating current 630A shall be provided. The Short time rating current shall be 16 kA for 3 seconds for 11kV. The Bus bar connections shall Anti- oxide greased.

9.5 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 Ring Main Units under the stipulated service conditions. The SF6 gas 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 bidder indicating all the tests as per IEC 376 for each lot of SF6 Gas.

9.6 Load Break Switches (Load Break Isolators):

i) The Load Break Isolators for Incoming and Outgoing supply must be provided and the load break isolators are fully insulated by SF6 gas.

ii) The operating mechanism shall be spring assisted mechanism with operating handle for ON /OFF. Earth positions with arrangement for padlocking in each position. Also independent manual operations with mechanically operated indicator. The earth 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 fascia, which is allowed to move only if the main or earth switch is in the off position.

iii) The load break isolators shall be remotely operated. Each load break switch shall be of the triple pole, simultaneously operated, automatic type with quick break contacts and with integral earthing arrangement.

iv) The rated current of Isolator shall be 630 Amps continuous at maximum ambient temperatures. No Derating shall be allowed. For the isolator at an Ambient temperature of 50 °C, which means that Isolator rating should be 630 Amps maximum ambient temperature of 50 °C. The temperature rise of Isolator shall be 55^0C maximum. The relevant type test report to prove the temperature rise below 55 °C shall be submitted by the bidder with the offer.

9.7 Current Transformer:

i) The Current Transformers being prone to failure due to various reasons, the quality and reliability of the Current Transformers are of vital importance. Current Transformer's insulation used shall be of very high quality, details of which shall be furnished in the technical offer.

ii) The Current Transformers shall be single wound double ratio, one Current Transformers for metering and one Current Transformers for protection.

iii) The instrument security factor for metering Current Transformers shall be low enough but not greater than 5 at lower ratio. This shall be demonstrated on metering Current Transformers in accordance with the procedure specified in IS: 16227, I & II and relevant IEC.

iv) The Current Transformers shall be ring type (Tape wound / resin cast). Contact tips of terminals shall be silver plated.

v) Correct polarity shall be invariably marked on each terminal.

vi) A panel shall be provided in each Ring Main Unit enclosure to mount a single wound double ratio, Current Transformers for metering and protection purposes. Current Transformers access for maintenance or any other purpose shall be from the back of these panels.

vii) Secondary terminals of Current Transformers shall be brought out suitably to a terminal block, which will be easily accessible for testing and terminal connections.

viii) Further characteristics and features of Current Transformers used for metering and protection are listed as follows:

Metering Current Transformers:

a) Type: Ring Type
b) Material:, Resin Cast
c) Burden: 2.5VA
d) Ratio: 200-100/1 Amps
e) Accuracy Class for metering: 0.5

Protection Current Transformers:

a) Type: Ring Type
b) Material:, Resin Cast
c) Burden: 2.5VA
d) Ratio: 200-100/1 Amps
e) Accuracy Class for protection: 5P10.

Metering Voltage (Potential) Transformer:

i) The Potential Transformers shall be of Resin Cast and they shall conform to IS : 16227, I & III. Their design and construction, in particular, shall be sufficiently robust to withstand the thermal and dynamic stresses during short circuits.

ii) A panel shall be provided in each Ring Main Unit enclosure to mount Potential Transformers. The primary and secondary contacts (moving & fixed type) shall have firm grip while in service. Service position locking mechanism shall be provided and indicated by bidder in relevant drawing. Rigidity of primary stud point with earth bus in service position shall be confirmed.

iii) Contact tips of primary/secondary contacts shall be silver plated. Correct polarity shall be distinctly marked on primary and secondary terminal.

iv) Secondary terminal studs shall be provided with at least three nuts, two plain and two spring washers for fixing leads. The stud nut and washer shall be of brass, duly nickel plated. The minimum outside diameter of the studs shall be 6 mm. The length of at least 15 mm shall be available on the studs for inserting the leads. The space clearance between nuts on adjacent studs when fitted shall be at least 10 mm.

v) Each secondary core will be protected by suitable MCB.

vi) HRC fuses shall be provided on the HV side.

vii) Further characteristics and features of Potential Transformers used for metering are listed as follows:

a) Type: Ring Type

b) Material:, Resin Cast

c) Burden: 50 VA

d) Ratio: 11 kV/√3 /110V/√3 For 11 kV

e) Accuracy Class for metering: 0.5

9.8 Auxiliary Voltage (Potential) Transformer:

i) The Auxiliary Potential Transformers shall be of Resin Cast and they shall conform to IS:16227, I & III. Their design and construction, in particular, shall be sufficiently robust to withstand the thermal and dynamic stresses during short circuits.

ii) A panel shall be provided in each Ring Main Unit enclosure to mount Auxiliary Potential Transformers. The primary and secondary contacts (moving & fixed type) shall have firm grip while in service. Service position locking mechanism shall be provided and indicated by bidder in relevant drawing. Rigidity of primary stud point with earth bus in service position shall be confirmed.

iii) Contact tips of primary/secondary contacts shall be silver plated. Correct polarity shall be distinctly marked on primary and secondary terminal.

iv) Further characteristics and features of Potential Transformers used for metering are listed as follows:

a) Type: Ring Type

b) Material:, Resin Cast

c) Burden: 500 VA

d) Ratio: 11 kV/√3 / 230V For 11 kV

e) Voltage Regulation: 5 %

Note: Instrument transformers shall be suitable for continuous operation at the ambient temperature prevailing inside the Ring Main Unit enclosure, when the Ring Main Unit is

operating at its rated load and the outside ambient temperature is 50^0C. The class of insulation shall be E or better.
All instrument transformers shall withstand the power frequency and impulse test voltage specified for the Ring Main Unit assembly. The current transformer shall further have the dynamic and short time ratings at least equal to those specified for the associated Ring Main Unit and shall safely withstand the thermal and mechanical stress produced by maximum fault currents specified when mounted inside the Ring Main Unit enclosure.
The parameters of instrument transformers specified in this specification are indicative and shall be finalized by the Employer during detailed engineering, considering the actual burden of various relays and other devices finally selected. In case the Bidder finds that the specified ratings are not adequate for the relays and other devices offered by him, he shall offer instrument transformer of adequate ratings without any cost implication.

All instrument transformers shall have clear indelible polarity markings. All secondary terminals shall be wired to separate terminals on an accessible terminal block.

9.9 Earthing of Bus bars (Earth Switch):

i) The unit shall consist of a 630 Amp Tee Off spring assisted three position rotating arc type SF6 circuit breaker unit, with integral fault making/dead breaking earth switch, the function shall be naturally interlocked to prevent the main and earth switch from being switched `ON` at the same time and the CB not allowed to close in
`Earth On` position. The selection of the main/earth switch lever on the fascia, which is allowed to move only if the main or earth switches in the off position. The lever may be padlocked in either the main or earth position.
ii) The cables shall be earthed by an integral earthing switch with short-circuit making capacity, in compliance with IEC 129 standard. The earthing switch shall be operable through the main circuit mechanism and manual closing shall be driven by a fast-acting mechanism, independent of operator action.

9.10 Circuit Breaker (Vacuum media for arc quenching):

i) The 3 pole circuit breaker for the protection of Distribution transformers or feeder shall be enclosed in the main tank. The rated breaking and making current at rated voltage shall be as follows:

For 11kV system: Rated breaking capacity shall be 16 kA for 3 second.
Rated making current shall be 40 kA for 3 second.

ii) The manual operation of the circuit breaker shall not have an effect on the spring charging mechanism.
iii) The circuit breaker shall be fitted with a mechanical flag, which shall operate in the event of fault occurrences. The breaker indications ON and OFF positions shall be indicated by suitable flag. For ON position indication by Red flag and OFF position indication by Green flag shall be provided.

iv) The circuit breaker shall be operated by the same unidirectional handle or switch. The rated operating sequence shall be O-3min-CO-3 min- CO.

9.11 Bushings:

All the bushings shall be of same height, parallel, on equal distances from the ground and protected by a cable cover. It is preferable to have bushings accessible from the front / rear side of the Ring Main Unit.

9.12 Cable Boxes:

All cable boxes shall be air insulated suitable for dry type cable terminations. The cable boxes at each of the two ring switches suitable HV cables of size 3C x 300 sq.mm and circuit breaker cable suitable up to 3C x 300 sq.mm. Necessary Right angle Boot should be supplied to the cable terminations. Compound filled cable boxes are not acceptable. The cable box shall be arc resistant as per IEC 62271-200 amended up to date.
The internal arc fault test on cable box shall be carried out for 11 kV systems for 16 kA/ 1 second.
The clearance between phase to phase and phase to earth shall be as per IEC 61243 – 5 amended up to date. The cable termination and gland arrangements shall be appropriate for the type and style of cables used at the time.
The cable boxes for an isolator in its 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.

9.13 Voltage Indicator Lamps and Phase Comparators:

The Ring Main Unit shall be equipped with a voltage indication. 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 Ring Main Unit to be equipped with a permanent voltage indication as per IEC 61958 to indicate whether or not there is voltage on the cables.

The capacitive dividers will supply low voltage power to sockets at the front of the unit, an external lamp must be used to indicate live cables.

Three outlets can be used to check the synchronization of phases with the use of an external device.

9.14 Extensible:

Each combination of Ring Main Unit shall have the provision for extension by load break isolators / breakers in future, with suitable trenching chamber, accessories and necessary Bus bars. 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 standard i.e. 16 KA for 3 second for 11kV system. The Breaker should have a rated current carrying capacity of 200 A for Distribution Transformers and Feeders.

9.15 Wiring and Terminals:

a) 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 wiring for automation, DC, Control wiring), Spare terminals shall be provided by the bidder. The wiring cable must be standard single-core multi stranded, 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.

b) The wiring shall be carried out using single core multi-strand copper conductor super flexible PVC insulated and shall be flame retardant low smoke type wires of 1.1 KV

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.

c) 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.

d) 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.

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

f) 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 colors

Voltage supply: Red, Yellow, Blue for phases, Black for Neutral
CT circuits:Red, Yellow, Blue for phases, Black for Neutral

230V AC circuits: Black for both phases 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-moulded 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.

9.16 Earthings:

The Ring Main Unit outdoor metal clad, Switch Gear, Earth contact of Load break isolators, Neutral and body of Distribution Transformer, M.S. Channels / M.S. Angles etc, shall be equipped with an earth bus securely fixed along the base of the Ring Main Unit.

When several units of the Ring Main Unit (Extra Isolators / Breakers) are mounted adjoining to each other, the earth bus shall be made continuous and necessary connectors and clamps for this purpose shall be included in the scope of supply. The size of earth bus bar of tinned copper flat shall be as per IEC/IS standards and shall be fixed with the Ring Main Unit. Provision shall be made on end of Ring Main Unit for connecting the earth bus to the earth grid by erecting suitable 2 earth pipes of 40mm diameter MS rod of 3 meters in pits. Both the earth pipes are also to be connected in a grid formation. Necessary terminal clamps and connectors shall be included in the scope of supply.

9.17 Motorization :

All the functions within the Ring Main Unit i.e Isolators / Breakers should be fitted with motor mechanism and closing coil making it suitable to make it ON from remote. Control Supply and Auxiliaries following has to considered:

(i) Shunt trip coil – 24VDC for Isolators and Breakers
(ii) Closing Coil – 24VDC
(iii) Motor Mechanism – 24VDC
(iv) 6NO+6NC – Potential free auxiliary contacts for breakers / isolator
(v) Auxiliary supply should be – 24VDC
(vi) Battery/ Battery charger with battery backup of at least 1hours
(vii) Local / Remote switch for breaker and Isolators.

9.18 Metering:

The Ring Main Unit should be provided with separate Metering Module Consisting of Bus connected Potential Transformer and metering cum protection Current Transformer to be provided for VCB function i.e. for Distribution Transformer / Feeder along with provision of installing Tri-vector Meter (TVM). The Potential Transformer with PT Fuse and Ring Core type Current Transformer provided shall be made up of Epoxy Cast Resin. The CT ratio shall as per transformer rating.

9.19 Take OFF Terminal Units for Automation:

The Ring Main Unit should be provided with necessary take off terminal units for automations. Remote operation of the Ring Main Units line switches must be possible using motors fitted to the operating mechanism.

It shall be possible to fit the motors either directly in manufacturing plant or on site as and when required. Installation on site shall be possible with the Ring Main Unit fully energized and manufacturer should provide detailed instructions for installation to the control mechanism.

The fitting of the motors to the mechanism must not in any way impede or interfere with the manual operation of the switches or circuit breaker.

Necessary mechanical & Electrical interlocks shall be provided between CB, Isolator & Earth switches for safe operation.
Each CB, Isolator & earth switch shall have 8 NO + 6 NC Auxiliary spare of good quality (corrosion free and easy for making connection) for future use by owner. It should be located at accessible position in panel.
All the binary inputs/outputs shall be wired to the terminals & kept ready for SCADA connectivity.

9.20 Fault Passage Indicators (FPI) on Short Circuit and Earth fault:

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 Fault Passage Indicators (FPI) shall be integral part of Ring Main Unit.
The Fault Passage Indicators (FPI) shall facilitate for detection of short circuit fault and earth fault through Current Transformer inbuilt in Fault Passage Indicators.

9.21 Tropicalisation:

Due regard should be given to the climatic conditions under which the equipment is to work. Ambient temperature normally varies between 20 ℃ and 32 ℃, although direct sun temperature may reach 45 °C. The climate is very humid and rapid variations occur, relative humidity between 90% and 100% being frequently recorded, but these values generally correspond to the lower ambient temperatures. The equipment should also be designed to prevent ingress 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.

9.22 Safety of people:

Any accidental overpressure inside the sealed chamber will be limited by the opening of a pressure limiting device in the enclosure. Gas will be released to the rear of the unit away from the operator. Manufacturer shall provide type test report to prove compliance with IEC 298 appendix AA 'Internal fault'.

9.23 Automatic Water Level Controller Using Mercury Float Switch:

The float switch shall be provided in Ring Main Unit at 200 mm below live contacts to avoid flash over due to water.
The float switch is a device used to detect the level of water within the Ring Main Unit. The float switch shall be used in the Ring Main Unit as an indicator, an alarm (at Control Room), tripping of Vacuum Circuit Breaker and opening of Load Break switch.
A mercury switch is a switch whose purpose is to allow the flow of electric current in an electrical circuit in a manner that is dependent on the switch's physical position.
Mercury switches shall have 4 NO + 4 NC Auxiliary contacts in a sealed glass envelope which contains a bead of mercury. The envelope may also contain air, an inert gas, or a vacuum. Gravity is constantly pulling the drop of mercury to the lowest point in the envelope. When the switch is tilted in the appropriate direction, the mercury touches a set of contacts, thus completing the electrical circuit through those contacts. ‘Normally

Open' contact becomes 'Normally Close' contact, hence signals to breaker and motor for tripping of Vacuum Circuit Breaker and opening of Load Break switch. These signals shall be goes to Sub Station Control Room / SCADA Control Room via RTU with opening reason for further action.

9.24 Operating lever:

An anti-reflex mechanism on the operating lever shall prevent any attempts to re-open immediately after closing of the switch or earthing switch.

All manual operations will be carried out on the front of the switchboard.

The effort exerted on the lever by the operator should not be more than 250 N for the switch and circuit breaker.

The overall dimensions of the Ring Main Unit shall not be increased due to the use of the operating handle. The operating handle should have two workable positions 180° apart.

9.25 Front plate:

The front shall include a clear mimic diagram which indicates 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.

9.26 Danger Board:

The danger Board plate as per relevant IS: 2551, 1982 shall be riveted on the front plate of the Ring Main Unit.

9.27 Internal arc rating:

The Ring Main Unit 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.
The Ring Main Unit shall be tested for an internal arc rating of 21 kA for 1 Sec for 11 kV. Suitable temperature rise test on the Ring Main Unit shall be carried out & test reports shall be submitted with tender for technical bid evaluation.

9.28 Specific Requirement for Automation:

The Ring Main Units should be provided with provision of following minimum signals available at separate SCADA terminal box.

Minimum signals for SCADA/DMS - to be wired to separate TBs

Sr. No.	Particulars	Contacts

1.	CB Close / Open	Potential free contacts
2.	LBS Close / Open	Potential free contacts
3.	LBS & CB Earth Switch Close / Open	Potential free contacts
4.	CB Test/Service Position	Potential free contacts
5.	Spring charge Status indication	Potential free contacts
6.	SF6 gas pressure low	Potential free contacts
7.	O/C Operated	Potential free contacts
8.	E/F Operated	Potential free contacts
9.	Local/Remote	Potential free contacts
10.	Common Power Supply Healthy	Potential free contacts
11.	Motor MCB Healthy Status	Potential free contacts
12.	Battery charger Fail	Potential free contacts
13.	RMU Door Open	Potential free contacts
14.	CB Trip Coil Healthy	Potential free contacts
15.	Current Transformer Status	Potential free contacts
16.	Potential Transformer Status	Potential free contacts
17.	FPI Control	Potential free contacts
18.	CB control	Potential free contacts
19.	LBS Control	Potential free contacts
20.	Water Level Alarm	Potential free contacts
21.	CB Open	Potential free contacts
22.	LBS Open	Potential free contacts

A) Specific requirement for SCADA Connectivity:

i) Fault Passage Indicator shall be provided per isolator
ii) DC control supply system should be 24V DC.
iii) Battery charger to cater load of minimum 10 motorized operation cycles (Close- Open) in absence of battery.
iv) Battery to cater load of minimum 10 motorized operation cycles (Close-Open) in absence of battery charger. The battery backup should be minimum of 6 Hrs.
v) Miniature Circuit Breakers (MCB) shall be provided for battery charger supply, RMU Motor supply & FRTU supply (Minimum 2 Amp circuit for future use of FRTU).
vi) Individual control circuit of Isolator/Circuit Breaker to have point of isolation/protection.
vii) Individual motor circuit of Isolator/Circuit Breaker to have point of isolation/protection.
viii) The Ring Main Unit shall have minimum protection of IP54 for Outer Enclosure with gland plate & knock outs. Provision for control cable entry should preferably be from Right/ Left top through LV cable box & shall be independent of HV Isolator/Circuit Breaker status. It should be vermin proof.
ix) Control cable gland plate shall be independent of power cable gland plate.
x) A point of earthing for control cables shall be electrically isolated from power cable earthing.
xi) Ambient temperature of 50^0C max. Allowable temperature rise of battery & battery charger above ambient 40^0C.
xii) Local / Remote switch shall be provided on all the isolator & breaker panels for selection of controls.
xiii) Current Transformer & Potential Transformer terminals for all the circuit breakers for Distribution Transformers / Feeders only.

B) Following is the list of I/O requirements for Ring Main Unit modules. Please note that all DI & DO should be potential free contacts.
i) List of potential free contacts for Isolator (Terminals shall be provided):

a) Digital Indications:

1. Isolator ON --02 No. & 2 NC
2. Isolator OFF --02 No. & 2 NC
3. Isolator Earth switch Status (ON/OFF)
4. FPI Operated
5. LOCAL/REMOTE switch position

b) List of commands:

1. Isolator Close
2. Isolator Open
3. FPI reset

ii) List of potential free Contacts for Circuit Breakers (Terminals shall be provided):

a) Digital Indications:

1. Circuit Breaker ON
2. Circuit Breaker OFF
3. Auto Trip
4. LOCAL/REMOTE switch position

b) List of commands:

1. Circuit Breaker Close
2. Circuit Breaker Open

iii) Requirement of Tri-Vector Meter (TVM):

a) The terminals shall be provided for CT and PT Connections

b) Space shall be provided for Tri-Vector Meter (TVM) mounting on Outer Enclosure panel

9.29 Distribution Automation System Interface:

The Ring Main Unit shall be equipped so that it can be monitored and controlled via the SCADA. In this respect, it shall interoperate with the RTU that will be housed in the Ring Main Unit Control Cabinet. The RTU in turn will interoperate with the SCADA via the remote communications system.

The Ring Main Unit shall have provisions for opening and closing its switches / breakers using output from the RTU. The Ring Main Unit shall also supply analog and status signals to the RTU for monitoring the condition of the Ring Main Unit's distribution network circuits as well as the components of the Ring Main Unit.

10.0 Tests:

a. Type tests:

The Ring Main Unit and accessories offered in the tender should have been successfully type tested at NABL laboratories in India or equivalent International Laboratories in line with the relevant standard and technical specification, within the last 5 (five) years from the date of offer. The bidder shall be required to submit complete set of the type test reports in physical format along with the offer. The bidder must provide the original copies of type test reports for verification purpose or produce authentic documents to confirm the type tests are authentic in case of tests carried out at equivalent International Laboratories

In case these type tests are conducted earlier than five years, all the type tests as per the relevant standard shall be carried out by the successful bidder at NABL in presence of purchaser's representative free of cost before commencement of supply. The undertaking to this effect should be furnished along with the offer without which the offer shall be liable for rejection.

Type tests:

i) Short time current withstand test and peak current withstand test.
ii) Lightening Impulse voltage with-stand test
iii) Temperature rise test.
iv) Short Circuit current making and breaking tests.
v) Power frequency voltage withstand test (dry).
vi) Capacitive current switching test confirming to IEC.
vii) Mechanical operation test.
viii) Measurement of the resistance of the main circuit.
ix) Degree of protection of Inner enclosure and outer enclosure
x) Switch, circuit breaker, earthing switch making capacity.
xi) Switch, circuit breaker breaking capacity.
xii) Internal arc withstand Test for Inner Enclosure and Cable Chamber.
xiii) Checking of partial discharge on complete unit.

The details of type test certificate according to the composition of the Switchboard shall be submitted with the offer.
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.

In addition to that, Test report of Vacuum Interrupter along with Catalogues & Literatures to be submitted along with the Offer.

b. Acceptance and Routine Tests:

All acceptance and routine tests as stipulated in the respective applicable standards amended up-to-date for all the equipment shall be carried out by the supplier in the presence of purchaser's representative without any extra cost to the purchaser before dispatch.

The bidder shall have full facilities to carry out all the acceptance and routine test as per the applicable standards.

After finalization of the program of acceptance/routine testing, the supplier shall give 15 days' advance intimation to the purchaser, to enable him to depute his representatives for witnessing the tests.

The routine tests should be carried out by the manufacturer at his works in presence of representative of MITL.

All the Ring Main Units must be routine tested for the following:

1. Conformity with drawings and diagrams,
2. Measurement of closing and opening speeds,
3. Measurement of operating torque,
4. Checking of filling pressure,
5. Checking of gas-tightness / SF6 gas leak test.
6. Dielectric testing and main circuit resistance measurement.
7. Power frequency voltage
8. Resistance test for the circuit
9. Mechanical operation tests.
10. Micro-ohm test for the assembly inside the tank.
11. Circuit breaker analyzer test so as to ensure the simultaneous closing of all poles for VCB.
12. Partial Discharge test on the complete gas tank so as to be assure of the proper insulation level and high product life.
13. High voltage withstands.
14. Secondary test to ensure the proper functioning of the live line indicators, fault passage indicators and relays.

F

All major type tests shall have been certified at an independent authority with the tests carried outside country of manufacture shall be translated in English and submitted in hard copy.

The supplier in the presence of MITLs representative shall carry out all above acceptance and routine tests. The supplier shall give at least 15 days advance intimation to the MITL to enable them to depute their representative for witnessing the tests. The cost towards transport, stay and other expenses shall be borne by the supplier.

The MITL 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 MITL to satisfy that the material complies with the intent of this specification.

11.0 Inspection:

The inspection may be carried out by the purchaser at any stage of manufacture. The successful bidder shall grant free access to the purchaser's representative/s at a reasonable notice when the work is in progress. Inspection and acceptance of any equipment under this specification by the purchaser 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 purchaser informed, in advance, about the manufacturing program so that arrangement can be made for stage inspection.

The purchaser reserves the right to insist for witnessing the acceptance/routine testing of the bought-out items. The supplier shall keep the purchaser informed, in advance, about such testing program.

12.0 Manufacturing Facilities:

As Ring Main Units are having sealed pressure system in compliance with IEC 298, manufacturer shall have complete facility with state-of-the-art equipments for ensuring the quality of product delivered strictly adhering to IEC 298 Guidelines. Following are the work station at manufacturer place to ensure the adherence: -

1. Robotic welding station for stainless steel main tank ensuring the leak rate less than 0.1% per annum.
2. Work stations with adjustable work benches and torque wrenches, giving flexibility to workmen for proper tightness of internal components of sealed tank.
3. State of the Gas leak testing system ensuring the quality of sealing and have precision to measure leak rate less than 0.1% per annum.
4. High voltage testing station to have high voltage power frequency test and partial discharge measurement.
5. Computerized system to measure time travel characteristic of breaker before sealing the tank.
6. Computerized SF6 filling and testing facility.
7. Partial Discharge Lab for conducting the partial discharge test.

13.0 Quality Assurance Plan:

The bidder shall invariably furnish following information along with his offer.

1) 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.

2) Information and copies of test certificates as in (1) above in respect of bought out accessories.

3) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

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

5) List of testing equipment available with the Bidder for final testing of Ring Main Unit and associated combinations vis-à-vis, the type, special, acceptance and routine tests specified in the relevant standards. The supplier shall, within 15 days from the date of receipt of Purchase Order submit following information to the MITL.

   1. List of raw materials as well bought out accessories and the names of sub- suppliers selected from those furnished along with offer.
   2. Necessary test certificates of the raw material and bought out accessories.
   3. Quality Assurance Plan (QAP) with hold points for MITL's inspection. The quality assurance plan and hold points shall be discussed between the MITL 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.

14.0 Drawings and Documentations

ll drawings shall conform to relevant IEC Standards Specification. All drawings shall be in clear and visible.

The Bidder shall submit following drawings for approval:

i) General Arrangement Drawing.
ii) General Arrangement Drawing with Door Open.
iii) Name Plate Drawing.
iv) Foundation Drawing.
v) Single Line Diagram Drawing.
vi) MIMIC Diagram Drawing.
vii) Control Schematic Wiring Diagram of Load Break Switch.
viii) Control Schematic Wiring Diagram of Circuit Breaker.
ix) Control Schematic Wiring Diagram of Earth Switch.
x) Control Schematic Wiring Diagram of Automatic Water Level Controller.
xi) Control Schematic Wiring Diagram of Voltage Indicator Lamps.
xii) Control Schematic Wiring Diagram of Fault Passage Indicators (FPI).
xiii) Terminal Block Drawing.
xiv) Mechanical Interlock Drawing.
xv) Electrical Interlock Drawing.
xvi) SF6 Monitoring Pressure Switch and Indication Schematic Drawing.
xvii) Schematic Wiring Diagram of Metering Unit.
xviii) Vacuum Interrupter Drawing.
xix) Danger Plate Drawing.
xx) Two Cable Arrangement Drawing.
xxi) Technical Detail Sheet Drawing.
xxii) Bill of Material.
xxiii) Packing List.

1. After issue of letter of acceptance, the successful bidders shall submit 3 identical sets of complete drawings along with detailed bill of materials for approval, to the General Manager (P-E), Maharashtra Industrial Township Limted (MITL),1st Floor, Udyog Sarathi, Mahakali Caves Road, Andheri(East),Mumbai-400093. If any modifications are required on these, the same will be conveyed to the supplier who shall modify the drawings accordingly and furnish final drawings for approval. In no case delivery extension will be granted for any delay in drawing approval.
2. The manufacturing of the Ring Main Units shall be strictly in accordance with the approved drawings and no deviation will be permitted without the written approval of MITL. All manufacturing and fabrication work in connection with the Ring Main Units prior to the approval of the drawings shall be at the supplier's risk and cost.
3. Approval of drawings by the purchaser shall not relieve the supplier of any of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirements of the latest revisions of applicable standards, rules and codes of practices.
4. After approval of the drawings detailed packing lists and bills of materials, the suppliers shall be forwarded to the respective consignees. Copies of packing lists shall also be submitted to the MITL along with the bills for payment.
5. Before dispatch of Ring Main Units to various consignees, the suppliers shall furnish sets of final drawings, including bills of materials and wiring schedules and also sets of

technical literature and commissioning manuals. These shall be in Five sets and shall be furnished to the MITL office,Mumbai,positively before the dispatch of Ring Main Units. All drawings shall preferably be of A3 size. No drawing of width more than 35 cm will be acceptable. One set each of the final drawings; bill of materials, wiring schedules and commissioning manuals shall invariably be forwarded to the consignee along with each Ring Main Units consignment and shall be listed out in the packing list, when submitted for approval.

6. In case the supplier fails to furnish contractual drawings and manuals even at the time of supply of Ring Main Units, the date of furnishing of drawings/manuals will be considered as the date of supply of Ring Main Units for the purpose of computing penalties for late delivery.
7. The successful bidder shall furnish in the form of nicely bound volumes, the manuals covering erection, commissioning, operation and maintenance instructions and all relevant information and drawings pertaining to the Ring Main Unit as well as auxiliary devices. Marked erection drawings shall identify the component parts of the Ring Main Unit as shipped to enable Engineer/Purchaser to carry out erection with his own personnel. Each manual shall also contain one set of all the approved drawings type test reports as well as acceptance test reports to corresponding consignment dispatched. The total quantity of the operating manuals/approved drawings sets to be supplied by the supplier shall be equal to the number of Ring Main Units ordered.

b. The Bidder shall submit along with his tender illustrative and descriptive literature in triplicate for various items in the Ring Main Units, which are all essentially required for automation.

The Bidder shall submit following documents along with the tender:

i) Instruction manuals.
ii) Catalogues of spares recommended with drawing to indicate each items of spares.
iii) List of spares and special tools recommended by the supplier.
iv) Copies of Type Test Certificates as per latest IS/IEC.
v) Dimensional drawings of each material used for item.
vi) Actual single line diagram of Ring Main Unit with or without extra combinations shall be made displayed on the front portion of the Ring Main Unit so as to carry out the operations easily.

Operation, Maintenance and erection instruction manual in English language shall be also supplied along with each Ring Main Unit to the respective consignee as per the dispatch instructions given from MITL office, Mumbai. The successful bidder shall submit the drawings, bill of materials, packing lists, etc. in time and get these approved from MITL office,Mumbai.

15. Name Plate:

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

b. Name of manufacturer.
c. Type.
d. Serial number.
e. Voltage.
f. Current.
g. Frequency.
h. Symmetrical breaking capacity.

i. Making capacity.
j. Short time current and its duration.
k. Purchase Order number and date.
l. Month and Year of supply.
m. Rated lighting impulse withstands voltage.

16.0 Packing and Forwarding :

The equipment shall be packed in crates suitable for vertical/horizontal transport as the case may be and the packing shall be suitable to withstand handling during the transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable materials shall be carefully packed and marked with the appropriate caution symbols.

Wherever necessary, proper arrangement for lifting, such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by the supplier without any extra cost.

Each consignment shall be accompanied by a detailed packing list containing the following information:

a. Name of the consignee.
b. Details of consignment
c. Destination.
d. Total weight of consignment.
e. Sign showing upper/lower side of the crate.
f. Handling and unpacking instructions.
g. Bill of material indicating contents of each package.

The equipment shall be delivered to the stores centers only by road transport and shall be suitably packed to avoid damages during transit in the case of indigenous supplies.

The bidder shall quote delivery periods for various equipment and shall stick to the committed delivery. The delivery period will be counted from the date of receipt of letter of award of the contract. It is therefore, the responsibility of the successful bidder to submit the drawings, bill of materials, packing lists, etc. in time and get these approved from the MITL officr,Mumbai.

It may clearly be noted that the delivery period will under no circumstances be linked up with other formalities like drawing approval, etc.

17. Performance Guarantee:

All Ring Main Units and accessories supplied against this specification shall be guaranteed for a period of 66 months from the date of receipt at the consignee's Stores Center or 60 months from the date of commissioning, whichever is earlier. However, any engineering error, omission, wrong provision, etc. which do not have any effect on the time period, shall be attended to as and when observed/pointed out without any price implication.

18. Annexure:

The bidder shall fill in the following Annexure 'A' which forms part of the Tender Specification and offer. If the Annexure 'A' is not submitted duly filled in with the offer, the offer shall be liable for rejection.
Annexure 'A' - Principal Technical Parameters of Ring Main Units.

19. Schedules:

The bidder shall fill in the following Schedule which forms part of the Tender Specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.
Schedule – 'A'-Guaranteed Technical Particulars of 11 kV Ring Main Units.
Schedule – 'B '- List of Type Test Reports to be enclosed with the offer

Any additional information may be furnished separately by the bidder, if felt necessary by him.

20. Guaranteed Technical Particulars:

The bidder should fill up the details in schedule A – "Guaranteed Technical Particulars" and the statement such as "as per drawing enclosed", "as per MITL requirement", "as per IS", "as per specification" etc. shall be considered as details not furnished and such offers will be rejected.

Annexure 'A'

Principal Technical Parameters of Ring Main Unit and accessories:.

Sr. No.	Description	11 kV Ring Main Unit
A)Ring Main Unit Assembly		
1	Indoor / Out door	Indoor / Out door
2	Configurations(Type)	3 Way, M+LLV+
		4 Way, +LLLL+
		4 Way, M+LLLV+
		4 Way, M+LLVV+
		5 Way, M+LLVVV+
		6 Way, +LLVVV+V+
		L= Isolator.
		V= VCB.
		M=Metering
3	Reference Standard	IEC-62271-100, 200, 103 and IEC-60694
4	Rated Voltage in kV	11
5	Highest System Voltage in kV, Max.	12
6	Number of Phase	3
7	Frequency in HZ.	50 Hz
		± 3%
8	Short Circuit rating	
	a) Breaking Symmetrical for 3 Sec. in KA	16
	b) Breaking Asymmetrical for 3 Sec. in KA	16
	c) Short time for 3 Sec. in KA.	16
9	Insulation Level	
	a) Impulse withstand in KV peak.	75
	b) 1 Minute 50 Hz. Voltage withstand in KV rms	28
10	Internal arc rating for 1 sec. in kV	16
11	Construction: Material and Size	
	Inner Enclosure	Main Stainless Steel Tank with 2 mm Thickness

	Outer Enclosure	CRCA Sheet of 2 mm thickness or Galvanized Sheet of 1.6 mm thickness
12	Degree of protection	
	Inner Enclosure	IP 67
	Outer Enclosure	IP 54 (Main Door close) and IP 41 (Main Door open)
13	The Ring Main Unit and accessories completely wire and tested at factory	Yes
14	Paint	Polyurethane based powder paint
15	Color	Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007
16	Thickness of coat, Min.	150 microns for CRCA Sheet and 80 microns for galvanized Sheet
B) Bus Bar		
17	Reference Standard	IS: 1897, 2008
18	Grade and Material	Electrolytic Grade Copper
19	Cross sectional area in mm2	400
20	Size in mm or as per design	40 x 10
21	Current Density in Amps/mm2, Max.	1.6
22	Continuous Current in Amps	630
23	Maximum temperature rise over an ambient temperature 50^0C.	55^0C
24	Short time current rating for 3 Sec in kA rms	16
25	Clearance in mm from bare bus bar or as per design	
	Phase to Phase for Isolator or as per design	60
	Phase to Phase for VCB	60
	Phase to Earth for Isolator or as per Design	60
	Phase to Earth for VCB or as per design	60
26	Bus Supports	
	Reference Standard	IEC 60243-1,
		ASTM D 648

	Voltage Class in kV	11 Kv
	Creepage distance in mm or as per design	115 in SF6 gas
	Bus Bar support spacing in mm or as per design	120
27	Filling SF6 gas pressure (Filling pressure at 20^0C), Min.	1.4 Bar
28	Operating SF6 gas pressure at 20^0C, Min.	0.5 Bar
C)Vacuum Circuit Breaker		
29	Reference Standard	IEC 62271-100
30	Rated Voltage in kV	11
31	Highest System Voltage in kV, Max.	12
32	Type	Vacuum Type
33	Rated Frequency in Hz.	50 Hz
		± 3%
34	No. of Poles	3
35	Rated Current	630A
36	Maximum temperature rise over an ambient temperature 50^0C.	55°C
37	Rated operating Duty	O-3min-CO-3min-CO
38	Rupturing capacity at rated voltage in MVA, Min.	As per design
39	Breaking Capacity at rated voltage & operating duty	
	Symmetrical in kA rms	16
	Asymmetrical in kA rms	16
40	Rated making current in kA peak	40
41	Short time current for 3 sec in kA rms	16
42	Transient Recovery Voltage	
	Rate of rise in kV/µs	0.34 kV/µs as per IEC 62271-100
	Peak Voltage in kV	28
43	Insulation Level	
	Impulse Voltage with stand on 1.2/50 µs full wave in kV	75

	1 minute power frequency voltage withstand in kV	28
44	Total breaking time for transient fault (CB + Relay+ trip coil) in ms	45-50 ms
45	Opening time No load condition in ms	45-50 ms
46	Opening time under SF6 gas low or vacuum loss condition in ms	45-50 ms
47	Number of breaks per pole	Single
	No of breaker operations permissible without requiring inspection replacement of contacts and other Main parts	
48		
	At 100% rated current	2000
	At 100% rated breaking current, Min.	20
	Type of contacts	
49		
	Main	Butt Type
	Arcing	Butt Type
50	Material of contacts	
	Main	Copper
	Arching	Copper
	Chromium / Silver Plated	Chromium / Silver plated
51	Mechanical Endurance Test for Circuit Breaker, Number of Operations	
		2000
52	Spring charging mechanism	Motor Operated
53	Operating mechanism for closing of Circuit Breaker	
	Type	Spring operated Mechanism
	No of breaker operations stored	One
	Trip free or fixed trip	Trip Free

	Earthing for operating mechanism and metal parts	Solidly Earthed
	Earth terminal size and material, Min.	Electrolytic grade Copper 25 x 3mm
54	Operating mechanism for tripping of Circuit Breaker	
	Type	Spring Operated Mechanism
	No of breaker operations stored	One
	Trip free or fixed trip (V)	Trip Free
	Earthing for operating mechanism and metal parts	Solidly Earthed
	Earth terminal size and material	Electrolytic grade Copper 25 x 3mm
55	Breaker Accessories	
	Mechanical safety Interlock	Provided
	Automatic safety Interlock	Provided
	Operational Interlock	Provided
	Emergency manual trip	Provided
	Operation counter	Provided
	Spring charge / discharge indicator	Provided
	Manual spring charging facility	Provided
D) **Isolators**		
56	Reference standard	IEC-62271-102 / IEC-62271-103
57	Nominal Voltage in KV	11
58	Highest System Voltage in kV, Max.	12
59	Rated Frequency in HZ	50 Hz
		± 3%
60	No. Of poles	3
61	Rated Current in Amps	630
62	Maximum temperature rise over an ambient temperature 50^0C.	60°C
63	Operation	Close-Open-Earth
64	Rupturing Capacity at rated voltage	630Amps at 11Kv
65	Maximum over voltage factor when switching off Loaded feeder	40

	cable in kA	
66	No. of isolator operation permissible without requiring inspection,	
	replacement of contacts and other main parts	
	Mechanical Endurance in Number of operations	1000
	At 100% rated making current in Number of operations	
		100
	At 100% rated breaking current in Number of operations	100
67	Isolator provided with the following Mechanical safety	
	Mechanical ON and OFF Indication	Provided
	Cable Earth Indication	Provided
	Operational Counter	Provided
	Manual Spring Charging facility	Provided
E) Current Transformer		
68	Reference standard	IS:16227, I & II
69	Type	Ring Type, Resin Cast/Tape wound
70	Nominal Voltage in KV	11
71	Highest System Voltage in kV, Max.	12
72	Rated Frequency in HZ	50 Hz
		± 3%
73	Current Transformer Ratio	200-100/1Amps
74	Short circuit withstand	
	i) Short time current for 1 sec. in kA rms	5
	Dynamic current in kA peak, Min.	7.5
75	Class of insulation	Class B
76	Basic insulation level in kV rms	3

77	Maximum temperature rise over an ambient temperature 50^{0}C.	60^{0}C
78	Class of Accuracy	
	Metering Core	0.5
	Protection Core	5P10
79	Rated Burden	2.5 VA
80	Over Current Rating in %	120
81	Continuous Over Load in %	120
F) Metering Voltage(Potential) Transformer		
82	Reference standard	IS:16227, I & III
83	Type	Resin Cast/Tape wound
84	Nominal Voltage in KV	11
85	Highest System Voltage in kV, Max.	12
86	Rated Frequency in HZ	50 Hz
		± 3%
87	Voltage Transformer Ratio	11 kV/√3 /110V/√3
88	Rated Primary Voltage in kV	11 kV/√3
89	Rated Secondary Voltage in V	110V/√3
90	Rated Burden in VA	50
91	Accuracy Class	0.5
92	Insulation Class	B
93	Voltage Factor	1.2 Continuous and 1.9 for 8 hrs.
94	One Minute Power Frequency Dry Withstand Voltage Rating	
	Primary Winding Induced Test in kV rms	28
	Secondary Winding in kV rms	3
	Rated Impulse Voltage in kV peak	75
G) Auxiliary Voltage(Potential) Transformer		
95	Reference standard	IS:16227, I & III
96	Type	Resin Cast/Tape wound
97	Nominal Voltage in KV	11
98	Highest System Voltage in kV, Max.	12
99	Rated Frequency in HZ	50 Hz

		± 3%
100	Voltage Transformer Ratio	11 kV / 230V
101	Rated Primary Voltage in kV	11 kV
102	Rated Secondary Voltage in V	230 V
103	Rated Burden in VA	500 VA
104	Voltage Regulation in %	5
105	Insulation Class	B
106	Voltage Factor	1.2
107	Application & Construction Type	Indoor, Single Phase/Two Pole
108	One Minute Power Frequency Dry Withstand Voltage Rating	
	Primary Winding Induced Test in kV rms	28
	Secondary Winding in kV rms	3
	Rated Impulse Voltage in kV peak	75
H) Numerical Protection Relay		
109	Reference Standard	IEC 60255
110	Type and Model	3 Over Current(O/C) and 1 Earth fault(E/F)
111	Current Transformer Secondary Input to Relay	1:00 AM
112	Operating Curve Type	Inverse Definite Minimum Time (IDMT)Relay
113	Auxiliary Supply	Self Powered relay for Protection
114	Rated Frequency in HZ	50 Hz
		± 3%
115	Over Current Protection	
	Low set Over Current protection	20-200% of CT secondary rated current with increment/decrement by 1 %
	High set Over Current protection	100-2000% of CT secondary rated current with increment/decrement by 50%
116	Earth Fault Protection	
	Low set Earth Fault protection	5% to 80% of the CT rated current in steps of 1%
	High set Earth Fault protection	100-1000% of the CT rated current in steps of 50%
117	Mounting	Flush Mounted

118	Operational Indicator	LCD display and LED annunciation lamps
119	Contact Details	4 Binary Input(BI) and 6 Binary output(BO)
120	Self-diagnosis feature	Yes
121	Password protection	Yes
122	Communication Protocol	RS 232 or RS 485 Port for IEC 103, Communication Protocol
123	Event / fault record, Min.	10 Event and 5 Fault Records available
124	Setting groups	2 Groups available
125	Circuit Breaker control available	Yes, Only Trip
I) Tripping Coil		
126	DC Voltage in Volt	24
127	Maximum Tripping Current at rated voltage in Amps.	5
	Minimum Permissible voltage variation in %	85 to 110
J) HT three phase four wire CT / PT operated 1 Amps fully Static & AMR compatible TOD Tri - vector Energy Meter		
128	Reference Standard	IS: 14697, 1999
		IS: 15959, 2011
129	Make	Secure / L&T / other MSEDCL approved make
130	Auxiliary supply Voltage	110V/√3
131	Class of Accuracy	0.5S
132	Type of Display	Customized backlite liquid crystal display
133	Measuring Parameters as per MITL/MSEDCL Specification	
		Instantaneous parameters
		Block Load Profile parameters
		Billing Profile Parameters
		Name Plate details
		Programmable Parameters
		Event Conditions
		All logging parameters for each of the event condition for 3 Φ / 4W
K)Fault Passage Indicator (FPI) on Short Circuit and Earth fault		
134	Operating point/Current short circuit in Amp	Adjustable
		100/200/300

		/400/500
		/600/700
		/800/900/1000
		/1100/1200A (±15%)
135	Operating point/Current earth fault in Amp	Adjustable
		10/20/30/40
		/60/80/100A (±15%)
136	Response Time in ms	For Short Circuit Adjustable
		40/60/80/100/120
		/160/200/240 ms Sec(±100m Sec)
		For Earth Fault Adjustable
		40/60/80/160 ms (±100m Sec)
137	Auto Reset Time in Hrs	1/2/4/8 hrs (+ / - 1%) after fault
L) Battery Charger		
138	Input AC Voltage in V	230
139	Rated Frequency in Hz	50 Hz
		± 3%
140	Output DC Voltage in V	24
141	Current Rating in Amps	10
142	Output DC Voltage for charger	
	Boost Mode in V	27 to 28
	Float Mode in V	27 to 28
143	Operating Temperature in ^{0}C	-25 to 60
144.	Temperature Compensation	Junction temperature of SMPS crosses 142^{0}C, thermal shutdown occurs.
145	Short Circuit and Overload Protection	Provided
146	High Voltage Isolation	2 kV for 1 minute
147	Efficiency	Above 85 %
M) Battery		
148	Type	Dry Type
149	Ah Efficiency	> 95%
150	Self-Discharge	Self-Discharge
151	Operating Temperature	Normal : +20^{0}C to +30^{0}C &
		Limits : -20^{0}C to +50^{0}C
152	Voltage (V)	24V (2 x 12V)
153	Ah Capacity	7Ah / 12 Ah / 26 Ah
N) Manometer with Non Return Valve		
154	Type	Analogue
155	Material	Stainless Steel

156	Accuracy of calibration pressure	+/-1% at 20^{0}C
157	Pressure Element	Stainless Steel Welded
158	Dial	2''
159	Pointer	Dark
160	Window	Round
161	Gas pressure low signal	Indicated by Red Color Zone
162	Non Return Valve(NRV) Material	Stainless Steel
O) Indoor cable terminations kits		
163	Type	11 kV touch proof screened termination kit
164	Materials	Epoxy / EPDM / Silicon Rubber
165	Size	Up to 3 x 400 sq. mm 11 kV HT cables
166	Height of Bus bar / transformer / feeder Cable box from ground level	As per Manufacture design
167	Arrangement for mounting an extra cable at incoming and outgoing side box of Bus bar.	As per Manufacture design
168	Arrangement for mounting an extra cable at outgoing side box of transformer / feeder.	As per Manufacture design
P) Automatic Water Level Controller		
172	Position of Automatic Water Level Controller	200 mm below live contacts
173	Auxiliary contacts	4 NO + 4 NC
174	Breaker Tripping and Load break Isolator opening due to water level increases signals to Control room	Yes
Q) Name Plate		
175	Material	Anodized Aluminum / Stainless Steel
176	Thickness	18 swg / 1.00 mm
177	Size	145 mm x 116 mm
R) Painting		
178	Inside	Powder Coated
179	Outside	Polyurethane based powder paint. Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007.

Schedule 'A'

Guaranteed Technical Parameters of 11 kV, 630 Amps, Extensible / Non extensible type, Outdoor / Indoor, SCADA Compatible Motorized Ring Main Unit with 200Amps Vacuum Circuit Breaker

Sr. No.	Description	11 kV Ring Main Unit	Parameters to be filled by Bidder
A)Ring Main Unit Assembly			
1.	Indoor / Out door	Indoor / Out door	
2.	Manufacturer's Name & address		
3.	Manufacturer's Type Designation		
4.	Model		
5.	Configurations(Type)	L= Isolator. V= VCB. M=Metering	
	i) Configurations	3 Way, M+LLV+	
	ii) Configurations	4 Way, +LLLL+	
	iii)Configurations	4 Way, M+LLLV+	
	iv)Configurations	4 Way, M+LLVV+	
	v) Configurations	5 Way, M+LLVVV+	
	vi) Configurations	6 Way, +LLVVV+V+	
6.	Reference Standard	IEC-62271-100, 200, 103 and IEC-60694	
7.	Rated Voltage in kV	11	
8.	Highest System Voltage in kV, Max.	12	
9.	Number of Phase	3	
10.	Frequency in HZ.	50 Hz ± 3%	
11.	Short Circuit rating		
	a) Breaking Symmetrical for 3 Sec. in KA	16	
	b) Breaking Asymmetrical for 3 Sec. in KA	16	
	c) Short time for 3 Sec. in KA.	16	
12.	Insulation Level		
	a) Impulse withstand in KV peak.	75	
	b) 1 Minute 50 Hz. Voltage withstand in KV rms	28	
13.	Internal arc rating for 1 sec. in kV	21	
14.	Construction: Material and Size		
	a) Inner Enclosure	Main Stainless Steel Tank with 2 mm Thickness	
	b) Outer Enclosure	CRCA Sheet of 2 mm thickness or Galvanized Sheet of 1.6 mm thickness	
15.	Degree of protection		
	a) Inner Enclosure	IP 67	
	b)Outer Enclosure	IP 54 (Main Door close)	

		and IP 41 (Main Door open)	
16.	The Ring Main Unit and accessories completely wire and tested at factory	Yes	
17.	Paint	Polyurethane based powder paint	
18.	Color	Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007	
19.	Thickness of coat, Min.	150 microns for CRCA Sheet and 80 microns for	
Overall Dimensions and Weight			
20.	Tolerance to Overall Dimensions	+ 5 %	
	1.Extensible 3 Way RMU(3 Way, M+LLV+)	As per Manufacture Design	
	W x D x H, in mm	As per Manufacture Design	
	Weight in kg	As per Manufacture Design	
	2. Extensible 4 Way RMU(4 Way, +LLLL+)	As per Manufacture Design	
	W x D x H, in mm	As per Manufacture Design	
	Weight in kg	As per Manufacture Design	
	3. Extensible 4 Way RMU(4 Way, M+LLLV+)	As per Manufacture Design	
	W x D x H, in mm	As per Manufacture Design	
	Weight in kg	As per Manufacture Design	
	4. Extensible 4 Way RMU(4 Way, M+LLVV+)	As per Manufacture Design	
	W x D x H, in mm	As per Manufacture Design	
	Weight in kg	As per Manufacture Design	
	5. Extensible 5 Way RMU(5 Way, M+LLVVV+)	As per Manufacture Design	
	W x D x H, in mm	As per Manufacture Design	
	Weight in kg	As per Manufacture Design	
	6. Extensible 6 Way RMU(6 Way, +LLVVV+V+)	As per Manufacture Design	
	W x D x H, in mm	As per Manufacture Design	
	Weight in kg	As per Manufacture Design	
B) Bus Bar			
21.	Make	As per Manufacture Design	
22.	Reference Standard	IS: 1897, 2008	
23.	Grade and Material	Electrolytic Grade Copper	
24.	Cross sectional area in mm2	400	
25.	Size in mm	40 x 10 or as per Manufacture design	

26.	Current Density in Amps/mm2, Max.	1.6	
27.	Continuous Current in Amps	630	
28.	Maximum temperature rise over an ambient temperature 50^0C.	55^0C	
29.	Short time current rating for 3 Sec in kA rms	16	
30.	Clearance in mm from bare bus bar		
	a) Phase to Phase for Isolator or as per design	60	
	b)Phase to Phase for VCB or as per design	60	
	c)Phase to Earth for Isolator or as per design	60	
	d)Phase to Earth for VCB or as per design	60	
31.	Bus Supports		
	i)Make	As per Manufacture Design	
	ii)Type	As per Manufacture Design	
	iii)Reference Standard	IEC 60243-1, ASTM D 648	
	iv)Voltage Class in kV	11 kV	
	v) Creepage distance in mm or as per design	115 in SF6 gas	
	vi)Bus Bar support spacing in mm or as per design	120	
32.	Filling SF6 gas pressure (Filling pressure at 20^0C), Min.	1.4 Bar	
33.	Operating SF6 gas pressure at 20^0C, Min.	0.5 Bar	
C)Vacuum Circuit Breaker			
34.	Make	As per Manufacture Design	
35.	Type	As per Manufacture Design	
36.	Reference Standard	IEC 62271-100	
37.	Rated Voltage in kV	11	
38.	Highest System Voltage in kV, Max.	12	
39.	Type	Vacuum Type	
40.	Rated Frequency in Hz.	50 Hz $\pm$ 3%	
41.	No. of Poles	3	
42.	Rated Current	630A	
43.	Maximum temperature rise over an ambient temperature 50^0C.	55°C	
44.	Rated operating Duty	O-3min-CO-3min-CO	
45.	Rupturing capacity at rated voltage in MVA, Min.	400	
46.	Breaking Capacity at rated voltage & operating duty		
	i)Symmetrical in kA rms	16	
	ii)Asymmetrical in kA rms	16	
	iii)Rated making current in kA peak	40	

47.	Short time current for 3 sec in kA rms	16	
48.	Transient Recovery Voltage		
	i)Rate of rise in kV/µs	0.34 kV/µs as per IEC 62271-100	
	ii)Peak Voltage in kV	28	
49.	Insulation Level		
	a)Impulse Voltage with stand on 1.2/50 µs full wave in kV	75	
	b)1 minute power frequency voltage withstand in kV	28	
50.	Vacuum Bottle		
	i)Make	As per Manufacture Design	
	ii)Type	As per Manufacture Design	
	iii)Rated Voltage in kV	As per Manufacture Design	
	iv)Rated Current in Amps.	As per Manufacture Design	
51.	Total breaking time for transient fault (CB + Relay+ trip coil) in ms	45-50 ms	
52.	Opening time No load condition in ms	45-50 ms	
53.	Opening time under SF6 gas low or vacuum loss condition in ms	45-50 ms	
	i)At 100% Breaking capacity		
	a) Opening time (ms)	As per Manufacture Design	
	b) Arcing time (ms)	As per Manufacture Design	
	c) Total break time (ms)	As per Manufacture Design	
	ii)At 60% Breaking capacity		
	a) Opening time (ms)	As per Manufacture Design	
	b) Arcing time (ms)	As per Manufacture Design	
	c) Total break time (ms)	As per Manufacture Design	
	iii)At 30% Breaking capacity		
	a) Opening time (ms)	As per Manufacture Design	
	b) Arcing time (ms)	As per Manufacture Design	
	c) Total break time (ms)	As per Manufacture Design	
	iv)At 10% Breaking capacity		
	a) Opening time (ms)	As per Manufacture Design	
	b) Arcing time (ms)	As per Manufacture Design	
	c) Total break time (ms)	As per Manufacture	

		Design	
54.	Number of breaks per pole	Single	
55.	No of breaker operations permissible without requiring inspection replacement of contacts and other Main parts		
	a)At 100% rated current	2000	
	b)At 100% rated breaking current, Min.	20	
56.	Type of contacts		
	i)Main	Butt Type	
	ii)Arcing	Butt Type	
57.	Material of contacts		
	i)Main	Copper	
	ii)Arching	Copper	
	iii)Chromium / Silver plated	Chromium / Silver plated	
58.	Mechanical Endurance Test for Circuit Breaker, Number of operations	2000	
59.	Spring charging mechanism	Motor Operated	
60.	Operating mechanism for closing of Circuit Breaker		
	i)Type	Spring operated Mechanism	
	ii)No of breaker operations stored	One	
	iii)Trip free or fixed trip	Trip Free	
	iv)Earthing for operating mechanism and metal parts	Solidly Earthed	
	v)Earth terminal size and material, Min.	Electrolytic grade Copper 25 x 3mm	
61.	Operating mechanism for tripping of Circuit Breaker		
	i)Type	Spring Operated Mechanism	
	ii)No of breaker operations stored	One	
	iii)Trip free or fixed trip (V)	Trip Free	
	iv)Earthing for operating mechanism and metal parts	Solidly Earthed	
	v)Earth terminal size and material	Electrolytic grade Copper 25 x 3mm	
	vi)Spring charging mechanism		
	a)Make	As per Manufacture Design	
	b)Type	As per Manufacture Design	
	c)Motor, Voltage and Watts	As per Manufacture Design	
62.	Breaker Accessories		
	i)Mechanical safety Interlock	To be Provided	
	ii)Automatic safety Interlock	To be Provided	
	iii)Operational Interlock	To be Provided	
	iv)Emergency manual trip	To be Provided	
	v)Operation counter	To be Provided	

	vi)Spring charge / discharge indicator	To be Provided	
	vii)Manual spring charging facility	To be Provided	
63.	Impact load on foundation design (to include dead load plus impact value on Closing at maximum interrupting rating)in kg		
	i)Extensible 3 Way RMU(3 Way, M+LLV+)	As per Manufacture Design	
	ii)Extensible 4 Way RMU(4 Way, +LLLL+)	As per Manufacture Design	
	iii)Extensible 4 Way RMU(4 Way, M+LLLV+)	As per Manufacture Design	
	iv)Extensible 4 Way RMU(4 Way, M+LLVV+)	As per Manufacture Design	
	v)Extensible 5 Way RMU(5 Way, M+LLVVV+)	As per Manufacture Design	
	vi)Extensible 6 Way RMU(6 Way, +LLVVV+V+)	As per Manufacture Design	
D)Isolators			
64.	Make	As per Manufacture Design	
65.	Type	As per Manufacture Design	
66.	Reference standard	IEC-62271-102 / IEC-62271-103	
67.	Nominal Voltage in KV	11	
68.	Highest System Voltage in kV, Max.	12	
69.	Rated Frequency in HZ	50 Hz $\pm$ 3%	
70.	No. Of poles	3	
71.	Rated Current in Amps	630	
72.	Maximum temperature rise over an ambient temperature 50^0C.	60°C	
73.	Operation	Close-Open-Earth	
74.	Rupturing Capacity at rated voltage	630Amps at 11kV	
75.	Maximum over voltage factor when switching off Loaded feeder cable in kA	40	
76.	No. of isolator operation permissible without requiring inspection, replacement of contacts and other main parts		
	i)Mechanical Endurance in Number of operations	1000	
	ii)At 100% rated making current in Number of operations	100	
	iii)At 100% rated breaking current in Number of operations	100	
77.	Isolator provided with the following Mechanical safety		
	a)Mechanical ON and OFF Indication	To be Provided	
	b)Cable Earth Indication	To be Provided	
	c)Operational Counter	To be Provided	
	d)Manual Spring Charging facility	To be Provided	

E) Current Transformer			
78.	Make	As per Manufacture Design	
79.	Reference standard	IS:16227, I & II	
80.	Type	Ring Type, Resin Cast/Tape wound	
81.	Nominal Voltage in KV	11	
82.	Highest System Voltage in kV, Max.	12	
83.	Rated Frequency in HZ	50 Hz ± 3%	
84.	Current Transformer Ratio	200-100/1Amps	
85.	Short circuit withstand		
	i)Short time current for 3 sec. in kA rms	5	
	ii)Dynamic current in kA peak, Min.	7.5	
86.	Class of insulation	Class B	
87.	Basic insulation level in kV	3	
88.	Maximum temperature rise over an ambient temperature 50^0C.	60^0C	
89.	Class of Accuracy		
90.	Metering Core	0.5	
91.	Protection Core	5P10	
92.	Rated Burden	2.5 VA	
93.	Over Current Rating in %	120	
94.	Continuous Over Load in %	120	
F) Metering Voltage(Potential) Transformer			
95.	Make	As per Manufacture Design	
96.	Reference standard	IS:16227, I & III	
97.	Type	Resin Cast/Tape wound	
98.	Nominal Voltage in KV	11	
99.	Highest System Voltage in kV, Max.	12	
100.	Rated Frequency in HZ	50 Hz ± 3%	
101.	Voltage Transformer Ratio	11 kV/√3 /110V/√3	
102.	Rated Primary Voltage in kV	11 kV/√3	
103.	Rated Secondary Voltage in V	110V/√3	
104.	Rated Burden in VA	50	
105.	Accuracy Class	0.5	
106.	Insulation Class	B	
107.	Voltage Factor	1.2 Continuous and 1.9 for 8 hrs.	
108.	One Minute Power Frequency Dry Withstand Voltage Rating		
	a) Primary Winding Induced Test in kV rms	28	
	b)Secondary Winding in kV rms	3	
	c)Rated Impulse Voltage in kV peak	75	
G) Auxiliary Voltage(Potential) Transformer			
109.	Make	As per Manufacture Design	
110.	Reference standard	IS:16227, I & III	
111.	Type	Resin Cast/Tape wound	
112.	Nominal Voltage in KV	11	
113.	Highest System Voltage in kV, Max.	12	
114.	Rated Frequency in HZ	50 Hz ± 3%	

115.	Voltage Transformer Ratio	11 kV/√3 / 230V	
116.	Rated Primary Voltage in kV	11 kV/√3	
117.	Rated Secondary Voltage in V	230 V	
118.	Rated Burden in VA	500 VA	
119.	Voltage Regulation in %	5	
120.	Insulation Class	B	
121.	Voltage Factor	1.2	
122.	Application & Construction Type	Indoor, Single Phase/Two Pole	
123.	One Minute Power Frequency Dry Withstand Voltage Rating		
	a)Primary Winding Induced Test in kV rms	28	
	b)Secondary Winding in kV rms	3	
	c)Rated Impulse Voltage in kV peak	75	
H) Numerical Protection Relay			
124.	Make	As per Manufacture Design	
125.	Type and Model	As per Manufacture Design	
126.	Reference Standard	IEC 60255	
127.	Type and Model	3 Over Current(O/C) and 1 Earth fault(E/F)	
128.	Current Transformer Secondary Input to Relay	1 A	
129.	Operating Curve Type	Inverse Definite Minimum Time (IDMT)Relay	
130.	Auxiliary Supply	Self Powered relay for Protection	
131.	Rated Frequency in HZ	50 Hz ± 3%	
132.	Over Current Protection		
	a)Low set Over Current protection	20-200% of CT secondary rated current with increment/decrement by 1 %	
	b)High set Over Current protection	100-2000% of CT secondary rated current with increment/decrement by 50%	
133.	Earth Fault Protection		
	a)Low set Earth Fault protection	5% to 80% of the CT rated current in steps of 1%	
	b)High set Earth Fault protection	100-1000% of the CT rated current in steps of 50%	
134.	a)Mounting	Flush Mounted	
	b)Mounting Dimensions, W X L x H in mm	As per Manufacture Design	
135.	Operational Indicator	LCD display and LED annunciation lamps	
136.	Contact Details	4 Binary Input(BI) and 6 Binary output(BO)	
137.	Self-diagnosis feature	To be Provided	

138.	Password protection	To be Provided	
139.	Communication Protocol	RS 232 or RS 485 Port for IEC 103 Communication Protocol	
140.	Event / fault record, Min.	10 Event and 5 Fault Records available	
141.	Setting groups	2 Groups available	
142.	Circuit Breaker control available	Yes, Only Trip	
I) Tripping Coil			
143.	Make	As per Manufacture Design	
144.	Type	As per Manufacture Design	
145.	DC Voltage in Volt	24, Pulse operated	
146.	Maximum Tripping Current at rated voltage in Amps.	5	
147.	Minimum Permissible voltage variation in %	85 to 110	
148.	Power at Voltage in Watts	As per Manufacture Design	
J) HT three phase four wire CT / PT operated 1 Amps fully Static & AMR compatible TOD Tri - vector Energy Meter			
149.	Reference Standard	IS: 14697, 1999 IS: 15959, 2011	
150.	Make	Secure / L&T / other MSEDCL approved make	
151.	Auxiliary supply Voltage	110V/√3	
152.	Class of Accuracy	0.5S	
153.	Type of Display	Customized backlite liquid crystal display	
154.	Measuring Parameters as per MITL/MSEDCL Specification		
	i)Instantaneous parameters	To be Provided	
	ii)Block Load Profile parameters	To be Provided	
	iii)Billing Profile Parameters	To be Provided	
	iv)Name Plate details Programmable Parameters	To be Provided	
	v)Event Conditions	To be Provided	
	vi)All logging parameters for each of the event condition for 3 Φ / 4W	To be Provided	
K)Fault Passage Indicator (FPI) on Short Circuit and Earth fault			
155.	Make	As per Manufacture Design	
156.	Type and Model	As per Manufacture Design	
157.	Operating point/Current short circuit in Amp	Adjustable 100/200/300 /400/500 /600/700 /800/900/1000 /1100/1200A (±15%)	
158.	Operating point/Current earth fault in Amp	Adjustable 10/20/30/40	

		/60/80/100A (±15%)	
159.	Response Time in ms	For Short Circuit Adjustable 40/60/80/100/120 /160/200/240 ms Sec(±100m Sec) For Earth Fault Adjustable 40/60/80/160 ms (±100m Sec)	
160.	Auto Reset Time in Hrs	1/2/4/8 hrs (+ / - 1%) after fault	
L) Battery Charger			
161.	Make	As per Manufacture Design	
162.	Type and Model	As per Manufacture Design	
163.	Input AC Voltage in V	230	
164.	Rated Frequency in Hz	50 Hz ± 3%	
165.	Output DC Voltage in V	24	
166.	Current Rating in Amps	10	
167.	Output DC Voltage for charger		
	i)Boost Mode in V	27 to 28	
	ii)Float Mode in V	27 to 28	
168.	Operating Temperature in ^{0}C	-25 to 60	
169.	Temperature Compensation	Junction temperature of SMPS crosses 142^{0}C, thermal shutdown occurs.	
170.	Short Circuit and Overload Protection	To be Provided	
171.	High Voltage Isolation	2 kV for 1 minute	
172.	Efficiency	Above 85 %	
173.	Mounting Arrangement	As per Manufacture Design	
174.	Dimensions, W x D x H in mm	As per Manufacture Design	
N) Battery			
175.	Make	As per Manufacture Design	
176.	Type	Dry Type	
177.	Ah Efficiency	> 95%	
178.	Self-Discharge	Self-Discharge	
179.	Operating Temperature	Normal : +20^{0}C to +30^{0}C & Limits : -20^{0}C to +50^{0}C	
180.	Voltage (V)	24V (2 x 12V)	
181.	Ah Capacity	7Ah / 12 Ah / 26 Ah	
O) Manometer with Non Return Valve			
182.	Make	As per Manufacture Design	
183.	Type and Model	Analogue, ---	

184.	Material	Stainless Steel	
185.	Accuracy of calibration pressure	+/-1% at 20^0C	
186.	Pressure Element	Stainless Steel Welded	
187.	Dial	2''	
188.	Pointer	Dark	
189.	Window	Round	
190.	Gas pressure low signal	Indicated by Red Color Zone	
191.	Non Return Valve(NRV) Material	Stainless Steel	
P) Indoor cable terminations kits			
192.	Make	As per Manufacture Design	
193.	Type	11 kV touch proof screened termination kit	
194.	Materials	Epoxy / EPDM / Silicon Rubber	
195.	Cable Size	Up to 3 x 400 sq. mm 11 kV HT cables	
196.	Height of each Cable box from ground level	As per Manufacture Design	
197.	Arrangement for mounting an extra cable at incoming and outgoing side box of Bus bar.	As per Manufacture Design	
198.	Arrangement for mounting an extra cable at outgoing side box of transformer / feeder.	As per Manufacture Design	
Q) Automatic Water Level Controller			
199.	Make	As per Manufacture Design	
200.	Type and Model	As per Manufacture Design	
201.	Position of Automatic Water Level Controller	200 mm below live contacts	
202.	Auxiliary contacts	4 NO + 4 NC	
203.	Breaker Tripping and Load break Isolator opening due to water level increases; signals to Control room	To be Provided	
R) Name Plate			
204.	Material	Anodized Aluminum / Stainless Steel	
205.	Thickness	18 swg / 1.00 mm	
206.	Size	145 mm x 116 mm	
S) Painting			
207.	Inside	Powder Coated	
208.	Outside	Polyurethane based powder paint. Dark Admiralty Grey, Shade No. 632 as per IS: 5, 2007.	

T) Danger Board			
209.	Reference Standard	IS: 2551, 1982	
210.	Material	Mild Steel	
211.	Thickness in mm, Min.	1.6	
212.	Size H x L in mm	200 x 250	
U) Type Test			
213.	Following Type Test carried out within 5 years at NABL laboratories in India or equivalent International Laboratories, Yes / No		
214.	Short time Current withstand test and peak current withstand test.	Yes	
215.	Lightening Impulse voltage with-stand test	Yes	
216.	Temperature rise test.	Yes	
217.	Short Circuit current making and breaking tests.	Yes	
218.	Power frequency voltage withstand test (dry).	Yes	
219.	Capacitive current switching test confirming to IEC.	Yes	
220..	Mechanical operation test.	Yes	
221.	Measurement of the resistance of the main circuit.	Yes	
222.	Degree of protection of Inner enclosure and outer enclosure	Yes	
223.	Switch, circuit breaker, earthing switch making capacity.	Yes	
224.	Switch, circuit breaker breaking capacity.	Yes	
225.	Internal arc withstand Test for Inner Enclosure and Cable Chamber.	Yes	
226.	Checking of partial discharge on complete unit.	Yes	
227.	Guarantee of Ring Main Units and accessories supplied against this specification	66 months from the date of receipt at the consignee's Stores Center or 60 months from the date of commissioning	

Schedule 'B '

List of Type Test Reports to be enclosed with the offer

Sr. No.	Description of Type Test	Type & Make of Ring Main Unit & its rating	IS/IEC Clause No.	Testing Lab. & Date of Testing	Type test report No., dt & pages	Whether certificate of compliance with IS/IEC is enclosed with T.R.
1.						
2.						
3.						
4.						

Name of the firm_____
Signature of the bidder_____
Designation_____
Date_____

TECHNICAL SPECIFICATION FOR STRAIGHT THROUGH/TERMINATIONS/TRANSITION JOINTING KITS FOR HT LT ARMOURED PVC / XLPE ALUMINIUM /COPPER CONDUCTOR CABELS

1.00 SCOPE

This specification covers design, manufacturing, testing, supply of IS Mark (IS-13573:2011) HT/LT Cable accessories i.e Joints/Termination (straight through, stop ends and transition joints for dissimilar cables etc.) suitable for armoured, PVC/XLPE, Aluminum/Copper conductor cables.

The cable accessories shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to purchaser, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in these specifications and or the commercial order or not.

2.00 APPLICATION

The cable accessories shall be use on armoured, PVC/XLPE, LT/HT, Aluminum/Copper conductors cables installed in sub-stations for power distribution system and LT/HT consumers.

3.00 SERVICE CONDITIONS

The cable accessories to be supplied against this specification shall be suitable for continuous operation under the following tropical conditions .

Environmental Conditions

a)	Maximum ambient temperature	50^0 C
b)	Maximum ambient temperature in shade	45^0 C
c)	Minimum temperature of air in shade	35^0 C
d)	Maximum daily average temperature	40^0 C
e)	Maximum yearly weighted average temperature	32^0 C
f)	Relative Humidity	10 to 95 %
g)	Maximum Annual rainfall	1450 mm
h)	Maximum wind pressure	150 Kg/m^2
i)	Maximum altitude above mean sea level	1000 meters
j)	Isoceraunic level	50 days/years
k)	Seismic level (Horizontal acceleration)	0.3 g

l) Climate: Moderately hot and humid tropical climate conducive to rust andfungus growth and polluted with industrial pollution

4.00 APPLICABLE STANDARDS

IS-13573 (Part –I):2011 – for working voltage from 1.1kV upto and including 3.3kV (E) - Test methods and requirements.(for Type Test Only)

IS-13573 (Part-II):2011 - for working voltage from 3.3kV (UE) upto and including 33kV (E) – Test requirements. (for Type Test Only)

IS-13573(Part-III):2011 – for working voltage from 3.3kV (UE) upto and including 33kV (E) – Test methods. (for Type Test Only)

IEC: 60502-04:2010/ 2005, VDE 0278 – Standard for cable accessories. IEEE48 – for terminations of cable. (forType Test Only)
ENA-09-13 standards – for components used in the Kit (From 1kV (E) to 36 kV (E))

ENA-09-11 standards – for components used in the Kit (From 600V (E) to 1 kV (E))

The specification given in this documents supersedes the relevant clauses of IS-13573:2011 (Part-I/II/III) wherever applicable.

5.0 GENERAL TECHNICAL REQUIREMENT

Material used for construction of a joint/termination shall perfectly match with the di-electric, 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 joints.

The Straight through joint kit or termination shall be complete with all accessories, jointing material, insulating stress control and sealing material, lugs, etc. as well as an instruction booklet explaining the method of using the kit. In case of heat shrinkable type kit, the joint shall include a heat shrinkable dual wall tubing which shall be insulating from inside and semi conductive from outside. Detailed sectional views of the assemblies shall be submitted along with the offer.

The straight through joints should be absolutely impervious to the entry of 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.

The cable termination kit shall be suitable for terminating the cable on indoor or outdoor installation as per requirement. The type of cable will be armoured, PVC / XLPE insulated H.T/L.T. Cables

The Straight - through joints shall be suitable for Buried / Over Head application.

The heat shrinkable component shall be light in weight and shall be made of

specially formulated cross linked polymeric material with excellent

tracking & erosion resistance characteristic. Environmentally sealed system for splicing dielectric shielded power cables.

The design of joint and termination shall be such that on completion of work, the cable can be charged immediately.

The joint/termination shall have range taking feature. The Connector/ferrule used shall be range taking, Moisture entry into conductor shall be protected by providing special mastic.

The termination kit offered shall provide for total environmental sealing of the cable crutch and at the lug end. The details of the same shall be submitted along with the offer

Indoor Termination: HT/LT Jointing kit should be designed to withstand high humidity and surface contamination under electrical stress caused due to condensation and dust in indoor conditions.

Outdoor Terminations: LT/HT Terminations should be designed to withstand exposure to extreme climatic variations & surface contamination, UV rays from sunlight and electrical stress caused due to heavy pollution & dust in external conditions.

The following HT/LT Armoured PVC /XLPE Aluminum/Copper conductor cables of sizes/ rating are generally used in MITL/MSEDCL network and suitable to these cables, straight through joints & cable termination kits shall be supplied.

Sr. No	3.5 Core L.T Cable	1 Core L.T. Cable	3 Core H.T Cable
1	35 SQMM,	35 SQMM,	95 SQMM
2	50 SQMM	50 SQMM	120 SQMM
3	70 SQMM	70 SQMM	150 SQMM
4	95 SQMM	95 SQMM	185 SQMM
5	120 SQMM	120 SQMM	240 SQMM
6	150 SQMM	150 SQMM	300 SQMM
7	185 SQMM	185 SQMM	400 SQMM
8	240 SQMM	240 SQMM	500 SQMM
9	300 SQMM	300 SQMM	630 SQMM
10	400 SQMM	400 SQMM	-

5.00 Heat Shrinkable Straight through joints for MV Cable.

The heat shrinkable straight through joints shall have following function abilities .

a) For encapsulation and environmental sealing, heat shrink wraparound sleeves with hot melt adhesive coating are required to be provided along with 304 grade Stainless Steel channels for locking the sleeve. The bidder should submit certificate to confirm grade for stainless steel channels.

b) To Reduce stress over conductor, heat shrinkable stress control tube to be provided. The stress control tube has to be in electrical contact with the outer insulation screen of the cable. Impedance of the tube shall be constant up to an operating temperature and shall be within the range $1x10^8$ ohm-cm to $8x10^8$ ohm-cm and with relative permittivity shall be minimum 15. Voids filling and stress relief over crimped connector and cut point of the insulation screen to be provided with void filling and moisture sealing high permittivity stress grading mastic and lubricant. The nested ends of the heat shrinkable tubing shall be provided with environmental sealing red mastic. Continuity of copper metallic screen of cable to be provided by Tinned copper mesh with 50% overlap. Mechanical protection of joint to be provided by Rollable Metallic Strip Canister or GI Wire mesh of suitable size and length for 3 core and by tinned copper mesh for 1 core cable.

c) For jointing of main conductor cores suitable size of crimp type ferrules/mechanical connectors with range taking feature should be provided. The cross- sectional area(CSA)of the ferrule/mechanical connector shall not be less than CSA of the conductor of the cable. Length of the ferrule/connector shall be sufficient to allow adequate number of crimps/shear head type bolts, to limit temperature rise at the joint. For providing insulation over the conductor area maximum three layers of heat shrinkable insulating tube are to be provided (including stress control tube, Insulating tube and Dual Wall tube).The thickness of the heat shrinkable tubes after installation should not be less than 1.2 times the insulation thickness of the cable. For outer semi conductor screening of the joint suitable heat shrinkable dual wall tubes which are co- extruded are to be provided

d) Earth Continuity between armour to be provided by tinned copper braid of adequate cross section. This is required for proper earthing of the joint. Also, to support armour wire support ring is to be provided. The material of support ring to be steel (G.I.) for 3 core Cable and Aluminium for 1 core cable

- Worm drive clip(jubilee/hose clips) for tightly securing the earthing braid is required tobe provided in suitable size & quantity.

e) For cleaning of cores, removing burrs on ferrules & rough insulation. Sufficientquantity of cleaning solvent & aluminium oxide cloth is required to be provided.

5.01 Heat Shrinkable Termination for MV Cables

(a) The cable termination (Indoor & Outdoor) shall be of class-I type which consist of following point.
   i) stress control layer
   ii) non-tracking tubing Resistant to UV light and which provides environmentalprotection.
   iii) moisture seal-for environmental sealing against ingress of moisture & aggressivegases.

(b) for crutch portion sealing of cables trifurcating Heat shrinkable break out is required.

(c) To protect the cable breakout mono plast tape/non-adhesive PVC tape/black mastic is required to be applied over earthing arrangement(worm drive clip installed over copperbraid and armour) for suitable length of the termination part.

(d) for proper sealing of Lugs at end of the termination suitable size & length of Heat Shrinkable tube is to be provided. No tape is to be provided for sealing purpose. For earthing tinned copper braid of adequate cross section is to be provided. To support armour wire GI support ring is to be provided. Worm drive clip (jubilee clips) for tightlysecuring the earthing braid is required to be provided in suitable size & quantity.

(e) Suitable size of heat shrinkable stress control tubes is to be provided to reduce stress at cut back of screen. Void filling stress grading mastic is to be provided at semi-conducting screen. Heat shrinkable anti tracking tubes are to be provided to cover bare XLPE insulation and to provide UV resistance & environmental sealing. Anti tracking tubes shall have non-tracking adhesive coating inside, for a length of 50-60 mm on both ends.

(f) for cleaning of cores, removing burrs on ferrules & rough insulation, sufficient quantity of cleaning solvent & aluminium oxide cloth is required to be provided. Adhesive tapes to be provided in sufficient length for marking on cables.

g) For Indoor terminations, non-tracking tube of length 450 mm to be provided. For Outdoor terminations, non-tracking tube of length 650 mm to be provided. Suitable size and number of heat shrinkable rain sheds are to be provided to increase the creepage distance and to prevent water collection over termination end portion.

i. Following is the recommended selection chart for Minimum Creepage distance (in mm)for rain water sheds:

Cable cross section	**Voltage Level**		
	11 kV	**22 kV**	**33 kV**
25 – 50 sq mm	70 mm	70 mm	85 mm
70 – 120 sq mm	70 mm	85 mm	105 mm
150 – 185 sq Mm	70 mm	85 mm	105 mm
240 – 400 sq Mm	85 mm	105 mm	115 mm
500 – 630 sq Mm	85 mm	105 mm	115 mm

Note: 'Creepage distance' is defined as the length along the surface of the Creepage Extension Sheds.

ii.Number of Creepage extension sheds per core as per IS 13573 (part I,II&III) :

Voltage Level	**11 kV**	**22 kV**	**33 kV**
No. of Sheds	2 Nos	3 Nos	4 Nos

5.02 Cold Shrinkable Straight through Joints for LV Cable:

The cold shrink straight through joint shall consist of following functional abilities:

a) for encapsulation, environmental sealing & mechanical protection application of mastic coated vinyl tape and armor cast material is required.

b) for joining of main conductor cores suitable size of ferrules/mechanical connectors are required also for shielding over connector semiconducting tape is required to be provided in suitable size & length.

c) to reduce stress over conductor & moisture sealing over entire joint portion one piece body (splice assembly) made of silicon rubber is to be provided which has stress control, insulation and screen continuity property.

d) suitable size of copper braid is required for proper earthing for the joint. Also, to support armour G I solid collect & worm drive (jubilee clips) to tighten the earthing braid is required to be provided.

e) for rebuilding the insulation & making joint cold shrink splice bodies of suitable size(diameter & length) is required to be provided. The material of the joint (splice) body shall be of silicone which is factory expanded and placed on a removable core. The removing of the core causes the cold shrink joint body shall maintain a compressive force continuously throughout the life of product. This pressure will ensure a complete moisture seal.

f) for cleaning of cores, removing burns on ferrules & rough insulation sufficient quantity of cleaning liquid & aluminium oxide cloth is required to be provided.

5.03 Cold Shrinkable Termination.

(a) The cable termination (Indoor & Outdoor) shall be of class-I type which consist offollowing point

i) stress control layer
ii) Resistance against UV light environmental protection.
iii) moisture seal-for environmental sealing against ingress of moisture& aggressive gases

b) for cruch portion sealing of ends trifurcating break out boot is required

c) To protect the boot mono plast tape/pvc tape is required to apply over armour for suitable length of the termination part.

d) for proper sealing of end termination suitable size & length silicon tape is required. Also to support armour GI solid collect & worm drive clips (jubliee clips) of suitable size to tighten earthing braid is required to be provided with semiconducting tape.

e) cold shrink termination bodies with stress control material is required to be provided to reduce the stress at cut back of screen & protect XLPE insulation against UV & environment. Also to feel the void parts at cut back portion suitable size & length semi conducting tape is required.

f) for cleaning of cores, removing burrs on ferrules & rough the insulations, sufficient quantity of cleaning liquid & aluminium oxide cloth is required to be provided. Also somepvc adhesive tapes to be provided in sufficient length for marking on cables.

g) sufficient quantity of suitable size rain sheds are to be provided to increase the creepage distance & prevent water collection over termination end portion.

5.04 1.1kV Joints for Armour,XLPE,Aluminium/Copper Conductor cable:

This specification covers design and manufacturing of heat shrinkable cable joints suitable for 1.1kV Armoured PVC/XLPE Al/Cu Conductor Cables.

1. The accessories shall be supplied in kit form. Each component of the kit shall carry the manufacturer's mark of origin.
2. The supplied joint shall have a range taking feature.
3. The kits must have unlimited shelf life.
4. For outer sealing of the joint, a suitable size of Heat Shrinkable wraparound sleeve with 304 grade Stainless Steel Channel shall be provided. The bidder should submit certificate to confirm grade for stainless steel channels.
5. Suitable size of Heat Shrinkable tubings are to be provided for shrinking over individual cores for protection against moisture and dust ingress.
6. Type tests should have been carried out to prove the general qualities and design of a given type of jointing system. This type of joint should have been tested as per IS 13573 Part I at CPRI, ERDA or any such NABL accredited lab. Type Test Report for the same shall be submitted along with offer.
7. For conductor connection, either crimp type ferrules or sheer head bolt mechanical connectors should be provided.
8. The connector should be range taking which can be used for both copper & Aluminium cables.
9. Armour Connectivity and mechanical protection shall be maintained by using sufficient quantity of GI Wire mesh
10. Sufficient cross section qty of Aluminum braid shall be provided for earthing purposes.
11. The design of joint shall be such that on completion of joint the cable can becharged immediately.

6.0 MARKING AND LABELING

As per the IS 13573 (Part-I&II):2011 all kits shall be marked and labeledsuitably for identification.

a. Manufacturer's name or logo and the name of components whereverfeasible;

b. Type of jointing materials, the application;

c. Batch number(s), where relevant;

d. Product reference;

e. Defined storage conditions and expiry date, if any;

f. If relevant, the manufacturing date;

g. Health and safety marking and handling instructions, where relevant; and

h. Reference to compliance with this standard.

7.0 TYPE TESTS

The Jointing Kit offered, shall be fully type tested at NABL Lab as per the relevant standards. The applicable standards are indicated in Clause No.4.00. The tenderer shall furnish the type test reports alongwith the offer. Offer without Type test reports will not be considered. The Type test reports not pertaining to the size/ratings cables mentioned in clause no 5 shall not be considered. For any change in the design/type, already type **t**ested and the design/type offered against this specification the purchaser reserved the right to demand repetition of type tests without any extra cost in presence of purchaser' representative.

8.00 TYPE TEST SEQUENCE

The type test shall be carried out as per the test sequence given in IS 13573/2011(Part – I,II & III)

A. Acceptance & Routine Tests:

All acceptance and routine tests as stipulated in the relevant standards shall be carried out by the supplier in presence of purchaser's representative. The purchaser reserves the right to insist for witnessing the acceptance/routine testing of the bought out items.

9.00 PRE DESPATCH INSPECTION

All acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon the manufacturer and purchase at the time purchase. Manufacturer shall offer to the inspector representing the purchaser, all the reasonable facilities, free of charge, for inspection and testing to satisfy him that the material is being supplied in accordance with this specification. The MITL representative attending

the above test will carried out testing for suitable number of cable joints/terminations as per sampling procedure laid down in IS:13573(Part-I,II,III):2011 (amended up to date) and issue test certificate approval to the manufacturer and give clearance for dispatch. The cable jointing/termination kit shall be sealed after the inspection.

10.00 INSPECTION AFTER RECEIPT AT STORES

For Random sample testing (RST) the sample Cable Termination/jointing kit will be drawn from any one of the store.

11.00 DEMONSTRATION & TRANING :

The purchaser reserves the right to ask for demonstration of the equipment offered at the purchasers place. The Tenderer shall arrange for demonstration of installation of jointing/termination kits free of cost for giving training to purchasers representative to get acquainted with the jointing method.The jointing/termination kit along with required length of the kits to be used for demonstration purpose shall be specified the cable will be provided by the Purchaser.

12.00 GUARANTEE

The Kits shall be suitable for storage without deteriorating at a temperature upto 50^0C under normal conditions of storage and shall have unlimited shelf storage life. The tenderer shall guarantee the installed cable accessories for a minimum period of not less than 5 years from the date of installation. The stores/materials found defective within the above guarantee period, shall be replaced by the supplier free of cost within one month of receipt of intimation. If the defective stores/materials are not replaced as per the above guarantee clause, the Company shall recover an equivalent amount plus 15% supervision charges from any of the supplier's bills.

13.00 QUALITY CONTROL

The purchaser has a right to send team of experienced Engineers for assessing the capability of the firm for manufacturing and testing of Cable jointing kit as per this specification. The purchaser representative should be given all assistances and cooperation for inspection and testing at the bidder's work.

13.01 QUALITY ASSURANCE PLAN

The tendered shall invariably furnish QAP along with his offer, The QAPadopted by him in the process of manufacturing shall consist of

a. List of Plant and Machinery available at the manufacturers premises.
b. List of Testing equipment available at the manufacturers premises with their calibration schedule.
c. Organizational chart.

14.00 PACKING:

The Cable jointing kits shall be suitably packed to avoid damage or disturbance during transit or handling. Each Cable jointing kits may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the cartoon may be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning if considered necessary. The cases may then be properly sealed against accidental opening in transit.

The following information shall be furnished with the consignment :

Name of consignee

Details of consignment

Destination

Total Weight of consignment.

Sign showing upper / lower side of the crate

Sign showing fragility of the material.

Handling and unpacking instructions.

Bill of Materials indicating contents of each component and spare materials.

Installation instructions including drawing or other information specific to the accessories.

15.00 SCHEDULES

The tenderer shall fill in the following schedules which are part and parcel of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule A – Guaranteed and technical particulars.
Schedule B – Tenderer's experience.
The discrepancies if any between the specification and the catalogs and / or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard will not be entertained.

SCHEDULE-A1

GTP FOR HT CABLE ACCESSORIES ie JOINTS & TERMINATIONS

(Heat Shrinkable)

Sr. No.	Particulars	MITL Requirement	Bidder Offer.
1	Manufacturer' Name& Address		
2	Brand Name &Country of Origin		
3	Kit Storage Temperature	50^0 C max	
4	Voltage Grade(Kv)	12, 24 & 36	
5	Applicable Standards	Indicated in Cl.No.4 of Technical Spec.	
6	Material to be used	cross link Polymeric	
7	Type Of Kit Offered	1)Straight through Joint. 2)Transition joint. 3)Termination joint.	
8	Shelf life of components in the kit	Unlimited	
9	Time Required for energization after completion of termination/joint	Immediate.	
10	Conductor resistance test (As per cable cross section area)	Conductor resistance shall not vary more than 10% of initial value	
11	A.C. withstand voltage ph/ground) @ 4.5 Uo	4.5 Uo for 5 min #	
12	Heat Cycle in air 8 hours total with > 2hours steady heating and >3 hours cooling	30 Cycles at 2.5Uo #	
13	Heat Cycle in water 8 hours total with >2 hours steady heating and >3hours cooling	30 Cycles at 2.5Uo #	
14	Partial discharge test @ 1.73 Uo 10 pC max at max temp as well as room Temperature	Max 10 pC #	
15	Humidity test (Only for Indoor termination)	300hours @ 1.25Uo #	
16	Salt fog test (Only for Outdoor termination)	1000hours @ 1.25Uo #	

Sr.no	Particulars	MITL requirement	Bidder offer
17	Dielectric Strength for 1)insulating Tube. 2)Anti tracking Tube 3)Dual wall tube	1)10(min) 2)10(min) 3)10(min)	
18	Dielectric constant for 1) stress control tube 2)insulatingtube 3)anti tracking Tube 4)dual wall Tube 5) stress control mastic	1)15(min) 2)3.5(min) 3)3.5(min) 4) 3.5(min) 5)9.0(min)	
19	Tensile strength for 1)stress control tube 2)insulating tube 3)anti tracking tube 4)dual wall tube 5) stress control mastic	1) 10 N/sq.mm(min) 2) 10 N/sq.mm(min) 3) 8 N/ sq.mm(min) 4) 10 N/sq.mm(min) 5) 8 N/sq.mm (min)	
20	Ultimate Elongation for 1)stress control tube 2)insulating tube 3)anti tracking tube 4)dual wall tube 5) stress control mastic	1)200% 2)200% 3)200% 4)200% 5)200%	
21	Water Absorption for 1)Stress Control Tube 2)Insulating Tube 3)Anti Tracking Tube 4)Dual wallTube 5) Stress control mastic	1)0.5% 2) 0.5% 3) 0.5% 4) 0.5% 5)0.5%	
22	Longitudinal Change for 1)stress control tube/ 2)insulating tube 3)anti tracking tube 4)dual wall tube	1) max 10% 2) max 10% 3) max 10% 4) max 10%	
23	Heat Shock for 1) stress control Tube 2)insulating tube 3)anti tracking tube 4)dual walltube	1)30min@250^{0}c, 2)30min@250^{0}c, 3)30min@250^{0}c, 4)30min@250^{0}c	
24	Flammability for insulating tube/anti tracking tube/dual walltube	Pass	
25	Tracking Resistance for antitracking tube	Non tracking	
26	Dissipation factor for stress control mastic	0.15(max)	

S No	Particulars	MITL Requirement	Bidder Offer
27	Service Temperature for stresscontrol mastic	90^0 C	
28	Heat shrink wraparound sleeves with SS Channels	As per specification (clauseno.5.01)	
29	Canister/GI Wire Mesh	As per cable size	
30	Red mastic	As per cable size	
31	G.I. Solid Collet	As per cable size	
32	Copper Braid	As per requirement	
33	Co-extruded Heat shrink Dual wall tube	As per specification (clauseno.5.01)	
34	Heat shrink insulating tube	As per specification (clauseno.5.01)	
35	Heat shrink stress control tube	As per specification (clauseno.5.01)	
36	Stress Grading mastic	As per specification (clauseno.5.01)	
37	Ferrule/Connector	As per specification (clause no.5.01& 5.02)	
38	PVC NA Tape	As per requirement	
39	PVC Adhesive Tape	As per requirement	
40	Cleaning Liquid	As per requirement	
41	Aluminum Oxide cloth	As per requirement	
42	Heat shrink break boot(Termination)	As per specification (clauseno.5.02)	
43	Heat stress control tube	As per specification (clauseno.5.02)	
44	Heat shrink Anti tracking tube	As per specification (clauseno.5.02)	
45	Rain sheds (Termination)	As per specification (clauseno.5.02)	
46	List Of Contents Of Kit (To Be Furnished Separately)	Detailed component list with Quantity etc.	

These values are indicated in IS-13575 part –I at clause no.6.1,7.2.IS-13573 part-II at clause no.4.4.2,4.5.2&5.1, IS-13573 part-III at clause no.4.1(in accordance with IS -10810) 7.1,9&13

SCHEDULE-A2

GTP FOR HT CABLE ACCESSORIES ie JOINTS & TERMINATIONS

(Cold Shrinkable)

Sr. No.	Particulars	MITL Requirement	Bidder Offer.
1	Manufacturer' Name& Address		
2	Brand Name &Country of Origin		
3	Kit Storage Temperature	50^0 C max	
4	Voltage Grade	12kv,24kv & 36kv	
5	Applicable Standards	Indicated in Cl.No.4 of Technical Spec.	
6	Material to be used	Polyurethane Polymeric	
7	Type of Kit offered	1)Straight through Joint. 2)Transition joint. 3)Termination joint.	
8	Shelf life of components in the kit except compound	Unlimited	
9	Time required for energisation after completion of termination/joint.	Immediate.	
10	Conductor resistance test (As per cable cross section area)	Conductor resistance shall not vary more than 10% of initial value. #	
11	A.C. withstand voltage ph/ground) @ 4.5 Uo	4.5 Uo for 5 min #	
12	Heat Cycle in air 8 hours total with > 2hours steady heating and >3 hours cooling	30 Cycles at 2.5Uo #	
13	Heat Cycle in water 8 hours total with >2 hours steady heating and >3 hours cooling	30 Cycles at 2.5Uo #	
14	Partial discharge test @ 1.73 Uo 10 pC max at max temp as wellas room temperature	Max 10 pC #	
15	Humidity test (only for indoor termination)	300hours @1.25Uo #	
16	Ultra voilet test	No cracking #	
17	Dielectric Strength for 1)stress controltube 2) insulating material(body insulation)	1)8 kv/mm, 2)20kv/mm	
18	Dielectric constant for 1)stress controltube2) insulatingmaterial(body insulation), 3)Silicon rubber	1)18, 2)3.5 3)3.5	
19	Volume Resistivity for 1)stress controltube 2) insulating material(body insulation)	1)$1x10^2$ ohm.cm, 2)$1x10^{15}$ohm.cm,	

S N	Particulars	MITL Requirement	Bidder Offer
20	Ultimate Elongation for 1)stress controltube 2) insulating material(body insulation)	1)700%, 2)700%,	
21	Hardness for 1) stress control tube 2)insulating material(body insulation)	1) 35±5 shoreA, 2) 40±5 shoreA	
22	Dielectric loss factor tan delta for1)stress control tube/ 2)insulating material(body insulation), 3)silicon rubber	1)0.08, 2)0.005 3)0.004	
23	Service temperature range		
	1) stress control tube 2) insulating material(body insulation)	1) -50 up to 130^{0}C 2)-50 up to 130^{0}C	
24	Installation temperature range for1)stress control tube 2) insulating material(body insulation)	-20 up to 50^{o}C	
25	Tear Resistance for insulatingmaterial(body insulation)	26 N/mm	
26	Silicon rubber (Permanent set 22hours 100^{0}C 100% elongation 5min)	8%	
27	Tracking Resistance for Silicon rubber	10 Hrs Non tracking	
28	Armour cast material	As per specification (clauseno.5.03)	
29	Mastic Tape 2229i	As per requirement	
30	Mastic	As per requirement	
31	Worn drive clip	As per cable size	
32	G.I. solid collect	As per cable size	
33	Copper braid	As per requirement	
34	Cold shrink splice body	As per specification (clause no 5.03)	
35	Ferrule/mechanical connector	As per specification (clauseno 5.03&5.04)	
36	Semiconducting tape	As per requirement	
37	Pvc NA tape	As per requirement	
38	Pvc adhesive tape	As per requirement	
39	Aluminum Oxide cloth	As per requirement	
40	Pvc cleaning liquid	As per requirement	
41	Trifercating break out boot(Termination)	As per specification(clause no 5.03)	
42	Mono plast tape/pvc tape	As per cable size requirement	
43	Silicone tape	As per cable size Requirement	
44	Cold shrink termination Body with stress control material	As per specification(clause no 5.03)	

SN	Particulars	MITL Requirement	Bidder Offer
45	Rain sheds(Termination)	As per requirement	
46	List Of Contents Of Kit (To Be Furnished Separately)	Detailed component list with Quantity etc.	

These values are indicated in IS-13575 part –I at clause no.6.1,7.2.IS-13573 part-II at clause no.4.4.2,4.5.2&5.1, IS-13573 part-III at clause no.4.1(in accordance with IS -10810) 7.1,9&13

SCHEDULE-A3

GTP FOR LT CABLE ACCESSORIES i.e JOINTS & TERMINATIONS

(Heat Shrinkable)

Sr. No.	Particulars	MITL Requirement	Bidder Offer.
1	Manufacturer' Name& Address		
2	Brand Name &Country of Origin		
3	Kit Storage Temperature	50^0 C max	
4	Voltage Grade	1.1kv	
5	Applicable Standards	Indicated in Cl.No.4 of Technical Spec.	
6	Material to be used	Polymeric Heat shrinkable material	
7	Type Of Kit Offered	1)Straight through Joint. 2)Transition joint. 3)Termination joint.	
8	Shelf life of components in the kit	Unlimited.	
9	Time Required for energisation after completion of termination/joint.	Immediate.	
10	Impulse withstand on Low voltage kits.	As per IS 13573 joints classification.for cable size less than50sqmm.it will be 8kv & for cable size more than 50sqmm.it will be 20kv	
11	Heating cycle in Air	As per IS-13573 part-I See 8.3	
12	Heat Cycle in Water(Over sheath damage)	As per IS-13573 part-I See 8.3	
13	Insulation resistance(Immersed)	As per IS-13573 part-I See 8.4	
14	Insulation resistance(Air)	As per IS-13573 part-I See 8.4	

Sr.No.	Particulars	MITL requirement	Bidder offer
15	Impact at ambient temp.	As per IS-13573 part-I See 8.5	
16	AC High voltage withstand(in Air)	As per IS-13573 part-I See 8.6	
17	AC High voltage withstand(immersed)	As per IS-13573 part-I See 8.6	
18	Examination of joint.	As per IS-13573 part-I See 8.8	
19	Dielectric Strength for insulating Tube.	9kv/mm	
20	Dielectric constant for insulatingtube	3.5(min)	
21	Tensile strength for insulatingtube	12.5 N/mm^2	
22	Ultimate Elongation for insulating tube	200%	
23	Water Absorption for Insulating Tube	0.3%	
24	Longitudinal Change forinsulating tube	$\pm$10%	
25	Heat Shock for insulating tube	30min@250^0c,	
26	Flammability for insulating tube	Pass	
27	Heat Shrinkable Wraparound sleeves with SS Channels	As per specification (clause no.5.01& 5.02)	
28	G.I. Wire mesh / Canister	As per cable size	
29	Red mastic	As per cable size	
30	G.I. Solid Collet	As per cable size	
31	Earthing Conductor	As per requirement	
32	Ferrule	As per specification (clause no.5.01&5.02)	
33	PVC NA Tape	As per requirement	
34	PVC Adhesive Tape	As per requirement	
35	Cleaning Liquid	As per requirement	
36	Aluminum Oxide cloth	As per requirement	
37	Heat shrink break boot(Termination)	As per specification (clause no.5.02)	
38	List Of Contents Of Kit (ToBe Furnished Separately)	Detailed component list with Quantity etc.	

SCHEDULE-A4

GTP FOR LT CABLE ACCESSORIES i.e JOINTS & TERMINATIONS

(Cold Shrinkable/Mechanical types)

Sr. No.	Particulars	MITL Requirement	Bidder Offer.
1	Manufacturer' Name& Address		
2	Brand Name &Country of Origin		
3	Kit Storage Temperature	50^0 C max	
4	Voltage Grade	1.1kv	
5	Applicable Standards	Indicated in Cl.No.4 of Technical Spec.	
6	Material to be used	Rubber tubes for Cold shrink tubes..	
7	Type Of Kit Offered	1)Straight through Joint. 2)Termination joint.	
8	Shelf life of components in the Kit	Unlimited.	
9	Time Required for energisation after completionof termination/joint.	Immediate.	
10	Impulse withstand on Low voltage kits.	As per IS 13573 joints classification.for cable size less than50sqmm.it will be 8kv & for cable size more than 50sqmm.it will be 20kv	
11	Heating cycle in Air	As per IS-13573 part-I See 8.3	
12	Heat Cycle in Water(Over sheath damage)	As per IS-13573 part-I See 8.3	
13	Insulation resistance(Immersed)	As per IS-13573 part-I See 8.4	
14	Insulation resistance(Air)	As per IS-13573 part-I See 8.4	
15	Impact at ambient temp.	As per IS-13573 part-I See 8.5	
16	AC High voltage withstand(In Air)	As per IS-13573 part-I See 8.6	

SN	Particulars	MITL Requirement	Bidder Offer
17	AC High voltage withstand(immersed)	As per IS-13573 part-I See 8.6	
18	Examination of joint.	As per IS-13573 part-I See 8.8	
19	Dielectric Strength for insulating Tube.	20 kv/mm	
20	Dielectric constant for insulating tube	3.5(min)	
21	Tensile strength for insulating tube	$8N/mm^2$	
22	Ultimate Elongation forinsulating tube	700 %	
23	Water Absorption for Insulating Tube	0.5%	
24	Longitudinal Change for insulating tube	$\pm$10%	
25	Mastic2229i+ Vinyle tape and Armour cast for encapsulation.	To be used after completion of joint for encapsulation.	
26	G.I. Solid Collet	As per cable size	
27	Earthing Conductor	As per requirement	
28	Ferrule/Connector	As per specification (clause no.5.03&5.05)	
29	No. of shearing type bolts/special studs providedon connectorbarrel.	4 to 6 nos. to have secured connection.	
30	Material for armour connectivity.	Suitable tinned copper braiding required.	
31	Insulating tubing over the connector.	Dual wall design sleeve with entrapped lubricant with sufficient length to cover connector.	
32	Mechanical protection to joint body.	Suitable armour wrappingrequired.	
33	PVC NA Tape	As per requirement	
34	PVC Adhesive Tape	As per requirement	
35	Cleaning Liquid	As per requirement	
36	Aluminum Oxide cloth	As per requirement	
37	Side on Break out/Molds with compound.	As per specification (clause no.5.02)	
38	List Of Contents Of Kit (To Be Furnished Separately)	Detailed component list with Quantity etc.	

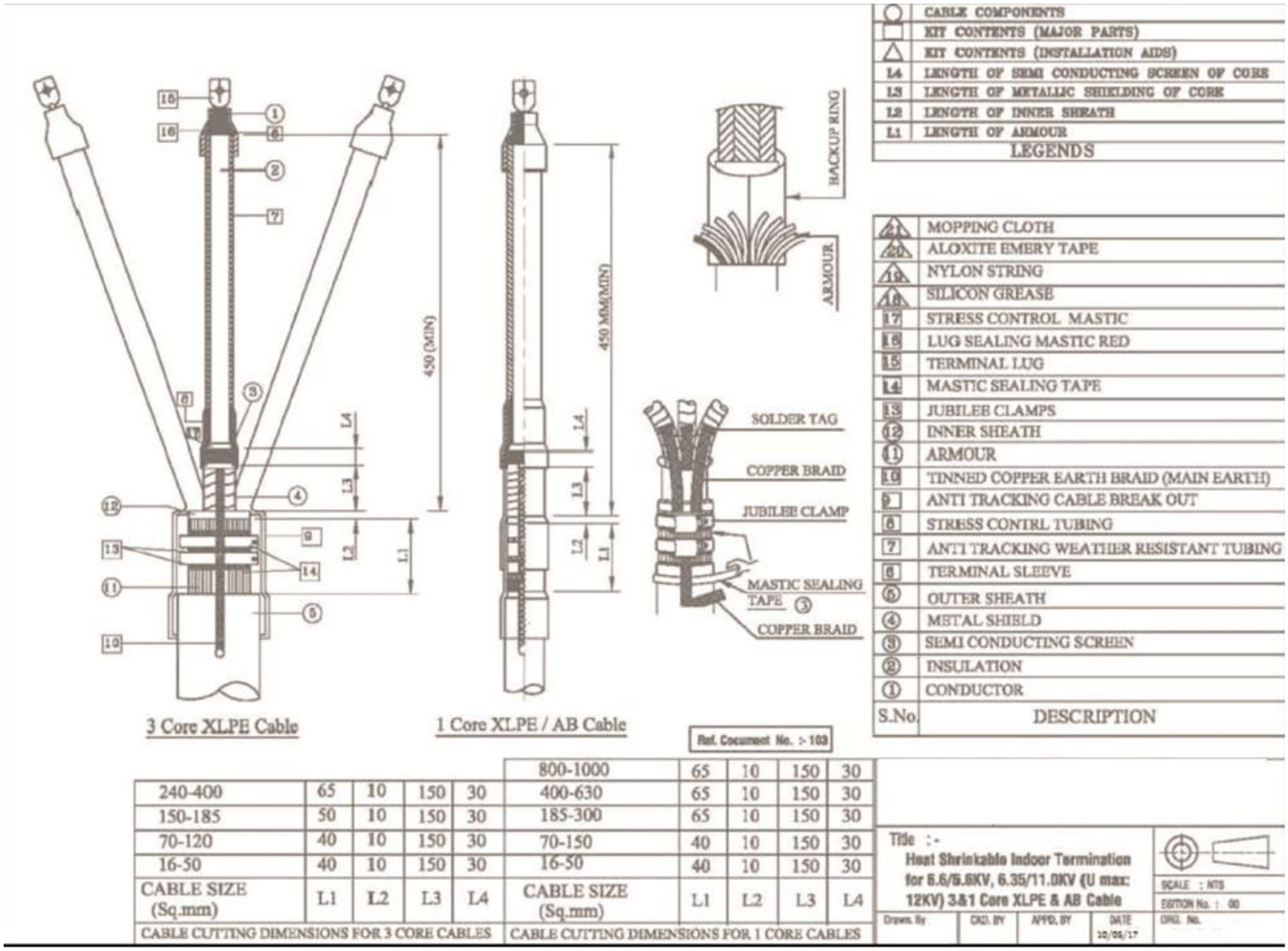
SCHEDULE – "B"

TENDERER'S EXPERIENCE

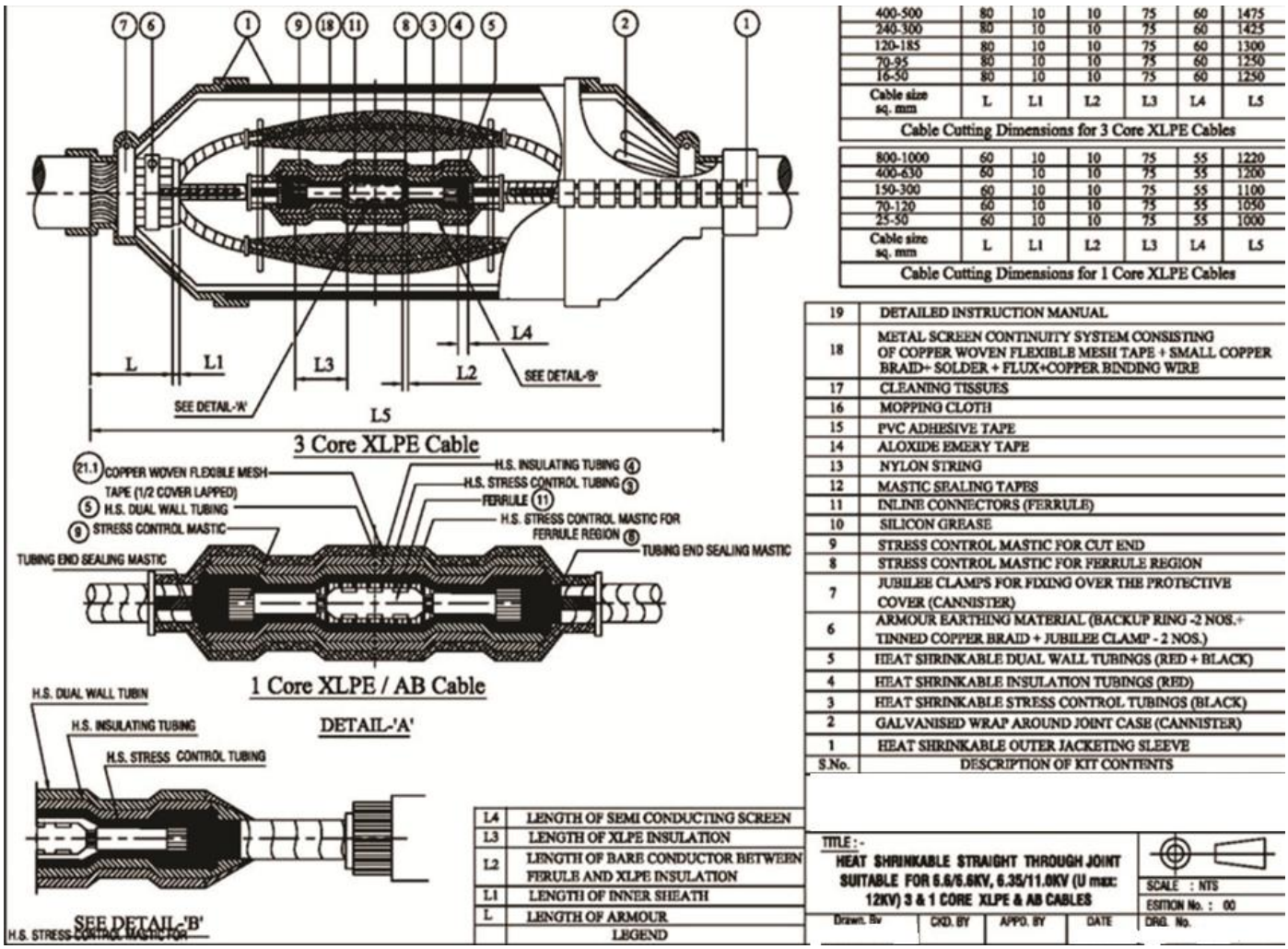
Tenderer shall furnish here list of similar orders executed / under execution for supplying HT/LT Cable Accessories by him to whom a reference may be made by purchaser in case he considers such a reference necessary.

Sr. No.	Name of client	Order No. & date	Qty. ordered	Qty. supplied

Indicative Drawing



Indicative Drawing



400-500	80	10	10	75	60	1475
240-300	80	10	10	75	60	1425
120-185	80	10	10	75	60	1300
70-95	80	10	10	75	60	1250
16-50	80	10	10	75	60	1250
Cable size sq. mm	L	L1	L2	L3	L4	L5

Cable Cutting Dimensions for 3 Core XLPE Cables

800-1000	60	10	10	75	55	1220
400-630	60	10	10	75	55	1200
150-300	60	10	10	75	55	1100
70-120	60	10	10	75	55	1050
25-50	60	10	10	75	55	1000
Cable size sq. mm	L	L1	L2	L3	L4	L5

Cable Cutting Dimensions for 1 Core XLPE Cables

S.No.	DESCRIPTION OF KIT CONTENTS
19	DETAILED INSTRUCTION MANUAL
18	METAL SCREEN CONTINUITY SYSTEM CONSISTING OF COPPER WOVEN FLEXIBLE MESH TAPE + SMALL COPPER BRAID+ SOLDER + FLUX+COPPER BINDING WIRE
17	CLEANING TISSUES
16	MOPPING CLOTH
15	PVC ADHESIVE TAPE
14	ALOXIDE EMERY TAPE
13	NYLON STRING
12	MASTIC SEALING TAPES
11	INLINE CONNECTORS (FERRULE)
10	SILICON GREASE
9	STRESS CONTROL MASTIC FOR CUT END
8	STRESS CONTROL MASTIC FOR FERRULE REGION
7	JUBILEE CLAMPS FOR FIXING OVER THE PROTECTIVE COVER (CANNISTER)
6	ARMOUR EARTHING MATERIAL (BACKUP RING -2 NOS.+ TINNED COPPER BRAID + JUBILEE CLAMP - 2 NOS.)
5	HEAT SHRINKABLE DUAL WALL TUBINGS (RED + BLACK)
4	HEAT SHRINKABLE INSULATION TUBINGS (RED)
3	HEAT SHRINKABLE STRESS CONTROL TUBINGS (BLACK)
2	GALVANISED WRAP AROUND JOINT CASE (CANNISTER)
1	HEAT SHRINKABLE OUTER JACKETING SLEEVE

L4	LENGTH OF SEMI CONDUCTING SCREEN
L3	LENGTH OF XLPE INSULATION
L2	LENGTH OF BARE CONDUCTOR BETWEEN FERULE AND XLPE INSULATION
L1	LENGTH OF INNER SHEATH
L	LENGTH OF ARMOUR
	LEGEND

TITLE :-
HEAT SHRINKABLE STRAIGHT THROUGH JOINT SUITABLE FOR 6.6/6.6KV, 6.35/11.0KV (U max: 12KV) 3 & 1 CORE XLPE & AB CABLES

SCALE : NTS
EDITION No. : 00
DRG. No.

Drawn. By	CKD. BY	APPD. BY	DATE

TECHNICAL SPECIFICATION

6 Way feeder pillar with HRC & bus sectionalizer configuration (No ACB).

1.00 SCOPE

This specification covers design, manufacture, testing, inspection at manufacturer's works, packing and supply of LT Feeder Pillars made out of either complete enclosure of Mild Steel or complete enclosure of thermosetting plastic i.e. glass reinforced polyester sheet molding compound confirming to IS: 13410/1992.The system shall be A.C. 3 phase, 4 wire, 433 V, 50 Hz with effectively grounded neutral. L.T. feeder pillars shall be 6Way/8Way with ACB along with provision for Energy meter and Resin cast CT arrangement at various stores/sites in Maharashtra state.

It is not the intent to specify herein complete details of design and construction. The equipment offered shall conform to relevant standardand high quality and workmanship capable to perform continuous and satisfactory operations in the actual service conditions at site. Bidder shall have proven experience of 3 years of manufacturing of similar products and supplying to electrical utilities.

2.00 SERVICE CONDITIONS:

The feeder pillar to be supplied against this specification shall be suitable for satisfactory continuous operation under the following environmental conditions:

a)	Maximum ambient temperature	55^0C
b)	Maximum ambient temperature in shade	45^0C
c)	Minimum temperature of air in shade	35^0C
d)	Maximum daily average temperature	40^0C
e)	Maximum yearly weighted average temperature	32^0C
f)	Relative Humidity	10 to 95 %
g)	Maximum Annual rainfall	1450 mm
h)	Maximum wind pressure	150 kg/m^2
i)	Maximum altitude above mean sea level	1000 meter
j)	Isoceraunic level	50 days/year
k)	Seismic level (Horizontal acceleration)	0.3 g

l) Climate: Moderately hot and humid tropical climate conducive to rust and fungus growth.

3.00 STANDARDS (to which feeder pillar shall comply)**:**

IS: 5039/1983	Distribution pillars for voltage not exceeding 1000 V
IS:14772/2000	General Requirements for Enclosures for Accessories for Household and Similar Fixed Electrical Installations - Specification
IS :13947/ 1993(Part 1) & (Part 2)	Specification for Low-voltage Switchgear and Controlgear –Part 1 : General Rules& Annex 'C' for Degrees of Protection provided by enclosures of electrical Equipments
	Part 2 : Circuit Breakers
IS: 13410/1992	Glass reinforced polyester sheet molding compounds (SMC)
IS: 13411/1992	Glass reinforced polyester dough molding compounds (DMC)
IS: 13703/1993	Low voltage Fuses (part 1,Part 2 sec1, Part 2 sec 2 & Part 4)
IS/IEC 127-2 : 1989	Miniature Fuses - Part 2 : Cartridge Fuse Links –Specification
IS/IEC 127-6 :1994	Miniature Fuses - Part 6 : Fuse Holders for MiniatureCartridge Fuse Links – Specification
IS:8623/1993 (Part 1,2 &3)	Specification for Low-Voltage Switchgear and Controlgear Assemblies for general requirement of L.T. Switchgears
IS: 4237/1982	General arrangement for switch gear and control Gear forvoltage not exceeding 1000 V with enclosure Box
IS: 732/1989	Code of Practice for Electrical Wiring Installations
IS: 5082/1998	Wrought aluminum and aluminum alloy bars, rods, tubesand sections for electrical purposes
IS: 6005/1998	Code of practice for phospating iron and steel
IS: 5/2004	Colour for ready mixed paints and enamel
IS: 8588(Part-1/ 1977	Thermostatic bimetals: General requirements and methods of Tests

4.00 PRINCIPLE TECHNICAL PARAMETERS:

Rated Supply Voltage : 3 phase, 440 V, 50Hz
Rated Current : 800A, 1000A,1250 A (as per requirement) Insulation level: 1100V AC 50 Hz Continuous
: 2.5 kV for 1 Min

: 2000 V DC

Rated short circuit Current :80KA
Temperature rise : Shall not exceed delivery operating temperature of components conforming to relevant standards limited to 30° C above ambient.

5.00 GENERAL TECHNICAL PARAMETERS:

5.1) CUBICLE

5.1.1 The cubicle of LT feeder pillars shall be made out of either 10 SWG (3.25 mm thick) cold rolled M.S sheet steel, plates and shaped sections. All panel edges and door edges shall be reinforced against distortion by rolling, bending etc. The complete cubical shall be rigid self supporting and free standing. The enclosure shall comply with the requirement of IP- 43 type as per the IS – 13947 or the latest version thereof. The enclosure shall be anti corrosive, dust proof, rust proof, vermin and water proof, ultra violet stabilized and flame retardant property.

5.1.2 The LT feeder pillars shall have front and rear compartments. Front compartment shall be suitable for HRC fuses and the rear for cable terminations. Asbestos sheet of at least 6 mm thick shall be provided for separation between front & rear compartments; between ACB & Meter compartment; between R-Y-B HRC fuse compartments.
L.T. Feeder pillar shall have Air Circuit Breaker of rating 800/1000/1250 Amp on incoming circuit as per the actual requirement and HRC fuse base with links of 630/400A on outgoing circuits as perthe requirement with necessary interconnecting Bus Bars/ Links etc.

5.1.3 The cubicles shall have center lift up type slanting roof rain hood made up of 10 SWG MS sheets. The depth and width of the rain hood shall be at least 120% of the depth and width of the pillars. The doors shall not be detachable after fixing the rain hood.

5.1.4 The base and doors of cubicle shall be individually in one piece except for fixing of the accessories like hinges, clamps, mounting clamps, bolts etc. The Average minimum thickness of the MS sheet for cubicle and door shall be 10 SWG for MS sheet for 6way/8way Pillar. Base and doors shall have flange / collarsas shown in drawing. Collar of Base and doors shall overlap by 10mm.

5.1.5 Standard General Arrangement of Air Circuit Breaker, HRC fuse base with links, Link Disconnector, Bus Bars, connecting links, Cabletermination arrangement etc. inside the L.T. pillars shall be as per the drawings attached with the specification for various types of L. T. Feeder

pillars. The clearances & creepage distances shall be in accordance with IS: 13947(Part 1) / 1993. Air Circuit breaker's operating handle shall be accessible only after opening of the doors.

5.1.6 The general overall dimensions of L.T. feeder pillars shall be as in the table below. The enclosure shall have doors from front & back side. The complete cubical shall be rigid self supporting and freestanding.

The dimensions mentioned below are overall dimensions without rain hood. However, Compact size with adequate clearances as per I. E. Rules 1956/IS: 13947 (Part 1) / 1993 is also acceptable.

Width	1400 mm for 6 Way and 1930 mm for 8 way
Depth	650 mm
Height	1850 mm

The supplier shall submit their own drawing for approval of the competent authority before manufacturing.

5.1.7 Suitable no. of hinges as mentioned below shall be fitted from inside of the box to fix the doors. Hinges shall be 50 mm in length and made from 2mm thick M. S. sheet. Hinge pin diameter shall be minimum 4mm. Doors shall be fixed with three screws in each hinge.The hinges shall not be visible from outside. On closing of doors, right door shall rest on the left door. Hinges shall be of such constructionthat the doors shall be swung open by not less than 150o. The details of doors & hinges to be provided shall be as mentioned below:

Front Door-3 no., Back Door-3 no., Hinges/door-3

5.1.8 The doors shall be centrally closed with "Godrej" type tripleposition locking arrangement and shall be operational with a common handle from outside the door. Movement of handle will lock the doors at center, top & bottom. A Nylon washer shall be provided between the handle and door to avoid penetration of water. One central lock with brass levers shall be provided inside the door. Key way with suitable cover shall be provided on the door for operating the lock from outside.Two keys shall be supplied for each pillar. In addition cleat arrangement shall be provided for putting two nos. of padlocks for each size of doors.

5.1.9 Four Louvers (two on each side) shall be provided to L.T. feeder

pillars. Louvers with stainless steel wire mesh with shall be provided on both sides of the feeder pillars and at the top and bottom of both sidesof L.T. pillars. Mounting of components inside the enclosure shall allow free air circulation keeping the clearances as per specification.

5.1.10 The cubicles shall be provided with pedestal arrangement having suitable no. of bottom holes for grouting bolts at all four corners & atthe middle as per requirement.. The pedestal shall be covered from all sides with 10 SWG M.S.sheets.

5.1.11 Suitable no. of detachable gland plates made up of 10 SWG MS sheets shall be provided in the cubicle at the bottom.Gland plate shall be provided with suitable size cable gland & with four screws for fixing the plate from inside. Size & no. of the glands to be provided will be intimated to the successful tenderer along with approval of drawings.

Fuse base shall be mounted on MS channel of size 60 x 20x 3.15 mm thick. All Nuts & Bolts in electrical circuit shall be of non- magnetic stainless steel.

5.1.12 A bayonet lamp holder complying with IS: 1258/1987 with a tumbler switch complying with IS: 3854/1988, a three pin plug & socket complying with IS: 1293/1988 with necessary fuses & wiringshall be provided inside the pillar on the front bottom portion of the shade near the neutral bus bar.

5.1.13 Rigid stand shall be made from M.S. angle or FRP Pultrudedsections as per IS: 6146. Horizontal and vertical members of the cubicle shall be of size 50 x 50 x 6 mm.

5.1.14 Two galvanized earthing Bolts of M12 X 50 mm size shall be welded from inside and projecting outside of the box. Two Nuts with washers shall be provided on each bolt.

5.1.15 Enameled name plate of the supplier, type of pillar and M.S.E.D.C.L. Tender Number & date shall be displayed on front door.

5.1.16 Enameled Danger Board with "DANGER 440 VOLTS" mark shall be displayed on the left hand side of front and back doors as per IS2551.

5.1.17 Toughened glass window with rubber gasket of 175 mm X 90 mm size should be provided on main door of cubicle in such a way tosee meter readings.

5.2) AIR CIRCUIT BREAKERS

5.2.1 Air Circuit Breakers of the following rating & technical specifications shall be provided for the Incomer of L.T. Feeder pillars with ACB, with split Bus bar type & with split with ACB as per the actual requirement.

5.2.2 ACB shall be of 440V, 50 HZ, 800/1000/1250 A (as per actual requirement) with short time current rating of 50KA for 1 sec. Air Circuit Breaker shall conform to IS: 13947 part - 2 of 1993 with latest amendments. Other technical details shall be as below:

Sr. No.	Particulars	Requirements
1	Rated operational voltage (V) at 50 Hz	440V
2	Rated frequency (Hz)	50
3	Current rating Amps (rms)	800/1000/1250 A
4	Rated insulation voltage (V) at50 Hz	1000
5	Number of poles	3
6	Mounting arrangement	Fixed type frontmounting
7	Rated impulse withstandvoltage(kV)	12 KV
8	Rated Ultimate Short circuit breaking capacity at 415 V, 50 Hz (kA rms) Icu	50
9	Rated Service Short circuit breaking capacity at 415 V,50 Hz (kA rms), Ics	50
10	Rated short circuit making capacity at 50Hz (kA peak), expressed as multiples of Icu	2.1
11	Rated short time withstand current for1 sec at 50 Hz (kA rms), Icw, expressed aspercentage of Icu	50 KA
12	Line-load reversibility	Required
13	Category of utilization	B
14	Shutters on 'Trip' & 'Close' push button with sealing facility	Required
15	Accessory mounting	Accessories shall be front accessible plug in type. Accessories namely motor shunt trip & closing coil, UVT

		etc. should be common for the entire range & shall be suitable for both AC & DC voltages.
16	Operating mechanism	Spring charging stored energy type, Manual & Automatic.
17	Mechanical life (Operating cycles)	20000
18	Electrical life (Operating cycles)per set of arcing contacts	5000
19	Indications	Breaker shall have following mechanical indications: 1. ON, 2. OFF, 3. TRIP 4.SPRING CHARGE STATUS
20	Sensing	True RMS based
21	Type	Microprocessor based
22	Control Terminal	Control Terminal should be front accessible & minimum 25 pairs of contacts shall be available. Minimum ten Auxiliary NO / NC contacts shall be provided for electrical interlocking between ACBs.
23	Working temperature	Suitable for operation at 50ºC
24	Protection required	Following protections with selective ranges required.
24a	Overload	Pick – up: 0.4 to 1.0 Time delay : 0.2 to 40 sec.
24b	Short Circuit	Pick – up: 2 to 10 Time delay: 20 to 400 msec
24c	Instantaneous over current	Pick – up: 4 to 16 & OFF
24d	Earth fault	Pick – up: 0.2 to 0.6 & OFF Time delay: 100 to 400 msec
25	Metering Required	Provision for following measurement functions shall be made on the ACB i) 3 phase current

		ii) 3 phase voltage iii) KWH iv) KVAH v) Power Factor vi) Max. demand(KVA) vii) Fault History of Minimum 50events
26	Indication	Release shall give individual indication for each type of fault.
27	Power	Release shall be self powered& independent of incoming supply.
28	Safety	Local controls shall besecured by padlocking arrangement

For Air Circuit Breakers used for Bus coupler /split bus bar purpose, metering is not required to be provided as per requirement at sr. no. 25of the above table.

5.3) <u>BUS BARS:</u>

5.3.1 The bus bars shall be made up of electrolytic grade aluminum confirming to grade 63401 WP of IS:5082.

5.3.2 The bus bars shall be with PVC sleeves of Colour Red, Yellow ,Blue and black for top ,middle and Bottom and below bottom(neutral) busbar respectively Or painted with non deteriorating type Epoxy paint for full length as below:
Red colour for top busbar. Yellow colour for middle bus bar,Blue colour for bottom bus bar,
Black colour for neutral bus bar below bottom bus bar

5.3.3 Size of the bus bar For R,Y&B phase shall be 60 x 10 mm and for Neutral it shall be 50 x 6 mm.

5.3.4 Electrolytic grade aluminum twin flat cable terminals (Z Patti) shall be provided in staggered formation for connecting cable cores foreach phase from rear side in all. L. T. pillars (except mini pillar). The arrangement shall be suitable for taking Load current reading withclip on type of meter. Insulated horizontal Bakelite bar of at least 50 x 12 mm shall be provided to support and take care of weight of cables, jointing etc.

5.3.5 Neutral bus bar shall have one terminal for each circuit way and shall be provided with two nickel plated, nuts, bolts, spring washers and plain washers at each end for earthing. Cross sectional area of neutral bus bas shall be at least 50% of cross sectional area of phase bus bar.

5.3.6 Suitable insulated phase barriers of at least 6 mm thick asbestos cement sheet shall be provided between front and rear compartment, between adjacent set of phase and neutral bus bars and between doors and bus bars with firm fixing arrangements.

5.3.7 The current rating – current carrying parts shall not generally exceed the limits those given in Clause No.5.4.7 Higher current rating adopted if any in special cases shall be subject to successful temperature rise tests carried out in reputed laboratories.

5.3.8 Minimum clearances, wherever shown, shall be as per General Arrangement Indicative Drawing enclosed with this specification. Other clearances shall be as per requirement of IS: 4237/1982 amended up to date.

5.3.9 There should be provision to insert Ring type CTs of required ratiointo the bus bars. Ratios are 200/5, 300/5A, 500/5A, 1000/5A for 100/200/315/630 kVA distribution transformer respectively. The feeder pillar manufacturers shall provide ring CTs of appropriate capacitiesonly. It shall be part of the feeder pillar. Ring CTs have to be procured from MITL/MSEDCL's approved vendor. Feeder pillar manufacturers should provide the required wires for CT connections of standard size & colour.

5.4) FUSE BASE ASSEMBLY:

5.4.1 The Fuse bases shall be suitable for HRC fuse links and strips. All fuse bases shall be identical and interchangeable irrespective of whether they are provided in incoming or outgoing circuits and shall be capable to carry rated normal current without exceeding safe temperature as per relevant standard duly tested at Lab like CPRI,ERDA etc.

5.4.2 The base of the HRC Fuse shall be of non-tracking, heat resistant insulating porcelain material of superior electrical and mechanical properties equivalent to Dough Molding Compound (DMC). The Fuse Base shall be sturdy in construction. The insulation shall not get affected due to dust, moisture etc, at wide fluctuation in temperature. The holes for fasteners shall be plugged by insulating filling compound which shall not drain at operating temperature in service.

5.4.3 The contacts shall be made up of electrolytic grade copper alloy with corrugated terminal pad and spring action to yield high contact pressure. G. I. spring ring shall be made out of at least 6 mm dia. spring

steel round. The spring action shall not get affected by operations and variations in operating temperatures in service.

5.4.4 Thermostatic bimetal device shall be provided between terminal pad and bus bars and between terminal pad and cable terminals(Z Patti) to prevent bimetallic deterioration.

5.4.5 HRC Fuse Base should withstand the breaking capacity of thefuse link of 80kA.

5.4.6 The complete assembly shall be so fixed and secured that there shall be no turn, fall out displacement and vibration of any part during inserting and removal of fuses/Links. Load current reading, cable end connection etc

5.4.7 The current rating adopted shall generally not exceed the following limits. Higher current density adopted if any in special corrugated and other shapes shall be subject to successful temperaturerise tests carried out in reputed laboratory.

Size of sectionmm x mm	Maximum current in Amps	
	Single Section	Double Section
30 x 3	205	385
30 x 5	270	500
40 x 3	280	500
40 x 5	350	650
40 x 10	515	975
50 x 5	425	780
50 x 10	625	1150
60 x 5	500	900
60 x 10	730	1330
80 x 5	680	1170
80 x 10	940	1700

5.5)FUSE LINKS:

The HRC Fuse Links shall be sturdy in construction of "Din Type". Corrugated fuse links shall be made out of electrolytic grade copper flat of at least 4 mm thick and shall be capable of carrying the rated current of the fuse base and shall be suitable for inserting and pulling out by insulated fuse pulling handle. Breaking capacity shall be 80 kA. For fault indication red pop up indicator should come out instantly on fusing. Manufacturer's name, current rating, breaking capacity and type shall be marked on HRC fuse link.

The successful bidder shall submit the complete type test reports as per specification for approval of MITL before commencement of supply.

5.6)PAINTING:

5.6.1 The M.S. cubicles shall be provided with anti corrosive high quality post office red colour paint conforming to shade No 538 of IS.5 from inside and outside to withstand the corrosive and humid atmosphere.

5.6.2 For M.S. Cubicle, all interiors and exteriors of the cubicle shall be degreased in 5% solution at 75°C for 15 minutes. They shall then be washed in hot water bath at 65°C to remove all rust, scale corrosion, grease and other adhering foreign matter and shall be rinsed in cold running water.

5.6.3 M.S. cubicles shall then be pickled in 25% hot sulpheric acid at 65°C for 5 minutes. Care shall be taken to avoid over pickling by addition of adequate quantities of inhibitor and avoid loss of tensile strength. The cubicle shall then be rinsed in cold running water and put in alkaline solution at 65°C for 1 to 2 minutes. The cubicle shall then be immersed in cold water (still agitated) to remove all traces of alkali and untreated salt. The cubicle shall then be dipped in deoxidize chamber to ensure complete removal of moisture.

5.6.4 Corrokill rust converter conforming to IS 13515 shall be preferably applied as primer. The cubicle stoved at 150°C for 10 to 12minutes. It shall then be cooled, filled with putty to get smooth and flawless surface. Enameled paint shall then be sprayed and towed at 150°C for about 12 minutes.

6.00 TESTS:

6.1) TYPE TESTS:

6.1.1 Type test reports as per cl.no.8.1.1 of IS: 5039/1983 shall be submitted along with the offer for the type and rating of circuit breakers offered, Type test reports shall be from any NABL approved laboratorysuch as M/s CPRI, ERDA. Type tests carried out prior to five years of the date of opening of the tender are not valid.

Following Type Test Reports shall be submitted for approval.

(a)ON COMPLETE L. T.PILLER:

Type tests as per IS:5039/1983 shall be carried out on complete L.T. feeder pillars .

1. Verification of temperature rise limits (As per Cl.8.2)

2. Verification of Dielectric Properties (As per Cl.8.3)

3. Verification of short circuit strength (As per Cl.8.4)

4. Verification of clearance &creepage distances (As per Cl.8.5)

5. Verification of Degree of protection for IP- 43 (As per Cl.8.6)

(b) ON AIR CIRCUIT BREAKER:

All type tests as per IS: 13947/1993 (Part II amended up to date) shall be carried out on Air Circuit Breakers

(c) ON HRC FUSES BASE AND HRC FUSE LINKS:

All type tests on HRC fuses and HRC fuse links shall be carried out asper IS:13703/of 1993 (Part I & II amended up to date) for HRC Fuse Base and HRC fuse link.

6.2) ROUTIN TESTS:

It should be carried out on all boxes on complete L.T. Feeder Pillar.In case of bought out items, routine and acceptance tests as per relevant IS and this specification shall be carried out at the original manufacturers' works.

1. Overall Dimensions Checking.
2. Insulation Resistance Tests.
3. High Voltage Test at 2500 V, 50 Hz AC for one minute.
4. Operation Test HRC fuse base and fuse links.

7.00 TEST CERTIFICATE:

The L.T. Pillar enclosure, Air Circuit Breakers, HRC fuse, HRC Fuse Link etc. offered shall be fully type tested as per relevant IS and this specification. The successful Bidder shall furnish detailed type test reports before commencement of supply. The detailed Type Test Reportsshall be furnished with relevant oscillogram and certified Drawings of the equipment tested. The purchaser reserves the right to demand repetition of some or all the Type Tests in presence of purchaser's representative at purchaser's cost.

All the type tests shall be carried out from laboratories which are accredited by the National Board of Testing and Calibration Laboratories(NABL) of Government of India such as CPRI Bangalore/Bhopal, ERDA Baroda to prove that the complete L.T. Pillar, meet the requirements of the specification.

Following test certificates and documents shall be furnished at the timeof inspection.

a) Chemical analysis certificate and documents showing genuine source of procurement of electrolytic grade conductivity Aluminum Sections.
b) Document showing genuine source of procurement of steel sheet and sections.
c) Certificate of temperature rise test.
d) Certificate of painting with degreasing, pickling phosphate, and painting and oven treatment by seven tank oven process in respect of M.S. Cubicles.

The supplier shall conduct voltage withstand test and operations testsat the time of inspection.

8.00 INSPECTION:

9.1 All routine & acceptance tests and inspection of material shall be carried out at the place of manufacturer. The manufacturer shall offer the Inspector (representing the purchaser) all reasonable facilities, free of charge at the time of Inspection

9.2 The supplier shall offer inspection of the material at his works before dispatch. If required the supplier shall also offer inspection of manufacturing painting and assembly processes and quality control system. If any material is not found in line with relevant specification the supplier shall carry out the modification and offer for re-inspection.

9.3 Inspection and acceptance shall not absolve the supplier of his responsibility to supply the material in accordance with the specifications. The purchaser reserves the right to reject the material not confirming the relevant specifications.

9.00 DRAWINGS AND DOCUMENTATION:

10.1 The successful bidder shall submit set of all drawings of the L.T. Pillar and its components in triplicate to General Manager (P-E), MITL office and getthe same approved before commencement of supply.

10.2 Following indicative drawings are enclosed herewith.

Outdoor Type 6 Way feeder pillar with HRC & bus sectionalizer configuration (No ACB).

10.3 The tenderer shall furnish all details and clarifications required if any for scrutiny and evaluation of the offer.

10.4 Manufacture of material to be supplied shall be done strictly as per approved drawing.

10.5 Approval of drawing shall not absolve the supplier of his liability for ensuring correctness according to applicable standards &regulations.

10.6 The Bidder/Supplier shall fill-in the following schedules which formpart of the specification if any schedule is not filled or incompletely filled the offer is liable to be treated as incomplete and rejected.

Schedule-A: Guaranteed technical particulars

Schedule-C: Bidder's/Supplier's Experience

****

SCHEDULE – A

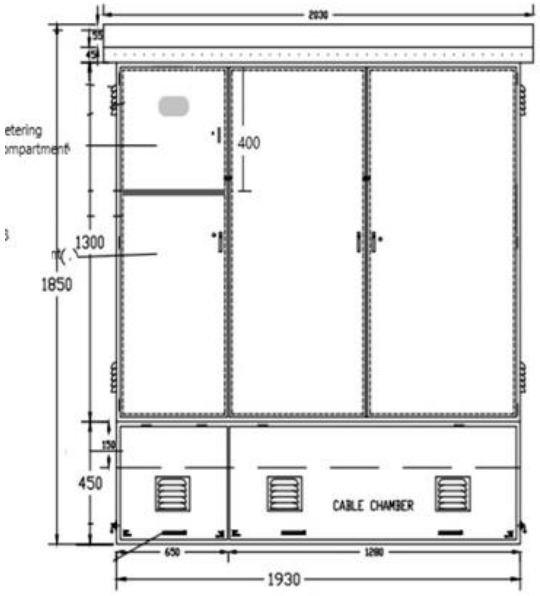
GUARANTEED TECHNICAL PATRICULARS (GTP) OF L. T. FEEDER PILLER.

Sr. No.	Parameter Name	Parameter type
1	Name or Trademark of Manufacturer.	Text
2	Type of L.T. Pillar	Text
3	Rated normal voltage	Text
4	Material of construction of L. T. Pillar enclosure & doors	Text
5	Thickness of SMC sheet / M.S.sheet for enclosure	Text
6	Thickness of SMC/MS sheet for doors	Text
7	Colour of the L. T. Pillar enclosure	Text
8	Dimensions of cubicle without rain hood – Width x Depth x Height (in mm)	Text
9	Dimensions of rain hood – Width x Depth x Height of center lift (in mm)	Text
11	Hinges	
11(a)	Hinges : Type	Text
11(b)	Hinges : Length (50mm)	Text
11(c)	Hinges : Thickness of material	Text
11(d)	Hinges : pin Diameter	Text
11(e)	Number of hinges per door	Text
12	Type of locking arrangements	Text
13	Number of padlocking arrangements	Text
14	Number and size of ventilating louvers with wire mesh	Text
15	Details of painting	Text
16	Dimensions and details of asbestos sheets	Text
17	Dimensions and details of bakelite sheets	Text
18	Dimensions and details of gland plates	Text
19	Bus Bar, Fuse Base & Fuse Link	
19(a)	Size of bus bar	Text
19(b)	Size of neutral bus bar	Text
19(c)	Grade and specification of material of Bus bars	Text
19(d)	Rated normal current of Bus bars	Text
19(e)	Rated safe temperature of Bus bars	Text
19(f)	Make & Type of Fuse base assembly	Text
19(g)	Grade and specification of material of Fuse base contacts	Text
19(h)	Thickness and dimensions of contacts of fuse base	Text
19(i)	Rated normal current of Fuse base	Text
19 (j)	Rated safe temperature of Fuse base	Text
19(k)	Grade and specification of material of Fuse links	Text
19(l)	Make & Type of Fuse link	Text
19m	Rated normal current of Fuse link	Text
19(n)	Rated safe temperature of Fuse link	Text
19(o)	Grade and specification of material of spring steel round	Text
19(p)	Dimensions of spring steel round	Text
20.	Make & Type of bimetallic lugs	Text
21.	One Minute P. F. withstand voltage	Text
22	Rated short time current	Text
23	Rated temperature rise	Text

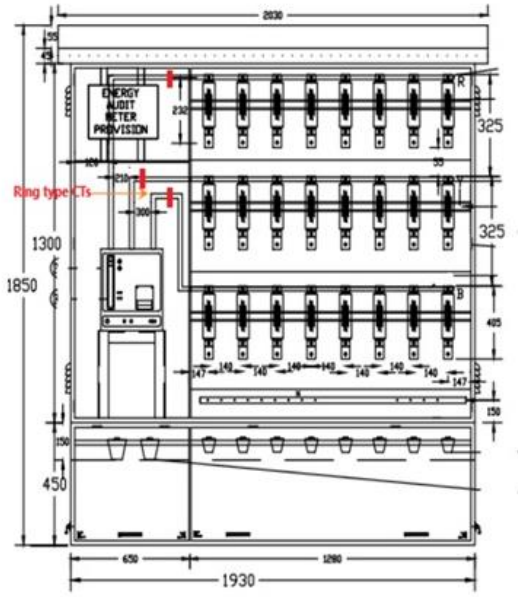
24	Size & Thickness of Bakelite sheets provided	Text
25	Air Circuit Breaker	
25(a)	Make & Type	Text
25(b)	Rated Voltage (440V)	Text
25(c)	Rated Current (800/1000/1200 Amps as per requirement)	Text
25(d)	Rated Frequency (Hz)	Numeric
25(e)	Whether facilities as per table in cl.no.5.6 are included in ACB offered	Boolean
25(f)	Whether Type test reports for ACB & other components are submitted Separately	Text
26	List of test conducted on similar equipment's	Text
27	List of copies of test certificate enclosed	Text
28	Any other details	Text

INDICATIVE DRAWING

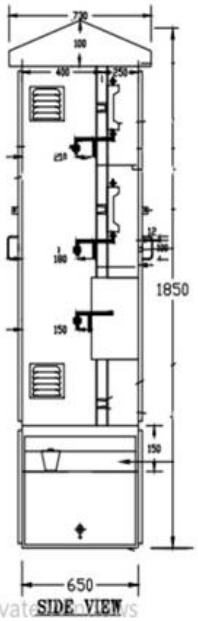
Drawing for 6way LT Feeder Piller with provision of meter & ACB



ELEVATION



ELEVATION



SIDE VIEW

Activate Windows

TECHNICAL SPECIFICATION

MINI PILLER 4 WAY

1.00 SCOPE

This specification covers design, manufacture, testing, inspection at manufacturer's works, packing and supply of LT Feeder Pillars madeout of either Complete enclosure of Mild Steel.The system shall be A.C. 3 phase, 4 wire, 433 V, 50 Hz with effectively grounded neutral. L.T. feeder pillars shall be 4Way with & without ACB, 2 Way, 3 Way L.T. feeder pillars and mini pillars at MITL sites in Maharashtra state.

It is not the intent to specify herein complete details of design and construction. The equipment offered shall conform to relevant standard and high quality and workmanship capable to perform continuous and satisfactory operations in the actual service conditions at site. Bidder shall have proven experience of 3 years of manufacturing of similarproducts and supplying to electrical utilities.

2.00 SERVICE CONDITIONS:

The feeder pillar to be supplied against this specification shall be suitable for satisfactory continuous operation under the following environmental conditions:

a) Maximum ambient temperature	55^0C
b) Maximum ambient temperature in shade	45^0C
c) Minimum temperature of air in shade	35^0C
d) Maximum daily average temperature	40^0C
e) Maximum yearly weighted average temperature	32^0C
f) Relative Humidity	10 to 95 %
g) Maximum Annual rainfall	1450 mm
h) Maximum wind pressure	150 kg/m^2
i) Maximum altitude above mean sea level	1000 meter
j) Isoceraunic level	50 days/year
k) Seismic level (Horizontal acceleration)	0.3 g

l) Climate: Moderately hot and humid tropical climate conducive torust and fungus growth.

3.00 STANDARDS (to which feeder pillar shall comply)**:**

IS: 5039/1983	Distribution pillars for voltage not exceeding 1000 V
IS:14772/2000	General Requirements for Enclosures for Accessories for Household and Similar Fixed Electrical Installations – Specification
IS:13947/1993 (Part 1)&(Part 2)	Specification for Low-voltage Switchgear and Controlgear –Part 1 : General Rules& Annex 'C' for Degrees of Protection provided by enclosures of electrical Equipments.
	Part 2 : Circuit Breakers
IS: 13703/1993	Low voltage Fuses (part 1,Part 2 sec1, Part 2 sec 2 & Part 4)
IS/IEC 127-2 : 1989	Miniature Fuses - Part 2 : Cartridge Fuse Links – Specification
IS/IEC 127-6 :1994	Miniature Fuses - Part 6 : Fuse Holders for MiniatureCartridge Fuse Links - Specification
IS:8623/1993 (Part 1,2 &3)	Specification for Low-Voltage Switchgear and Control gear Assemblies for general requirement of L.T. Switchgears
IS: 4237/1982	General arrangement for switch gear and control Gear for voltage not exceeding 1000 V with enclosure Box
IS: 732/1989	Code of Practice for Electrical Wiring Installations
IS: 5082/1998	Wrought aluminum and aluminum alloy bars, rods, tubes and sections for electrical purposes
IS: 6005/1998	Code of practice for phospating iron and steel
IS: 5/2004	Colour for ready mixed paints and enamel
IS: 8588(Part-1/ 1977	Thermostatic bimetals: General requirements and methods of Tests

4.00 PRINCIPLE TECHNICAL PARAMETERS:

Rated Supply Voltage : 3 phase, 440 V, 50Hz
Rated Current :600A, 800A, (as per requirement)
Insulation level : 1100V AC 50 Hz Continuous
: 2.5 kV for 1 Min
: 2000 V DC

Rated short circuit
Current :80KA
Temperature rise : Shall not exceed delivery operating temperature of components conforming to relevant standards limited to 30° C above ambient.

5.00 GENERAL TECHNICAL PARAMETERS:

5.1) CUBICLE

5.1.1 The cubicle of LT feeder pillars shall be made out of either10 SWG (3.25 mm thick) cold rolled M.S sheet steel, plates and shaped sections. All panel edges and door edges shall be reinforced against distortion by rolling, bending etc. The complete cubical shall be rigid self-supporting and free standing. The enclosure shall comply with the requirement of IP- 43 type as per the IS – 13947 or the latest version thereof. The enclosure shall be anti corrosive, dust proof, rust proof, vermin and water proof, ultra violet stabilized and flame retardant property.

5.1.2 The LT feeder pillars shall have front and rear compartments. Front compartment shall be suitable for HRC fuses and the rear for cable terminations. Asbestos sheet of at least 6 mm thick shall be provided for separation between front & rear compartments; between ACB & HRC fuse compartment; between R-Y-B HRC fusecompartments.
L.T. 4 way feeder pillar shall have Air Circuit Breaker or HRC fuse base with links of 630A on incoming circuit as per the requirement and HRCfuse base with links of 400A on outgoing circuits as per the requirement with necessary interconnecting Bus Bars/ Links etc.

5.1.3 The cubicles shall have center lift up type slanting roof rain hood made up of 10 SWG MS sheets. The depth and width of the rain hood shall be at least 120% of the depth and width of the pillars. The doors shall not be detachable after fixing the rainhood.

5.1.4 The base and doors of cubicle shall be individually in one piece except for fixing of the accessories like hinges, clamps, mounting clamps, bolts etc. The Average minimum thickness of the MS sheet for cubicle and door shall be 10 SWG respectively for the Mini Pillar, 2 Way, 3 Way Feeder Pillar 10 SWG MS sheet for 4 Way (with and without ACB) Feeder Pillar.Base and doors shall have flange / collars as shown in drawing. Collar of Base and doors shall overlap by 10mm.

5.1.5 Standard General Arrangement of Air Circuit Breaker, HRC fuse base with links, Link Disconnector, Bus Bars, connecting links, Cabletermination arrangement etc. inside the L.T. pillars shall be as per the drawings attached with the specification for various types of L. T. Feederpillars. The clearances & creepage distances shall be in accordance with IS: 13947(Part 1) / 1993. Air Circuit breaker's operating handle shall be accessible only after opening of the doors.

5.1.6 The general overall dimensions of L.T. feeder pillars shall be as in the table below. The enclosure shall have doors from front & back side. The complete cubical shall be rigid self supporting and freestanding.

The dimensions mentioned below are overall dimensions without rain hood. However, Compact size with adequate clearances as per I. E. Rules 1956/IS: 13947 (Part 1) / 1993 is also acceptable.

Dimension	Mini pillar with fuse	L. T. Pillar without ACB		L. T. Pillar with ACB
		2/3way	4 way	4way
Width	750	500	800	1550
Depth	400	500	500	850
Height	1400	1750	1750	1750

The supplier shall submit their own drawing for approval of the competent authority before manufacturing.

5.1.7 Suitable no. of hinges as mentioned below shall be fitted from inside of the box to fix the doors. Hinges shall be 50 mm in length and made from 2 mm thick M. S. sheet. Hinge pin diameter shall be minimum 4 mm. Doors shall be fixed with three screws in each hinge. The hinges shall not be visible from outside. On closing of doors, right door shall rest on the left door. Hinges shall be of such constructionthat the doors shall be swung open by not less than 150 degree. The details of doors & hinges to be provided shall be as mentioned below:

Particulars	L. T. Pillar without ACB			4 way with ACB
	Mini pillar with fuse	2/3 way	4 way	
Front Door	1	1	2	3
Back Door	1	1	2	3
Hinges/door	2	3	3	3

5.1.8 For Mini pillar locking device with flap cover on front and back door (2 no's each) should be provided. For 2/3/ 4 way feeder pillars the doors shall be centrally closed with "Godrej" type triple position locking arrangement and shall be operational with a common handle fromoutside the door. Movement of handle will lock the doors at center, top& bottom. A Nylon washer shall be provided between the handle and door to avoid penetration of water. One central lock with brass levers shall be provided inside the door. Key way with suitable cover shall be provided on the door for operating the lock from outside. Two keys shallbe supplied for each pillar. In addition cleat arrangement shall be provided for putting two nos. of padlocks for each size of doors.

5.1.9 Four Louvers (two on each side) shall be provided to L.T. feeder pillars. Louvers with stainless steel wire mesh with shall be provided on both sides of the feeder pillars and at the top and bottom of both sidesof L.T. pillars. Mounting of components inside the enclosure shall allow free air circulation keeping the clearances as per specification.

5.1.10 The cubicles shall be provided with pedestal arrangement having suitable no. of bottom holes for grouting bolts at all four corners & atthe middle as per requirement.. The pedestal shall be covered from all sides with 10 SWG M.S.sheets.

5.1.11 Suitable no. of detachable gland plates made up of 10 SWG MS sheets material shall be provided in the cubicle at the bottom.Gland plate shall be provided with suitable size cable gland & with four screws for fixing the plate from inside. Size & no. of the glands to be provided will be intimated to the successful tenderer along with approval of drawings.

Fuse base shall be mounted on MS base channel of size 60 x 20x 3.15 mm thick. All Nuts & Bolts in electrical circuit shall be of non- magnetic stainless steel.

5.1.12 A bayonet lamp holder complying with IS: 1258/1987 with a tumbler switch complying with IS: 3854/1988, a three pin plug & socket complying with IS: 1293/1988 with necessary fuses & wiringshall be provided inside the pillar on the front bottom portion of the shade near the neutral busbar.

5.1.13 Rigid stand shall be made from M.S. angle as per IS: 6146. The size of the angle shall be of size 50 x50 x6 mm.

5.1.14 Two galvanized earthing Bolts of M12 X 50 mm size shall be welded from inside and projecting outside of the box. Two Nuts with washers shall be provided on each bolt.

5.1.15 Enameled name plate of the supplier, type of pillar and M.I.T.L. Tender Number & date shall be displayed on front door.

5.1.16 Enameled Danger Board with "DANGER 440 VOLTS" mark shall be displayed on the left hand side of front and back doors as per IS2551.

5.2) AIR CIRCUIT BREAKERS

5.2.1 Air Circuit Breakers of the following rating & technicalspecifications shall be provided for the Incomer of L.T. Feeder pillars with ACB, as per the actual requirement.

5.2.2 ACB shall be of 440V, 50 HZ, 600/800 A (as per actual requirement) with short time current rating of 50KA for 1 sec. AirCircuit Breaker shall conform to IS: 13947 part - 2 of 1993 with latest amendments. Other technical details shall be as below:

Sr. No.	Particulars	Requirements
1	Rated operational voltage (V) at 50 Hz	440V
2	Rated frequency (Hz)	50
3	Current rating Amps (rms)	600/800 A
4	Rated insulation voltage (V) at 50Hz	1000
5	Number of poles	3
6	Mounting arrangement	Fixed type frontmounting
7	Rated impulse withstandvoltage(kV)	12 KV
8	Rated Ultimate Short circuit breaking capacity at 415 V, 50 Hz(kArms) Icu	50
9	Rated Service Short circuit breaking capacity at 415 V,50 Hz (kA rms), Ics	50
10	Rated short circuit making capacity at 50Hz(kA peak), expressed as multiples of Icu	2.1

11	Rated short time withstand current for1 sec at 50 Hz (kA rms), Icw, expressed aspercentage of Icu	50 KA
12	Line-load reversibility	Required
13	Category of utilization	B
14	Shutters on 'Trip' & 'Close' push button with sealing facility	Required
15	Accessory mounting	Accessories shall be front accessible plug in type. Accessories namely motor shunt trip & closing coil, UVT etc. should be common for the entire range & shall be suitable for both AC & DC voltages.
16	Operating mechanism	Spring charging stored energy type, Manual &Automatic.
17	Mechanical life (Operating cycles)	20000
18	Electrical life (Operating cycles) per set of arcing contacts	5000
19	Indications	Breaker shall have following mechanical indications: 1. ON, 2. OFF, 3. TRIP 4.SPRING CHARGE STATUS
20	Sensing	True RMS based
21	Type	Microprocessor based
22	Control Terminal	Control Terminal should be front accessible & minimum 25 pairs of contacts shall be available. Minimum ten Auxiliary NO / NC contacts shall be provided for electrical interlocking between ACBs.
23	Working temperature	Suitable for operation at 50ºC
24	Protection required	Following protections with

		selective ranges required.
24a	Overload	Pick – up: 0.4 to 1.0 Time delay : 0.2 to 40 sec.
24b	Short Circuit	Pick – up: 2 to 10 Timedelay: 20 to 400 msec
24c	Instantaneous over current	Pick – up: 4 to 16 & OFF
24d	Earth fault	Pick – up: 0.2 to 0.6 & OFF Time delay: 100 to 400 msec
25	Metering Required	Provision for following measurement functions shall be made on the ACB i) 3 phase current ii) 3 phase voltage iii) KWH iv) KVAH v) Power Factor vi) Max. demand(KVA) vii) Fault History of Minimum 50events
26	Indication	Release shall give individual indication for each type of fault.
27	Power	Release shall be self powered& independent of incoming supply.
28	Safety	Local controls shall besecured by padlockingarrangement

5.3) <u>BUS BARS:</u>

5.3.1 The bus bars shall be made up of electrolytic grade aluminum confirming to grade 63401 WP of IS: 5082.

5.3.2 The bus bars shall be with PVC Sleeves or painted with non deteriorating type Epoxy paint for full length with colour code as below:Red colour for top busbar.

Yellow colour for middle bus bar

Blue colour for bottom bus bar,

Black colour for neutral bus bar below bottom bus bar

5.3.3 Size of the bus bar For R,Y & B phase shall be as tabulated below.

Type of Bus bar	Mini pillar with fuse	L. T. pillars without ACB		L. T. Pillar with ACB
		2/3way	4 way	4way
For R,Y& B phase	50 x 6 mm	60 x10 Mm	60x10 mm	60 x10 mm
For Neutral	50 x 6 mm	40 x 6 Mm	50 x 6 mm	50 x 6 mm

5.3.4 Electrolytic grade aluminum twin flat cable terminals (Z Patti) shall be provided in staggered formation for connecting cable cores foreach phase from rear side in all. L. T. pillars (except mini pillar). The arrangement shall be suitable for taking Load current reading with clipon type of meter. Insulated horizontal Bakelite bar of at least 50 x 12mm shall be provided to support and take care of weight of cables, jointing etc.

5.3.5 Neutral bus bar shall have one terminal for each circuit way and shall be provided with two nickel plated, nuts, bolts, spring washers and plain washers at each end for earthing. Cross sectional area of neutral bus bas shall be at least 50% of cross sectional area of phase bus bar.

5.3.6 Suitable insulated phase barriers of at least 6 mm thick asbestos cement sheet shall be provided between front and rear compartment, between adjacent set of phase and neutral bus bars and between doors and bus bars with firm fixing arrangements.

5.3.7 The current rating – current carrying parts shall not generally exceed the limits those given in Clause No.5.4.7 Higher current rating adopted if any in special cases shall be subject to successful temperature rise tests carried out in reputed laboratories.

5.3.8 Minimum clearances, wherever shown, shall be as per General Arrangement Indicative Drawing enclosed with this specification. Other clearances shall be as per requirement of IS: 4237/1982 amended up to date.

5.4) FUSE BASE ASSEMBLY:

5.4.1 The Fuse bases shall be suitable for HRC fuse links and strips. All fuse bases shall be identical and interchangeable irrespective of whether they are provided in incoming or outgoing circuits and shall be capable to carry rated normal current without exceeding safe temperature as per relevant standard duly tested at Lab like CPRI, ERDA etc.

5.4.2 The base of the HRC Fuse shall be of non-tracking, heat resistant insulating porcelain material of superior electrical and mechanical properties equivalent to Dough Molding Compound (DMC). The Fuse Base shall be sturdy in construction. The insulation shall not get affected due to dust, moisture etc, at wide fluctuation in temperature. The holes for fasteners shall be plugged by insulating filling compound which shall not drain at operating temperature in service.

5.4.3 The contacts shall be made up of electrolytic grade copper alloy with corrugated terminal pad and spring action to yield high contact pressure. G. I. spring ring shall be made out of at least 6 mm dia. spring steel round. The spring action shall not get affected by operations and variations in operating temperatures in service.

5.4.4 Thermostatic bimetal device shall be provided between terminal pad and bus bars and between terminal pad and cable terminals(Z Patti) to prevent bimetallic deterioration.

5.4.5 HRC Fuse Base should withstand the breaking capacity of the fuse link of 80kA.

5.4.6 The complete assembly shall be so fixed and secured that there shall be no turn, fall out displacement and vibration of any part during inserting and removal of fuses/Links. Load current reading, cable end connection etc

5.4.7 The current rating adopted shall generally not exceed the following limits. Higher current density adopted if any in special corrugated and other shapes shall be subject to successful temperature rise tests carried out in reputed laboratory.

Size of sectionmm x mm	Maximum current in Amps	
	Single Section	Double Section
30 x 3	205	385
30 x 5	270	500
40 x 3	280	500
40 x 5	350	650
40 x 10	515	975
50 x 5	425	780
50 x 10	625	1150
60 x 5	500	900
60 x 10	730	1330
80 x 5	680	1170
80 x 10	940	1700

5.5) FUSE LINKS:

The HRC Fuse Links shall be sturdy in construction of "Din Type". Corrugated fuse links shall be made out of electrolytic grade copper flat of at least 4 mm thick and shall be capable of carrying the rated current of the fuse base and shall be suitable for inserting and pulling out by insulated fuse pulling handle. Breaking capacity shall be 80kA. For fault indication red pop up indicator should come out instantly on fusing. Manufacturer's name, current rating, breaking capacity and type shall be marked on HRC fuse link.

The successful bidder shall submit the complete type test reports as per specification for approval of General Manaer (P-E),MITL before commencement of supply.

5.6)PAINTING:

5.6.1 The M.S. cubicles shall be provided with anti corrosive high quality post office red colour paint conforming to shade No 538 of IS.5 from inside and outside to withstand the corrosive and humid atmosphere.

5.6.2 For M.S. Cubicle, all interiors and exteriors of the cubicle shall be degreased in 5% solution at 75°C for 15 minutes. They shall then be washed in hot water bath at 65°C to remove all rust, scale corrosion, grease and other adhering foreign matter and shall be rinsed in cold running water.

5.6.3 M.S. cubicles shall then be pickled in 25% hot sulpheric acid at 65°C for 5 minutes. Care shall be taken to avoid over pickling by addition of adequate quantities of inhibitor and avoid loss of tensilestrength. The cubicle shall then be rinsed in cold running water and put in alkaline solution at 65°C for 1 to 2 minutes. The cubicle shall then be immersed in cold water (still agitated) to remove all traces of alkali and untreated salt. The cubicle shall then be dipped in deoxidize chamber to ensure complete removal of moisture.

5.6.4 Corrokill rust converter conforming to IS 13515 shall be preferably applied as primer. The cubicle stoved at 150°C for 10 to 12minutes. It shall then be cooled, filled with putty to get smooth and flawless surface. Enameled paint shall then be sprayed and towed at 150°C for about 12minutes.

6.00 TESTS:

6.1) TYPE TESTS:

6.1.1 Type test reports as per cl.no.8.1.1 of IS: 5039/1983 shall be submitted along with the offer for the type and rating of circuit breakers offered, Type test reports shall be from any NABL approved laboratorysuch as M/s CPRI, ERDA. Type tests carried out prior to Five years of the date of opening of the tender are not valid.

Following Type Test Reports shall be submitted for approval.(a)

ON COMPLETE L. T. PILLER:

Type tests as per IS:5039/1983 shall be carried out on complete L.T. feeder pillars .

1. Verification of temperature rise limits (As per Cl.8.2)
2. Verification of Dielectric Properties (As per Cl.8.3)
3. Verification of short circuit strength (As per Cl.8.4)
4. Verification of clearance & creepage distances (As per Cl.8.5)
5. Verification of Degree of protection for IP- 43 (As per Cl.8.6)

(b) ON AIR CIRCUITBREAKER:

All type tests as per IS: 13947/1993 (Part II amended up to date) shall be carried out on Air Circuit Breakers

(c) ON HRC FUSES BASE AND HRC FUSELINKS:

All type tests on HRC fuses and HRC fuse links shall be carried out asper IS:13703/of 1993 (Part I & II amended up to date) for HRC Fuse Base and HRC fuse link.

6.2) ROUTINE TESTS:

It should be carried out on all boxes on complete L.T. Feeder Pillar.In case of bought out items, routine and acceptance tests as per relevant IS and this specification shall be carried out at the original manufacturers' works.

1. Overall Dimensions Checking.
2. Insulation Resistance Tests.
3. High Voltage Test at 2500 V, 50 Hz AC for one minute.
4. Operation Test HRC fuse base and fuse links.

7.00 TEST CERTIFICATES:

The L.T. Pillar enclosure, Air Circuit Breakers, HRC fuse, HRC Fuse Link etc. offered shall be fully type tested as per relevant IS and this specification. The successful Bidder shall furnish detailed type test reports before commencement of supply. The detailed Type Test Reportsshall be furnished with relevant oscillogram and certified Drawings of the equipment tested. The purchaser reserves the right to demand repetition of some or all the Type Tests in presence of purchaser's representative at purchaser's cost.

All the type tests shall be carried out from laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Government of India such as CPRI Bangalore/Bhopal, ERDA Baroda to prove that the complete L.T. Pillar, meet the requirements of the specification.

Following test certificates and documents shall be furnished at the timeof inspection.

a) Chemical analysis certificate and documents showing genuine source of procurement of electrolytic grade conductivity Aluminum Sections.
b) Document showing genuine source of procurement of steel sheet and sections.
c) Certificate of temperature rise test.
d) Certificate of painting with degreasing, pickling phosphate, and painting and oven treatment by seven tank oven process in respect of M.S. Cubicles.

The supplier shall conduct voltage withstand test and operations testsat the time of inspection.

8.00 INSPECTION:

9.1 All routine & acceptance tests and inspection of material shall be carried out at the place of manufacturer. The manufacturer shall offer the Inspector (representing the purchaser) all reasonable facilities, free of charge at the time of Inspection

9.2 The supplier shall offer inspection of the material at his works before dispatch. If required the supplier shall also offer inspection of manufacturing painting and assembly processes and quality control system. If any material is not found in line with relevant specification the supplier shall carry out the modification and offer for re-inspection.

9.3 Inspection and acceptance shall not absolve the supplier of his responsibility to supply the material in accordance with the specifications. The purchaser reserves the right to reject the material not confirming the relevant specifications.

9.00 DRAWINGS AND DOCUMENTATION:

10.1 Following indicative drawings are enclosed herewith.

i) Outdoor Type L.T. Mini Pillar drawing
ii) Outdoor Type 2/3 way L.T. feeder Pillar drawing
iii) Outdoor Type 4 way L.T. feeder Pillar with ACB
iv) Outdoor Type 4 way L.T. feeder Pillar drawing

10.2 The tenderer shall furnish all details and clarifications required if any for scrutiny and evaluation of the offer.

10.3 Manufacture of material to be supplied shall be done strictly as per approved drawing.

10.4 Approval of drawing shall not absolve the supplier of his liability for ensuring correctness according to applicable standards&regulations.

10.5 The Bidder/Supplier shall fill-in the following schedules which form part of the specification if any schedule is not filled or incompletely filled the offer is liable to be treated as incomplete and rejected.

Schedule-A: Guaranteed technical particulars

Schedule-B: Deviations from specifications

Schedule-C: Bidder's/Supplier's Experience

SCHEDULE – A

1. GUARANTEED TECHNICAL PATRICULARS (GTP) OF MINI L. T.PILLER

Sr. No.	Parameter Name	Parameter type
1	Name or Trademark of Manufacturer.	Text
2	Type of L.T. Pillar	Text
3	Rated normal voltage	Text
4	Material of construction of L. T. Pillar enclosure & doors	Text
5	Thickness of M.S. sheet for enclosure	Text
6	Thickness of M.S. sheet for doors	Text
7	Colour of the L. T. Mini Pillar enclosure	Text
8	Dimensions of cubicle without rain hood – Width x Depth x Height (in mm)	Text
9	Dimensions of rain hood – Width x Depth x Height of center lift (in mm)	Text
11	Hinges	
11(a)	Hinges : Type	Text
11(b)	Hinges : Length (50mm)	Text
11(c)	Hinges : Thickness of material	Text
11(d)	Hinges : pin Diameter	Text
11(e)	Number of hinges per door	Text
12	Type of locking arrangements	Text
13	Number of padlocking arrangements	Text
14	Number and size of ventilating louvers with wire mesh	Text
15	Details of painting	Text
16	Dimensions and details of gland plates	Text
17	Bus Bar, Fuse Base & Fuse Link	
17(a)	Size of bus bar	Text
17(b)	Size of neutral bus bar	Text
17(c)	Grade and specification of material of Bus bars	Text
17(d)	Rated normal current of Bus bars	Text
17(e)	Rated safe temperature of Bus bars	Text
17(f)	Make & Type of Fuse base assembly	Text
17(g)	Grade and specification of material of Fuse base contacts	Text
17(h)	Thickness and dimensions of contacts of fuse base	Text
17(i)	Rated normal current of Fuse base	Text
17 (j)	Rated safe temperature of Fuse base	Text
17(k)	Grade and specification of material of Fuse links	Text
17(l)	Make & Type of Fuse link	Text
17m	Rated normal current of Fuse link	Text
17(n)	Rated safe temperature of Fuse link	Text
17(o)	Grade and specification of material of spring steel round	Text
17(p)	Dimensions of spring steel round	Text
18.	Make & Type of bimetallic lugs	Text
19.	One Minute P. F. withstand voltage	Text
20	Rated short time current	Text
21	Rated temperature rise	Text

2.GUARANTEED TECHNICAL PATRICULARS (GTP) OF L. T. 2/3 AND 4 WAYWITHOUT ACB FEEDER PILLER

Sr. No.	Parameter Name	Parameter type
1	Name or Trademark of Manufacturer.	Text
2	Type of L.T. Pillar	Text
3	Rated normal voltage	Text
4	Material of construction of L. T. Pillar enclosure doors	Text
5	Thickness of M.S. sheet for enclosure	Text
6	Thickness of M.S. sheet for doors	Text
7	Colour of the L. T. Pillar enclosure	Text
8	Dimensions of cubicle without rain hood – Width x Depth x Height (in mm)	Text
9	Dimensions of rain hood – Width x Depth x Height of center lift (in mm)	Text
11	Hinges	
11(a)	Hinges : Type	Text
11(b)	Hinges : Length (50mm)	Text
11(c)	Hinges : Thickness of material	Text
11(d)	Hinges : pin Diameter	Text
11(e)	Number of hinges per door	Text
12	Type of locking arrangements	Text
13	Number of padlocking arrangements	Text
14	Number and size of ventilating louvers with wiremesh	Text
15	Details of painting	Text
16	Dimensions and details of asbestos sheets	Text
17	Dimensions and details of Bakelite sheets	Text
18	Dimensions and details of gland plates	Text
19	Bus Bar, Fuse Base & Fuse Link	
19(a)	Size of bus bar	Text
19(b)	Size of neutral bus bar	Text
19(c)	Grade and specification of material of Bus bars	Text
19(d)	Rated normal current of Bus bars	Text
19(e)	Rated safe temperature of Bus bars	Text
19(f)	Make & Type of Fuse base assembly	Text
19(g)	Grade and specification of material of Fuse base contacts	Text
19(h)	Thickness and dimensions of contacts of fuse base	Text
19(i)	Rated normal current of Fuse base	Text
19 (j)	Rated safe temperature of Fuse base	Text
19(k)	Grade and specification of material of Fuse links	Text
19(l)	Make & Type of Fuse link	Text
19m	Rated normal current of Fuse link	Text
19(n)	Rated safe temperature of Fuse link	Text
19(o)	Grade and specification of material of spring steel round	Text
19(p)	Dimensions of spring steel round	Text
20.	Make & Type of bimetallic lugs	Text
21.	One Minute P. F. withstand voltage	Text
22	Rated short time current	Text
23	Rated temperature rise	Text
24	Size & Thickness of Bakelite sheets provided	Text

25	Any other details	Text

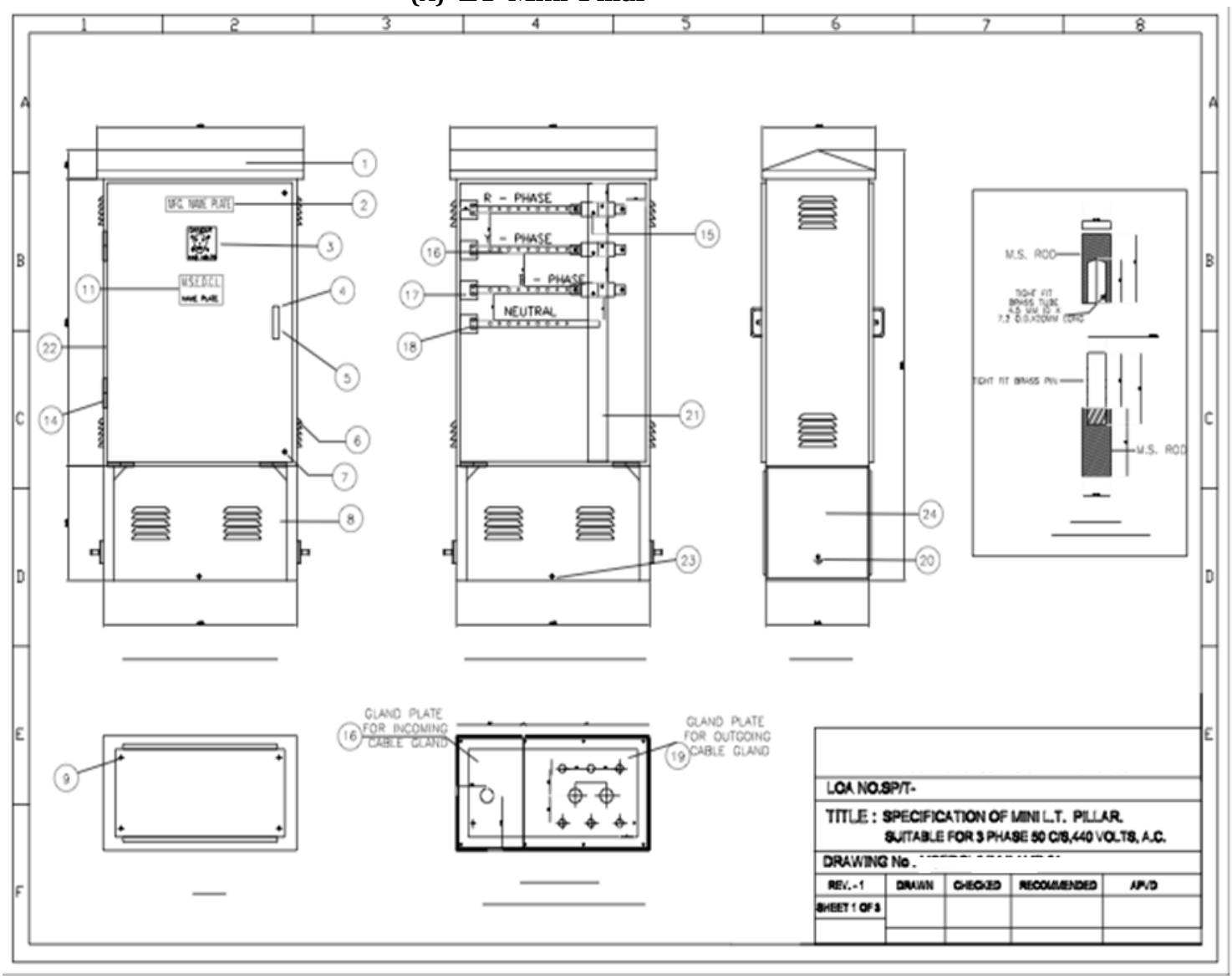
3.GUARANTEED TECHNICAL PATRICULARS (GTP) OF L. T. 4 WAYWITH ACB FEEDER PILLER

Sr. No.	Parameter Name	Parameter type
1	Name or Trademark of Manufacturer.	Text
2	Type of L.T. Pillar	Text
3	Rated normal voltage	Text
4	Material of construction of L. T. Pillar enclosure & doors	Text
5	Thickness of M.S. sheet for enclosure	Text
6	Thickness of M.S. sheet for doors	Text
7	Colour of the L. T. Pillar enclosure	Text
8	Dimensions of cubicle without rain hood – Width x Depth x Height (in mm)	Text
9	Dimensions of rain hood – Width x Depth x Height of center lift (in mm)	Text
11	Hinges	
11(a)	Hinges : Type	Text
11(b)	Hinges : Length (50mm)	Text
11(c)	Hinges : Thickness of material	Text
11(d)	Hinges : pin Diameter	Text
11(e)	Number of hinges per door	Text
11(e)	Number of hinges per door	Text
12	Type of locking arrangements	Text
13	Number of padlocking arrangements	Text
14	Number and size of ventilating louvers with wire mesh	Text
15	Details of painting	Text
16	Dimensions and details of asbestos sheets	Text
17	Dimensions and details of bakelite sheets	Text
18	Dimensions and details of gland plates	Text
19	Bus Bar, Fuse Base & Fuse Link	
19(a)	Size of bus bar	Text
19(b)	Size of neutral bus bar	Text
19(c)	Grade and specification of material of Bus bars	Text
19(d)	Rated normal current of Bus bars	Text
19(e)	Rated safe temperature of Bus bars	Text
19(f)	Make & Type of Fuse base assembly	Text
19(g)	Grade and specification of material of Fuse base contacts	Text
19(h)	Thickness and dimensions of contacts of fuse base	Text
19(i)	Rated normal current of Fuse base	Text
19 (j)	Rated safe temperature of Fuse base	Text
19(k)	Grade and specification of material of Fuse links	Text
19(l)	Make & Type of Fuse link	Text
19m	Rated normal current of Fuse link	Text
19(n)	Rated safe temperature of Fuse link	Text
19(o)	Grade and specification of material of spring steel round	Text
19(p)	Dimensions of spring steel round	Text
20.	Make & Type of bimetallic lugs	Text
21.	One Minute P. F. withstand voltage	Text
22	Rated short time current	Text

23	Rated temperature rise	Text
24	Size & Thickness of Bakelite sheets provided	Text
25	Air Circuit Breaker	
25(a)	Make & Type	Text
25(b)	Rated Voltage (440V)	Text
25(c)	Rated Current (600/800) Amps as per requirement)	Text
25(d)	Rated Frequency (Hz)	Numeric
25(e)	Whether facilities as per table in cl.no.5.6 are included in ACB offered	Boolean
25(f)	Whether Type test reports for ACB & other components are submitted Separately	Text
26	List of test conducted on similar equipment's	Text
27	List of copies of test certificate enclosed	Text
28	Any other details	Text

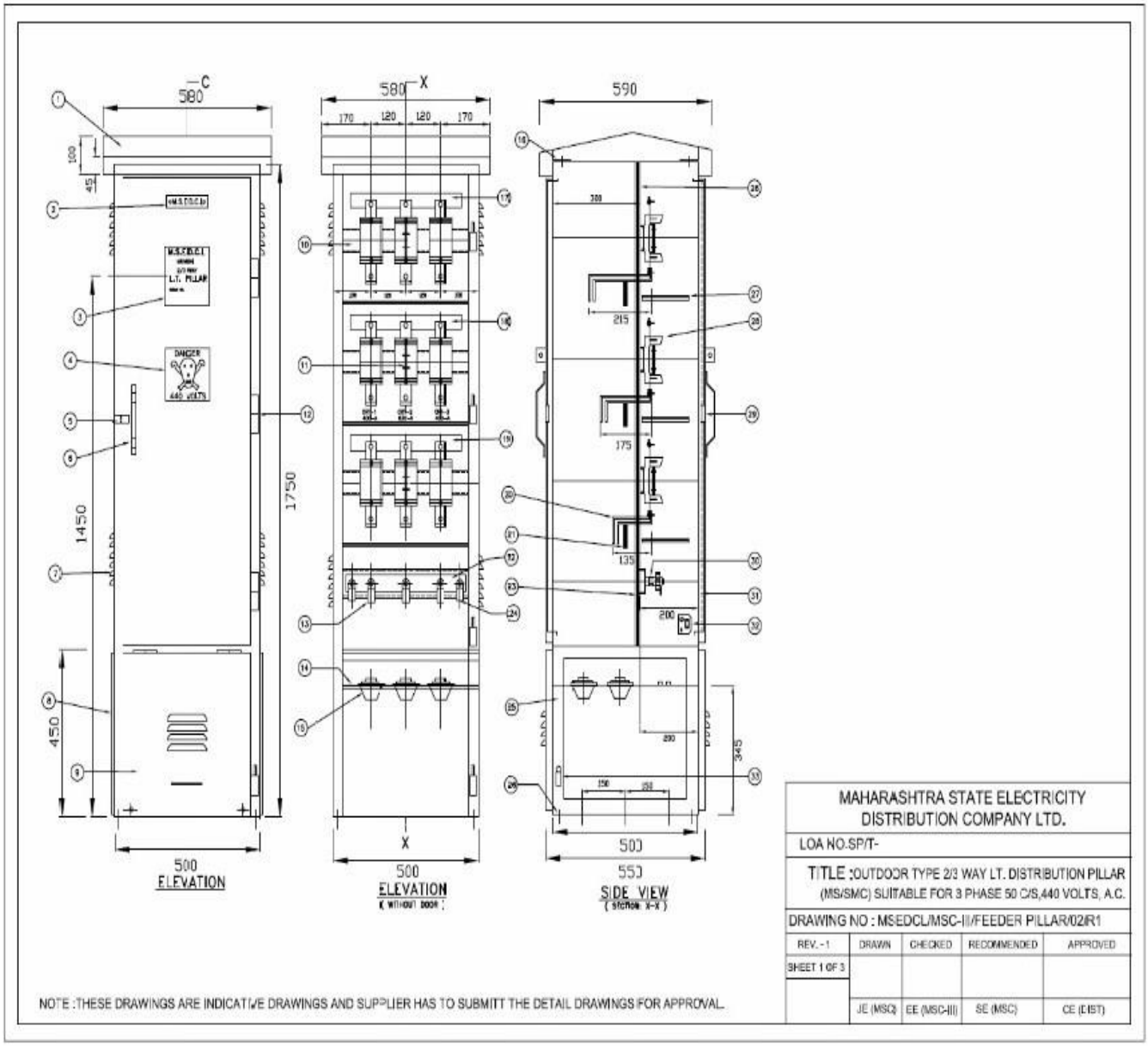
INDICATIVE DRAWING

(A) LT Mini Pillar



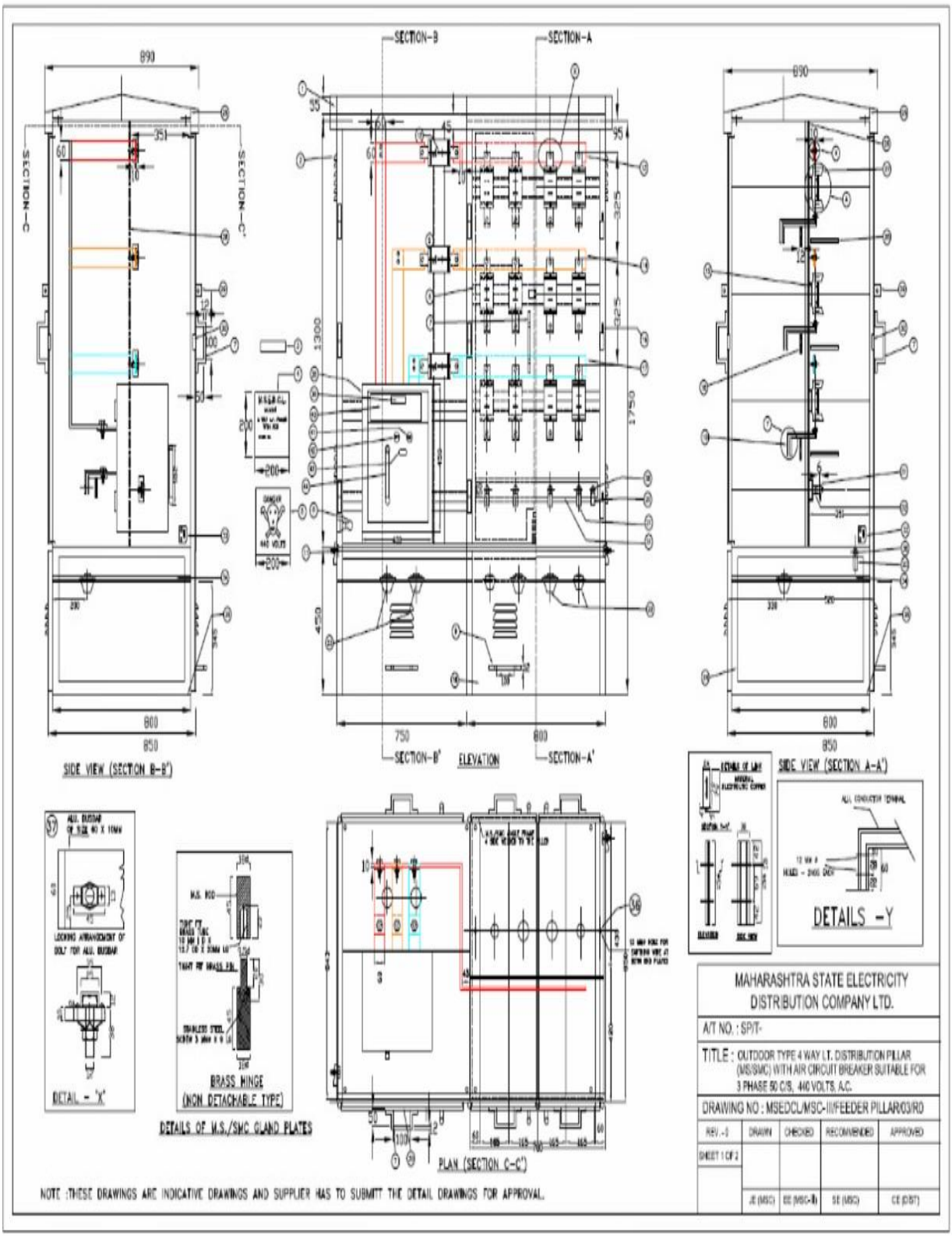
INDICATIVE DRAWING

(B) 2/3 Way LT feeder Pillar



INDICATIVE DRAWING

(C) 4 Way LT feeder Pillar



Technical Specification for
11kV/0.433kV Compact Substation (CSS) complete with all components

1.0 INTENT

The intent of this specification is to design, manufacture, testing at manufacturer's works and delivery of **11kV/0.433kV Compact Substation (CSS)** complete with all components to site **AURIC Shendra Industrial Area, Chhatrapati Sambhaji Nagar, Maharashtra".** The workmanship of fabrication, painting and wiring should be of highest quality.

2.0 SCOPE

2.1 Scope of Work includes design, manufacture and supply of Compact substation.

- BOQ - Annexure I
- TECHNICAL SPECIFICATION - Annexure II

Compact substation will be supplied as per the approved make list only, same shall be furnished by BU. Compact substation shall be designed, constructed and tested in accordance with applicable sections of the latest revision of relevant IS/IEC Standards.

2.2 Commissioning spares, Mandatory spares if any shall be furnish by BU.

3.0 GENERAL REQUIREMENT

3.1 ELECTRICAL SUPPLY SYSTEM:

- 11kV AC - +6% to -9%
- 415V AC - +6% to -6%
- 50Hz - +3% to -3%
- Combined (Voltage & Frequency) - +/-9% (absolute)

3.2 ELECTRICAL SUPPLY SYSTEM EARTHING:

- 11kV, 3-ph AC System - Earthed
- 415V, 3-ph AC system - Earthed

3.3 PROJECT INFORMATION

- LOCATION AND APPROACH

Project Location: i) Place: Shendra Industrial Area, Chhatrapati Sambhaji Nagar
ii) State : Maharashtra

- **METEROLOGICAL DATA:**
  - Max Design Ambient Temperature : 50 °C.
  - Max Daily Ambient Temperature : 45 °C.
  - Min Daily Ambient Temperature : 36 °C.
  - Relative Humidity : 95% Max & 10% Min
  - Altitude : Less than 1000M MSL

4.0 SPECIFICATION

Compact Substation (CSS) shall confirm to the technical specifications attached to **ANNEXURE II.**

5.0 DATA SHEETS

Manufacturer Technical data sheets for Compact Substation (CSS), which shall be filled – up complying with the technical requirements of the specification and submitted by the vendor along with the Bid & after the award of contract for approval by

ANNEXURE – I
BILL OF QUANTITY

S.No	CSS Rating	Qty.	Units
01	315Kva	1	Nos.
02	630kVA	1	Nos.

ANNEXURE – II
TECHNICAL SPECIFICATIONS

1. Compact Sub Station [CSS] consisting of following main components.
   - 12 kV, non-extendable, metal clad SF6 insulated switchgear, sealed for life, Ring Main Unit (RMU)
   - Dry type 11/0.433kV distribution transformer
   - LV switch board.
   - Prefabricated weather proof enclosure.
   - SCADA connection for remote control and monitoring.

2. The CSS is to be totally free from any external deposit (dust, condensation etc.) and suitable to operate in highly humid, hot environment without any preventive maintenance, cleaning etc. It shall be of"fit and forget"type. All nut bolts, frames etc. shall be rust proof, typically of stainless steel or materials not prone to rusting, in site environmental conditions.
3. CSS can be placed indoor or outdoor as per detail design and requirement.
4. The prefabricated substation unit is required for fast installation, to be maintenance free and with life expectancy of thirty years under site conditions.
5. **Basic Design Criteria**

   The CSS shall be designed with the following design criteria:
   - It shall be factory built and tested and preferably transported as such so that it is ready for site installation. Only external connections need to be done at site.
   - Design to comply with latest version of IEC 62271-202.
   - Maintenance free Ring Main Unit [RMU] with SF6 insulation sealed for life as per IEC standard.
   - Dry type, epoxy insulated transformer with HV side metering.
   - LV Switchboard with Capacitor bank for automatic power factor correction [APFC].
   - Enclosure to have independent compartments for RMU, transformer and LV Board with suitable entry doors.

   The electrical equipment including the enclosure, its supporting structure etc. is to be rust and corrosion proof throughout its life. In case there is no alternative to items such as mild steel sheet, and other structural items, the same shall be hot dip galvanized [minimum 610 gm zinc /m2] and epoxy painted. Nut, bolts, washers and other similar items shall be of rust proof material such as stainless steel.
   The Enclosure consisting of High Voltage switchgear, Low Voltage switchgear & Transformer of the Unitized substation shall be designed to be used under Indoor or outdoor service condition.

6. Quality of Material:

All material used shall be new and of best quality and of class most suitable for working under the conditions specified herein without distortion or deterioration. Galvanization of steel shall only be done by hot dip process after the parts are ready for the purpose of assembly. Alternatively stainless steel of the quality suitable for site shall be used.

7. Design and Standardization

- The equipment shall be designed to ensure satisfactory operation in which continuity of service is the first consideration and shall also be designed to withstand sudden load variations due to short circuits and other fault conditions.
- The design shall incorporate every reasonable precaution and shall have necessary provision for the safety of all those concerned in the operation and maintenance of the switchgear.

- All mechanism shall be made of such materials as to prevent sluggishness due to rust or corrosion. All Connections and contacts shall be of ample section and surface for carrying continuously the specified current without undue heating and shall be secured rigidly and locked in position.
- Standard sizes of bolts, screws, pipes and other fittings are to be used and number of sizes is to be kept to the minimum.
- Cast iron shall not be used for any part of the equipment which may be subjected to mechanical stresses.
- All apparatus shall be so designed and constructed as to obviate the risk of short circuits of the live parts by reptiles, rodents etc. Metal cubicles, housings and covers shall be 100% weather / vermin proof.
- All parts shall be manufactured in accordance with relevant standard specifications. Corresponding parts of similar equipment and apparatus shall be mutually interchangeable.
- All apparatus, connections and cabling [FRLS type] shall be designed and arranged to minimize the risk of fire and any damage, which might be caused in the event of fire.
- Design should take into consideration that equipment is to be operated under rainy, hot and humid atmospheric conditions, and surroundings with reptiles and rodents. Certification offering evidence for the satisfactory operation under such environmental conditions shall be provided.

8. Technical Data for CSS

Sr.No.	Description	Technical Data
1.	plicable Standard	IEC 62271-202
2.	sign Ambient Temperature	50° C
3.	Type of Ventilation for Normal Condition t Condition	Natural Natural
4.	mpartmentalized	Yes
5.	ted temperature enclosure class	10
6.	Degree of protection for external closure for Transformer compartment	IP34
	Degree of protection for external enclosure for HV compartment	IP54
	Degree of protection for external enclosure for LV compartment	IP54
7.	cation	Indoor / Outdoor
8.	ted HV	12kV, RMU, with Metering
9.	ansformer	Dry Type
10.	minal rated voltage rating on LV	415V
11.	Board	Incomer ACB(wherever rating >=630Amp) + Outgoing MCCB
12.	closure material	Resistant to rusting
13.	ickness of sheet (minimum)	2mm for enclosure.
14.	se	4mm hot-dip galvanized
15.	closure Paint	Epoxy, RAL 7032
16.	ADA system / Remote Control	Yes

9. Painting

- Since the local environment is harsh, even galvanized steel will rust after a few years. Therefore paint of suitable quality to protect the equipment is of utmost importance.
- All sheet steel work shall be phosphated in accordance with IS: 6005 'Code of practice for phosphating iron and steel, through seven tank process. Oil, grease, dirt shall be thoroughly removed by emulsion cleaning. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying. After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying.
- The phosphate coating shall be sealed with the application of two coats of ready mixed zinc chromate primer. The first coat may be air dried while the second coat shall be stove dried. Panels shall be painted with epoxy paint of superior quality. ALTERNATIVELY, the panels shall be painted with electrostatic epoxy powder coating process to have paint of hard coating. Necessary details shall be provided to MITL in this regard for prior approval.
- Paint Thickness:
  The final finished thickness of paint film on sheet shall be approximately 60 to 80 micron. The finished painted surface of panels shall present aesthetically pleasing appearance free form dents and uneven surfaces. Paints shall not scale off or wrinkle or be removed by abrasion due to normal handling. The colour for finishing paint shall be Siemens grey as per RAL 7032. Unless otherwise desired the same shall be got confirmed from the MITL before taking up painting. Each coat of primer and finishing paint shall be of slightly different shade to enable inspection of the painting.
- Spare Paint
  A small quantity (one liter per board) of finishing paint shall be supplied for minor touching up required at site after installation of the panel.

10. 12kV RING MAIN UNIT

i. Applicable Standards

The RMU shall confirm to the latest applicable standards specified below. In case of conflict between standards and this specification, this specification shall govern.

Sr.No.	Standard Code	Description
1.	IEC 62271-1	High-voltage switchgear and control gear – Part 1: Common specifications
2.	IEC 62271-200	High-voltage switchgear and control gear - A.C. metal enclosed switchgear and control gear for rated voltage above 1 kV and up to and including 52 kV.
3.	IEC 62271-103	Switches for rated voltages above 1 kV and less than 52 kV
4.	IEC 62271-100	High-voltage switchgear and control gear – Part 100: High voltage alternating current circuit breakers.
5.	IEC 62271-102	High-voltage switchgear and control gear – Part 102: High voltage alternating current disconnectors and earthing switches
6.	IEC 61958	High-voltage prefabricated switchgear and control gear assemblies – Voltage presence indicating systems
7.	IEC 60529	Degrees of protection provided by enclosures (IP Code)

8.	IS:722	A.C. electricity meters.
9.	IEC 60044-8	Instrument transformers – Part 8: Low Power Current Transducers
10.	IEC 60044-1	Instrument transformer – Part 1: Curent transformer
11.	IEC 60044-2	Instrument transformer – Part 2: Voltage transformer
12.	IEC 60255	Electrical relays
13.	IS: 5	Colours for ready mixed paints and enamels
14.	IS:1248	Electrical Indicating Instruments
15.	IS:1554	PVC insulated cables up to and including 1100 volts
16.	IS:4794	Push Button Switches
17.	IS:6005	Code of practice for phosphate coatings of iron and steel
18.	IS:2099	Bushings for alternating voltages above 1000 V
19.	IEC:62271-202	Pre-Fabricated Substation
20.	IS:13118, IS:3427, IEC:60694	Switchgear cubicles
21.	IS:9920, IEC:60265	Ring main unit
22.	IS:10118	Code of practice for selection, installation and maintenance of Switchgear
23.	IS:13072	Sulphur hexafluoride for electrical purposes

The equipment complying with other internationally accepted standards may also be considered if they ensure performance superior to the Indian Standards.

ii. **General Constructional Feature**

- The RMU shall be 3 way, 12 kV, extendable type, metal clad SF6 insulated Ring Main Unit (RMU) along with metering, PTs, CTs etc.
- The RMU shall be extendable type and stand alone.
- Two numbers, fault making / load breaking, motor operated, line side switches, fitted with indications for phase and earth fault along with associated CTs. The load break switches shall be connected via underground XLPE Cables.
- Outgoing feeder of RMU shall have , Tee-off, spring operated, Circuit breaker with sealed for life vacuum interrupter complete with meters, CTs, Protective and auxiliary relays to control desired number of 11/0.433 V distribution transformer or equipment's with complete arrangement to connect the tee-off circuit breaker to the 11 kV side of the power transformer.
- The springs for closing the load break switches & tee-off circuit breaker shall be motor operated.
- The opening & closing for the load break switches as well as tee-off circuit breaker shall be carried out electrically from remote via SCADA, besides local / hand operation.

- Built in compact battery [with no maintenance of any type] with charger shall be part of supply for this purpose.
- The breaker shall have necessary over current and low sensitivity earth fault protection on the delta connected, 11 kV side of the distribution transformer.
- Further the protections on distribution transformer shall operate this breaker with required alarms. It shall have basic metering features also to monitor these in RMU.
- RMU shall also be equipped with necessary Remote Terminal Units, transducers etc complete in all respects, since these RMUs shall be having provision for SCADA with remote control. The provision for requisite control & indications shall be provided in the RMUs & substations.
- Fault passage indicators, Feeder Remote Terminal Units, with self-healing feature, communicating with each other in the Ring circuit shall ensure automatic isolation of faulty cable and restoration of supply in case of cable fault in the system, using Fibre- Optic based communication.
- There shall be continuous monitoring of supply on 12 kV cables via capacitive voltage indicators.
- The RMU shall be complete in all respects including elbow type cable termination arrangement [with shrouds] in air from bottom, gland plate, double compression glands, foundation channels, bolts, inter connection arrangement etc
- The external dimensions shall be identical throughout the length of the 11kV board. The operation of any of the switching functions shall be simple with only three possible positions viz. closed, open and earthed. The earthing switch shall be placed on cable side. The earthing of cable is to be done by an independent fault making switch.
- All the necessary safety interlocks between switching devices, earthing switch and cable box covers shall be integrated.
- The accessories and LV auxiliaries (i.e. motor mechanism, coils, auxiliary switches etc.) shall be the same for the entire range of switching functions, load break switches or circuit breakers. They can be installed on site without any dedicated tool and training.
- Any other item not included above but required to complete the works shall be deemed to be included in RMU, without any financial liability to the purchaser

S.No	Description	11kV system
1.	Rated system voltage (kV)	12
2.	Rated current for load break switch [A]	Upto630Amps @ ambient 40Deg C
3.	Rated current for tee-off Breaker [A]	Upto630Amps @ ambient 40Deg C
4.	Nominal system voltage [kV]	11
5.	System Earthing	Solid

6.	**Basic Insulated level**	
	Lightning Impulse withstand voltage (kV)	75 (As per IS)
	Power frequency withstand voltage one minute (kV) rms	28 (As per IS)
7.	Frequency (Hz)	50
8.	Bus bar rated current (A)	Upto 630Amps @ ambient 40Deg C
9.	Rated short time symmetrical three phase current (kA for 3 sec for load break switches & tee-off breaker)	20
	Earth switch for load break switches (kA for 3 sec)	20
	Earth switch for tee-off breaker (kA for 3 sec)	20
	Rated making current (kA peak)	50
	Rated breaking current for circuit breaker kA per 3 sec)	20
	Fault Making Capacity in kA (peak)	50
	Filled and rated gas pressure	< 1 bar, gauge
	Internal arc test [kA for 1 sec]	20
	Interrupting time in millisecond less than	40
	Operating duty	O-3min-CO-3min-CO
	Paint thickness (micron)	60-80
	Partition class	PM
	Main HV circuit	IP 67
10.	Busbar Cross section area	Min. 400sqmm.
11.	Cable termination	Suitable for Min. 2Rx3Cx240 sqmm, Al, Ar., XLPE 11kV cable

iii. Technical Particulars :

- The Ring Main Unit (RMU) should consist of three phase, two load break switches and one tee-off VCB, Circuit Breaker Compact Unit, SF6 insulated and sealed for life complying to latest version of IEC.
- RMU for outdoor distribution shall be extendable type. Storage [without heaters, in humid environment]: from 0°C to +50°C.
- Front connection in cable box, suitable for armored, XLPE insulated Aluminum cable, as per calculated & specified size. Termination with elbow type plugs in bushings with insulating boots.
- **Load break switch:**

  The switch shall be combining the functions of a load break switch, disconnector and associated earthing switch. It shall have three positions (closed, open / disconnected earthed) earthing to be on cable side. The mechanism shall be anti-reflex, lever operated type, with intuitive operation and clear mimic panel indications.

  Switch shall have built-in fail safe interlocks between main switch and earthing switch. Standard built-

in padlocking facility for main switch, earthing switch and interlock shall be provided.

Switch shall have a provision for remote opening and closing through SCADA also. Earthing switch operation shall be locally.

It shall carry rated current continuously and short circuit current for the duration specified without exceeding the permitted temperature rise as per relevant IEC / Indian standard. Switch should not be damaged even when closed on a dead short circuit for the permitted period of short circuit.

Each load break switch shall be of the triple pole, gang operated, with quick break Contacts.

- **Circuit breaker for transformer :**

The Circuit Breaker shall have a switch disconnecting the circuit breaker with an associated earthing switch. It shall have three positions (closed, open / disconnected, earthed) earthing to be on transformer side. Circuit Breaker shall have a provision for remote opening and closing through SCADA. Earthing switch operation shall be locally.

It shall carry rated current continuously and short circuit current for the duration specified without exceeding the permitted temperature rise as per relevant IEC / Indian standard.

Circuit breaker shall be opened with a push button and closed with the "closing lever". The mechanism shall be anti-reflex, lever-operated type, with intuitive operation and clear mimic panel indications. Switch shall have built-in fail safe interlocks between main switch and earthing switch. Standard built-in padlocking facility for main switch, earthing switch and interlock shall be provided. The circuit breaker and load break switch can be locked in the open, close or earth position by 1 to 3 padlocks of ESI size. Breaker should not be closed when cable cover is open.

In case of fault the breaker shall be tripped through a self-powered relay.

- **Circuit Breaker Interrupting Unit:**

  - Tee-off Circuit breaker shall have Vacuum interrupting arrangement.
  - The design & construction of the Vacuum circuit breaker shall be compatible with the latest Vacuum circuit breaker technology.
  - The Vacuum interrupter bottles shall be completely maintenance free & mechanically strong for 30 years life. Test certificate to be provided.
  - Suitable interlock shall be provided against breaker operation in the event of loss of Vacuum.
  - Circuit breaker should allow low chopping current level.
  - Graph showing short circuit Vs tripping permitted for Circuit Breaker.

- **Duty Requirement:**

  - The circuit breaker shall be totally restrike free under all duty conditions and shall be capable of performing the duties satisfactorily.
  - The circuit breaker shall meet duty requirement for any type of fault location, also for line charging current. The operating duty of the circuit breaker shall be as follows:
    O-3min-CO-3min-CO
  - The circuit breaker shall be suitable to break the required induction current in accordance with the BIS / IEC standard. The value thereof shall be clearly specified at the time of offer.
  - The circuit breaker shall meet its duty requirement in case of application for controlling U/G cables, power transformer.

- The rated transient recovery voltage for terminal fault and short line faults shall be as provided in the relevant IEC / BIS.

➢ **Constructional Details:**

Complete switchgear including bus bars shall be contained in an earth screened stainless steel tank, filled with SF6 gas, degree of protection not less than IP-67, as per requirement of IEC standards. To prevent gas leakage the gas pressure shall be maintained low within one atmospheric gauge. The filled gas shall provide the required insulation and also current breaking for load break switches.

There should not be any condensation of SF6 gas on internal insulating surface of the circuit breaker and Load Break Switches. Temperature compensation shall be provided and the system shall be an integral part of breaker.

SF6 gas shall be sealed for life in the compartment so as to satisfy "Sealed Pressure Systems" requirement of IEC-60694 (Clause 5.15.3). Throughout the life of the equipment there shall not be any "topping up" of SF6 gas. The rated life of the equipment must not be less than 30 years as per IEC-60694. During this operational life of the switchgear, absolutely no gas filling is required. The container should be evacuated before gas filling and it should be diffusion-tight. The design of the RMU housing shall be such that in the event of an internal arc fault, the safety of the operator shall be ensured. All the safety requirements as required in IEC 62271-200 shall be provided.

The switchboard when charged must not have any access to live parts so as to endanger the life of operating personnel.

The RMU shall be so designed that the position of different devices is visible to the operator in front of the switchboard. The operating switches, handles etc. shall be at a height at which these or easy to operate, without any extra effort. All the items in the equipment shall be identified with long life labelling, cautions etc. The labelling must clearly indicate the required function.

All the items in the equipment shall be identified with long life labelling, precautions etc. The labelling must clearly indicate the required function.

There shall be operation counters for Load Break Switches and breaker with a provision to sound an alarm when the permitted operations are approaching

It shall be possible to lock the operating mechanism in any of the three positions when the contacts have fully homed and also to independently lock the "ON" and "EARTH" positions. The position "ON", "OFF" and "EARTH" of the switch shall be clearly indicated such that the direction of movement of the operating handle(s) from one position to another is readily apparent.

The operating mechanism shall be maintenance free without the need of any lubrication during its life time of 30 years. The operating mechanism shall undergo a mechanical endurance test as specified in IS/ IEC 62271-200.

The ring main shall be dust, moisture & vermin proof and suitable for indoor or outdoor installation. All the cabinets shall be free standing floor mounting type and shall be provided with double hinged doors with padlocking arrangements.

All door panels, removable covers shall be gasketed all round with neoprene gaskets. All louvers shall have screen and filters. Vent opening shall be covered with mesh and so arranged that hot gases or other material shall not be discharged, injuring operating personnel or surrounding apparatus and cables.

Metal enclosure unit shall comprise of rigid welded structure frame enclosed completely by metal sheet of thickness not less than 2 mm. The sheet should be cold rolled with smooth finish, levelled & free from flaws. However, the structural frame & all load bearing members of the enclosures shall have a

minimum thickness of 2.5 mm or more. All members shall be properly braced to prevent webbing.

Ring main design shall comprise full compartmental execution having separate vertical sections for each circuit having internal barriers. Compartment with doors for access to operating mechanism shall be so arranged as not to expose high voltage circuit. The ring main cubical compartment shall be provided with hinged doors on the front with facility for padlocking door handles.

All corresponding components of circuit breaker / load break switch cubicles of same ratings shall be interchangeable with one another.

The board shall be wired with the connection brought on to the terminal boards for remote operation.

The equipment shall also be as compact as possible so as to occupy minimum space in the sub-station room. Such type of equipment will have preference

Temperature rise in the unit shall not exceed as prescribed in IS/IEC.

Minimum clearance between the phases and between live parts & grounded objects in the switchgear/ load break panels shall be in accordance with IEC.

- **Operating mechanism:**

Circuit breaker as well as load break switches shall be provided with suitably designed spring charged motor operated mechanism. It shall be possible to charge the spring manually, if required. The closing/ opening shall be through remote or through locally operated push button or operating switch.

It should be"trip free"mechanically under every method of closing (except during closing for maintenance).

The operating mechanism shall be such that the failure or any auxiliary spring will not prevent tripping. When the circuit breaker is already closed it shall not cause damage to the breaker or endanger the operator. The breaker / load break switch shall also be hand operated, if so required.

Electrical as well as mechanical indicator shall be provided to show open & close positions of the breaker / load break switches. It shall be located in a position where it will be visible to a man standing on the ground with the mechanism housing closed. An operation counter shall also be provided with each breaker / load break switch.

Working parts of the mechanism shall be of corrosion resisting material. Bearings, which require grease, shall be equipped with pressure type grease fittings. Bearing pin, bolts, nuts and other parts shall be adequately pinned or locked to prevent loosening or required adjustment with repeated operation of the breaker / load break switch. The mechanism shall be maintenance free.

The closing mechanism should be able to be operated by one man standing on the ground & direction of rotation of the handle for charging / closing shall be clearly defined.

Arrangement shall be made to de-couple/ trip the motor in case of failure of limit switch to cut out motor when the springs are fully charged and annunciation for this shall be provided.

The mechanism shall be complete with opening spring, closing spring, auxiliary contacts & all other necessary accessories to make mechanism a complete operating unit. A continuous sequence of closing and opening operation shall be possible.

Besides the requirements of auxiliary switches used by the manufacturer, at least 4 NO + 4 NC shall be provided for the use of the purchaser.

- **RMU to be Maintenance free:**

The RMU's life and its operation must not be affected by environmental conditions such as foggy atmosphere, extremes of cold, seismic conditions such as corrosive / winds, 100% relative humidity

(condensing type) with hot and humid environment, temporary flooding etc.

The equipment shall be of "fit & forget" type requiring little maintenance, (practically no maintenance), during its life.

RMU should have reliable switching devices and maintenance free drives.

- **Insulating Medium**

The RMU shall comply with the requirements of IEC standard for "Sealed Pressure System, for which no filling of gas is to be carried out during the life span of the switchgear. The SF6 gas shall be as per IEC-60376 / IS:13072 and shall be suitable for its application in the switchgear. It should continue to have high insulating and arc quenching properties throughout the switchgear life of 30 years.

The SF6 gas shall be self-regenerating after the interruption of arc due to breaking load currents. The gas tank should have material in the tank to absorb the moisture from SF6 gas.

The use of organic seals on the equipment, grease and oil in the drives requiring periodic maintenance are not to be used.

- **SF6 Gas Monitoring & Pressure Relieving**

SF6 gas in the RMU tank shall be constantly monitored through a gas pressure indicator, which should be duly temperature compensated. In case the pressure is not adequate it should block its operation and give a warning to isolate the RMU.

The pressure sensors shall feed a microprocessor based or Manometer analyzing unit. By this system the gas pressure (temperature compensated) should be recorded to measure the dielectric strength of the gas in the compartment.

A loss of gas should be signaled via two contacts one to initiate the low alarm of gas and second to trip the whole system.

If the gas pressure exceeds the permissible limit, such as during short circuit clearing, the pressure relief device should operate in the underside of the module. This area must be partitioned from the cable connection apartment.

- **Voltage indicator lamps, phase comparators and Monitoring of RMU Bus Voltage**

It shall be possible for each of the functions on the RMU to be equipped with a continuous voltage indication, to indicate whether or not there is voltage on the cables. The capacitive dividers will supply low voltage power to sockets at the front of the unit, an external lamp shall be provided to indicate live cables. Three outlets can be used to check the synchronization of phases with the use of an external device. This device shall be in compliance with IEC 1958 standard. Besides this the voltage monitoring of bus bar shall be provided continuously.

- **Earthing of RMU Circuits**

The cables in the RMU on the load break switch sides shall be earthed (only when these are dead) through integral earthing switch having the short circuit capacity of the RMU.

The earthing switch should be mechanically interlocked so that it can only be operated when the main switch is in open condition and circuit is fully de-energized. Necessary voltage monitoring device in such a case shall be provided

The earthing switch shall be operated through the main circuit mechanism and manual closing shall be through a fast acting mechanism.

Mechanical interlocking system shall be provided to ensure that the switch is turned to 'OFF' position

before being turned from′ON′to EARTH′condition.

Cable box interlocking is to be provided to ensure that before the removal of the unit cable box cover, the unit earth is applied.

- **General Earthing Requirement:**

All metal parts not intended for carrying current shall be connected to duplicate earthing system and suitable terminals shall be provided on each equipment or part of equipment in conformity with the relevant standards.

The earth continuity conductor shall be of tinned copper and shall have sufficient cross sectional area so as to afford a low resistance path for the full fault current corresponding to the circuit breaker ratings.

The size of earth continuity conductor shall be adequate, so as to restrict the temperature rise to the limit without causing any damage to the earth connection, while short circuit current flows through it for the short time rating of the equipment.

The size of earth continuity conductor shall be as large as possible to reduce to the barest minimum the potential rise of the metal frame of the circuit breaker.

No sweated / riveted joints in current conducting path shall be permitted.

- **Cable end Termination box:**

Cable-end termination box shall form an integral part of the equipment. The cables shall be convenient to install.

There shall be elbow type connection for cable termination with insulating boots. The boots shall form part of supply.

Each Cable compartment shall be provided with three bushings to terminate the incoming and outgoing 11kV, 3 Core cables as the case may be. There shall be minimum 700 mm 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.

The arrangement for earthing the termination point of cables shall form a part of supply and should be of adequate rating. The standard size of 11 kV XLPE cable being used is as specified for load break switches as well as for the tee-off transformer.

The cable mounting arrangement on the load break switches shall be over the trench and no special arrangement is required for installation of the cables and their terminations. These shall enter directly from the cable trench through cable glands in gland plate to the load break switches. The ring type air insulated CTs shall be provided.

All of the cable boxes shall be air insulated suitable for dry type cable terminations. Compound filled cable boxes are not acceptable.

The cable boxes at each of the two ring switches suitable for accepting H.V. cables approaching from below or as per site requirement. The tee-off circuit breaker shall be suitable for either of the following termination arrangements:

- Direct coupling to a transformer flange
- Cable entry from below via a tee-off cable box
- Cable entry from above via a tee-off cable box

The extended function shall be suitable for cable entry from either above or below only.

Double compression type, chrome, plated cable brass glands shall be provided in the gland plate, with

necessary cable clamping and earthing arrangement.

Support frames shall be provided whose height shall be such that cable connections can be conveniently made after allowing for bending radius of cables.

Note: The XLPE, outgoing & incoming 12 kV power cables to LBS are not in the scope of the RMU manufacturer. However, elbow type termination kits for these cables (including two sets, of new cable termination tools) are included in the scope of supply.

- **Testing of cables:**

It shall be possible to test the core or the sheath insulation of the network cables while the RMU remains energized at rated voltage. It shall be preferable to carry out the phase by phase testing through a built-in-facility without necessity to have an access to cable compartment. The maximum test voltage shall be less than 38 kV DC for 10 minutes.

Any cable test access facility which requires the use of an additional loose devise shall not be acceptable

Any switching unit, load-break switch or circuit breaker, shall be able to receive a dedicated device for cable testing, allowing the cable test bench to be connected from the front of the cell without opening the cable compartment. This cable test device must be fully interlocked with the earthing switch.

- **Bushings:**

Bushing shall be homogeneous, free from laminations, cavities & other flaws or imperfection that might affect the mechanical or di-electric quality & shall be tough and impervious to moisture.

Silicon type bushings shall be used.

Bushings shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be subjected.

When operating at normal rated voltage there shall be no electric discharge between the conductors & bushings, which could cause corrosion or injury to the conductors, insulators or supports by the formation of substances produced by chemical action.

All iron parts shall be hot dip galvanized (not less than 75 micron) & all joints shall be airtight. Surfaces of the joints shall be smoothened up. Bushing design shall be such as to ensure a uniform compressive pressure on the joints.

All current carrying contact surfaces shall be sliver plated; silver plating shall not be less than 1 mil in thickness.

The creepage distance of the bushings shall be suitable for condensing type humidity atmosphere atmosphere.

Bushings shall be tested for type tests & routine tests in accordance with stipulation of IS: 2099. Routine as well as type test reports in conformity with above IS shall be furnished to the purchaser.

- **Caution notice.**

Caution name plates shall be provided at all points where such safety requirements are to be met as per Indian Electricity Rules.

- **Safety interlocks:**

Disengagement of a circuit breaker or switch shall not be possible unless it is in open position. Suitable interlocks shall be provided.

The position of the circuit breaker, whether in open or close position shall be indicted through suitably designed fail-safe mechanical indicators.

The operating position of circuit breakers or isolators, either on bus-bar side or for earthing, shall be clearly indicted by a reliable indicating device.

Integral earthing facility, when provided, shall be suitable to make earthing connections only when the associated circuit breaker is in tripped position. The current rating of earthing facility should be commensurate with the short circuit rating of the circuit breaker.

- **Metering, Protection, Indication & Auxiliary Switches**

- **General Requirements for Instruments:**

Multifunctional Measuring instruments, with an accuracy of 0.5S or better shall be of digital type, with minimum 3 line LED display and conforming to relevant IS / IEC & shall be of an approved type & design suitable for tropical climate and condensing type humidity. Measurement shall include voltage, current, pf, kW, kVA, kVAR and neutral current. It shall have RS 485 communication port.

All instruments shall be back connected and instruments cases shall be earthed. The instruments safety factor shall be equal to or less than 5.

- **Protection:**

The protection on the circuit breaker shall comprise the following arrangement:

The Tee-off, Circuit breaker unit fitted with 3 protection CTS of suitable ratio and burden [considering power transformer rating], a low burden trip coil and auxiliary switch assembly allowing the use of a self -powered, numerical relay with an open protocol having three over current and one sensitive earth fault elements. The relay should be housed within a cubicle box, accessible from the front. This relay shall also communicate with Feeder Remote Terminal Unit.

The protection curves and all other settings shall be adjustable in software through lap top, which when viewed from the front clearly show the unit settings. (Note DIL type switches are not acceptable). The protection setting range and minimum pick up current shall be in accordance with the protection of transformer rating. Typically the primary settings may be in the following range:

Overcurrent: 50-200%

Earth Fault: 10-80%

The relay should give local indication of a fault operation and should differentiate between overcurrent and earth fault.

It should be possible for the relay to perform a self-check.

Other auxiliary relays to give trip / alarm [local as well as remote] in case of operation of transformer protections, gas leakage, ON, OFF & Earth status of RMU load break / breaker, spring charged etc. shall be provided.

Besides the requirements of auxiliary switches used by the manufacturer, at least 4 NO + 4 NC shall be provided for the use of the purchaser.

- **Instrument transformers:**

The instrument transformers required for the switchgear shall conform with the respective standards specification.

Voltage Transformers

The Voltage Transformers (VT) shall be of dry compound epoxy insulated. The VT shall be protected on their primary sides by current limiting fuses. On the secondary side, the circuit shall be protected by

MCB′s. Provision shall be so made that the primary fuses can be handled only in the drawn out position.

The particulars of the voltage transformer are:

Type: Cast Resin.

Rated Voltage for 11kV system: $\frac{11000}{\sqrt{3}}$ / $\frac{110}{\sqrt{3}}$ / $\frac{110}{\sqrt{3}}$ Volts

Accuracy Class: 1.0

Burden: 50VA as per requirement

Note: vendor shall design the voltage transformer as per system requirements, and alternate arrangement, if any, shall also be considered.

Current Transformers:

The CT's shall be cast resin ring type, suitable for metering and protection requirements, air insulated and shall be able to withstand the thermal, dynamic and mechanical stresses resulting from the maximum short circuit and short time current rating of the switchgear. CT should be suitable for continuous operation at 130% of its rated current.

CT's shall have polarity marks engraved on each transformer and at the associated terminal blocks. Facility shall be provided for short circuiting and earthing the CT secondary at the terminal blocks by the use of shorting type terminals.

CT ratio, burden, accuracy [1.0 for metering and 5P for protection] and other requisite parameters shall be suitable for the self-powered relay. CT calculations in this regard shall be submitted.

- **Control of the RMU and CSS**

Remote & local operation of the RMU's line switches and Circuit breaker should be provided using motors fitted to the operating mechanism.

The provision of the motors to the mechanism must not in any way impede or interfere with the manual operation of the switches or Circuit breaker.

The vendor shall provide all necessary equipment for remote control and monitoring of the RMU including other important equipment items in CSS.

- **Fault Circuit Indicator**

To pinpoint the faulty section between a number of series connected, load break switches, of RMU's a Fault Circuit Indicator (FCI) shall be provided with each RMU.

This indicator shall operate for earth faults and phase to phase short circuits between any two RMU's.

The indicator should be suitable for use on 12 kV & 33kV RMU's in an open ring main system. In case of fault in a cable section between two RMU's. It shall be possible to pin point the faulty section and communicate with Feeder Remote Terminal Unit for automatic faulty cable isolation and supply restoration.

The FCI supplied should be complete in all respects, with all the necessary components e.g. LED lamp, Fault Indicator Unit, CTs cabling etc. and shall form part of RMU. It shall be with display to indicate current loading & type of fault.

Since RMU's shall be SCADA compatible, the FCI indications shall also be displayed on the central control room. Therefore these FCI's shall have additional provision for remote indication besides local indication.

FCI shall be of proven type and in the manufacturing range of RMU supplier.

- **Feeder Remote Terminal Unit (FRTU) For RMU**

Make of FRTU shall be same as that of the RMU manufacturer. It shall have peer to peer communication and with the remote switchgear / SCADA at the controlling substation through fiber optic cable to initiate the required switching operations.

- **Main Requirements:**

FRTU cubicle shall be equipped to meet the following main requirements for RMU. It shall be possible to mount it on wall if required.

❖ Monitoring and control of 33kV or 11kV LBS and VCB feeders
❖ In conjunction with FCI, detection and isolation of faulty cable for phase to phase and phase to earth cable short circuits and automatically ensure supply restoration in less than 60 seconds.
❖ Multifunction measurements.
❖ Transmit data to the remote control center.
❖ The system shall have necessary redundancy in communication.
❖ To incorporate self-healing grid logic for faster restoration of supply even in the absence of control center SCADA.
❖ Data storage.
❖ Provision for Maintenance
❖ FRTU shall be capable to monitor and control 3 Way RMU.
❖ Chronological time stamped event recording.
❖ Data storage, in the event of mains failure, shall be for at least 8 hours. The
❖ Minimum storage shall be for about 40000 events.

➢ **Control unit:**

Control Unit shall perform all the required control and monitoring functions as isolated unit or as part of RMU and shall be equipped with a remote and local control mode switch on its front panel.

- **Operation in Local Mode:**

❖ Transmission of data for remote measurements and time-stamped events shall not be disturbed.
❖ Opening and closing operation after validation.
❖ Inhibition of opening / closing from remote.
❖ Operation in Remote Mode:
❖ Transmission of measurements and time stamped events.
❖ Local electrical control shall get blocked.
❖ Opening and closing operation from remote control center.

All data shall be available locally on the front panel of the enclosure and remotely from the control centers. LBS / breaker open and close status can be had from the front mimic of FRTU respectively with the green / red LED indication. It shall be possible to retrieve and display the time-stamped events recorded at the enclosure locally as well as at the remote control Centre on a lap top computer.

➢ **Power Supply:**

Compact, built in sealed for life 12V battery with a long life and no maintenance of any kind for 5 to 7 years or more along with charger of stand-alone RMU supply arrangements shall be made by manufacturer is to be provided in the unit. The supply shall be conditioned to provide power at required voltage for motor operation and communication for local and remote SCADA. The transmission output shall be able to supply a conventional radio [without battery power of RTU] to inform the remote control center of a battery failure. Power from the unit shall be sufficient to supply control power to all the switch cubicles in the CSS, radio and the electronics in the enclosure. The standby power unit shall be with a minimum autonomy of at least 8 hours for 10 opening and closing cycles. The battery shall be checked at regular intervals by the slave station and an alarm shall be generated and transmitted to the remote control center in the event of a fault. The unit shall be protected against overvoltage and over loads.

➢ **Time-tagged data archiving:**

All the archived data shall be retrieved locally and remotely by means of the configuration and operating software supplied with the control unit. The data shall also be downloaded locally or remotely to a PC as a .CSV file.

Event and measurement time-stamping shall be accurate to one millisecond [ms] and the discrimination between two events shall be 10 ms.

- **Communication with the remote control center:**

FRTU shall have IEC 870-5-101 / 104 protocol to transfer information to control center SCADA and Modbus protocol to communicate with field MFM [Multifunction Meters] on RS485. The Modbus protocol shall be open. Security & communication package provider shall only lay the fiber optic cable for the same and further connections, repeaters, boosters and any other communication equipment shall be included in the scope of supply.

It shall be possible to configure each measurement to be transmitted spontaneously to the remote control center with 100% redundancy. Failure of one channel should have an automatic changeover to second channel.

Data shall be configured using a PC connected to the control unit via an Ethernet and / or USB port. It shall also be possible to configure data remotely

- **Software:**

The software shall not require a special license and it can be used and copied freely.

- **Indications**

The slave stations shall process at least the following information for remote indication and for local display purposes:

- Open / closed position of each LBS
- Earth status
- Absence of AC voltage,
- Local / remote control operating mode,
- Detection of phase-to-phase or earth fault current flow,
- Load current measurement
- Charger fault
- Battery fault
- motor drive DC supply fault
- Internal fault
- Detailed diagnosis of the status of the uninterruptible power supply (charger, batteries).
- Indications for LT side status of switches, alarms as required.

- **Erection / construction / Operating Tools and Tackles**

Each RMU will be provided with operating lever and other such equipment which are necessary for the normal operation of the equipment. It should also include any spring charging handles for the manual charging of closing springs. The tenderer shall separately list out in the tender in the given schedule, sets of tools required for initial erection/construction and subsequent maintenance. The price of those should be included in the cost of equipment.

An anti-reflex mechanism on the operating lever shall prevent any attempts to reopen immediately after closing of the switch or earthing switch. All manual operations will be carried out on the front of the switchboard.

The effort exerted on the lever by the operator should not be more than 250 N for the switch and circuit

breaker.

The overall dimensions of the RMU shall not be increased due to the use of the operation handle. The operating handle should have two workable positions 180 deg C apart.

- **Mimic Diagram:**

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 indicted in the mimic diagram. The manufacturer's plate shall include the switchboard's main electrical characteristics.

- **Labels and Marking of Connections:**

All apparatus, control gear and the apparatus mounted thereon shall be clearly labelled, indicating where necessary, their purpose and the 'ON' 'OFF' and 'EARTH' position. The labels shall be clearly lettered on enamelled surface or other approved materials. Brass should not be used for labels. Each phase of alternating current and connections shall be coloured to distinguish phases, neutral and earth. The colouring shall be red, yellow, blue, black and green respectively.

- **Bus Bars:**

Bus bars shall be of uncoated tinned conductor grade electrolytic copper.

The tenderer shall furnish calculations establishing thermal and dynamic adequacy of bus bar sizes with reference to its short circuit ability. The bus bar shall be integrated completely into the gas filled compartment including the coupling chambers between two adjacent modules.

The insulating ability of the entire bus bar system should be monitored along with the gas filled cladded compartment of the module. The bus bar size shall be so chosen so as to limit the current density to within permissible limit and if the fault current restricts the current density less than that, then lesser density shall be used. Calculations shall be submitted for this purpose.

- **Temperature rise:**

The temperature rise and the maximum temperature on any part of the equipment when in service at site under continuous full load condition or under short circuit shall not exceed the permissible limit as per relevant IEC or IS: 13947. This shall not be exceeded when corrected for the difference between the ambient temperature at site and the ambient temperature specified in the relevant standard

- **RMU Indications:**

Indication of spring charge, ON, OFF trip etc shall be provided by means of LED which shall be fed from control supply arrangement designed by vendor If LED's are provided, the indicating lamps shall have covers of following colours.

Red : Closed position of breaker/ load break switch
Green : Open position of breaker /load break switch
Blue : Spring charge condition of breaker / load break switch
Amber : Auto tripped position of breaker
Yellow : Earth position

- **Terminal boards and Secondary Wiring:**

Connection to switchgear, operating mechanism indicating relays and all instruments shall be deemed to form a portion of equipment of panel.

Panel connections shall be insulated and shall be healthy and securely fixed to back of the panel. The wiring must run on porcelain or non-rusting metal cleats or metal flexible tubes as may be approved by

MITL. All wiring in the vicinity shall be insulated and shall run in non-rusting flexible tubes from terminal boards conveniently situated. All control connections instruments and relay wires shall be

Provided with numbered ferrules at each terminal and the numbering shall be in accordance with an approved system. All wiring diagrams shall be clearly marked with the numbers corresponding with those on the ferrules of the individual cores.

Each set of current and voltage transformer secondary connection shall be complete and shall be earthed at one point only. Each such earthing shall be made through links which can be opened for insulation testing.

All the internal control wiring shall be through fire-resistant tinned stranded copper wires of 1.5 mm2 and for CT circuits these shall be with 2.5 mm2. The strands in the copper wire shall not be less than 48.

The CT circuits shall be provided with isolating type of links, to check the current in the CT circuits during testing. Similar it shall be possible to isolate PT's without disconnecting wires to check & test the meters. All CTs must have provision for shorting through link.

The air insulated control cabinet shall have provision for lighting.

As the equipment is to be installed in a tropical and humidity zone, the air insulated control cabin shall be provided with suitable space heater of PTC type.

- **Type and routine tests**

All the routine and type tests shall be carried out as per relevant IEC / Indian Standard. For type test certificates MITL may consider test certificates at its absolute discretion.

All the routine tests on the switchboard shall be witnessed by the MITL or its authorized representative.

The following type & routine test certificates shall be supplied / carried out on the RMU:

- Impulse withstand test
- Temperature-rise test
- Short-time withstand current test
- Mechanical operation test
- Checking of degree of protection
- Switch, circuit breaker, earthing switch making capacity.
- Switch, circuit breaker breaking capacity.
- Internal arc withstand test.
- Checking of partial discharge on individual components.

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 & times
- Measurement of operating torque
- Checking of filling pressure
- Checking of gas tightness
- Checking of partial discharges on individual components
- Dielectric testing and main circuit resistance measurement

All of the major type tests shall be certified by an independent authority and an internationally acceptable test house for the tests carried outside the country of manufacture.

- **Configuration of Ring Main Unit**

Each non / extendable ring main unit shall comprise of three or four configuration, with a continuous bus bar, SF6 insulated, sealed for life, CTs and PTs as per requirement, pad locks for locking with a universal key, complete in all respects.

The main items of RMU are given below any other item not specifically mentioned but required for the successful operation of the equipment shall be deemed to be included without any financial liability to purchaser.

Each load break switch panel shall be equipped with rating of 36kV or 12 kV, 630 Amps. 20kA / 3s, Gang operated, SF6 insulated, manual / motor operated, fault making, load breaking switch, along with associated bus bars, CTs, PTs [as required] and the same shall consist of the following main items:

Metal clad in door type weather proof housing.

- 12 kV, 630 Amps, fault making, .load breaking, manually / motor operated, self-aligning, gang operated.
- One set of 630 Amp, bus bar as specified.
- Isolating plug & socket for main & auxiliary contacts if required.
- Mechanical interlocks to prevent switching on with cable in earthed position.
- One set of triple pole gang operated cable earthing contacts.
- Load Current measurement.
- Air Insulated cable box for Cable end termination suitable for 3 core, 12 kV, XLPE armored cable of specified size, with AL conductor, along with glands, suitable Gland plate and Cable support.
- Mechanical On/Off/Earth/Test Indicators.
- Cable Testing Sockets
- Capacitive Voltage indicator lamps.
- Cable clamps
- Feeder Remote Terminal Unit [FRTU]
- Fault Circuit Indicator along with CTs.
- Indicating lamps & auxiliary contacts.
- Auxiliary relays (if required).
- Interlocked earthing arrangement.

Tee-off Circuit Breaker Panel, with SF6 insulation, suitable for transformer feeder shall be equipped with minimum 12 KV, upto 630 Amps, 20 kA, for 3 sec rated circuit breaker with associated C.Ts, PTs, spring operated mechanism, bus bars, compete with instruments, relays, terminal blocks. It shall comprise of the following main items:

- Metal clad / indoor type weather proof housing
- Vacuum circuit breaker, trip free
- One set of 630 Amps. Bus bars (integral part with load break bus bar).

- CTs for protection & Metering to match the transformer – 3 Nos.
- 3-overcurrent & one earth fault IDMT relays, direct operating.
- Termination suitable for connection to 11/0.433 kV transformer of specified rating.

➢ **Multifunction meter:**

- P.T. 11000/ √3 - 110/ √3 - 110/√3, as required.
- On/Off indicator
- Mechanical interlocks
- Tripping, closing coils.
- Indication lamp & spare auxiliary NO/NC contacts.
- Auxiliary relays for alarm and trip for transformer protections
- Earthing arrangement duly interlocked.
- Mechanism with spring charging motor.

The common system for the above shall consist mainly of:

❖ Channels, nuts, bolts, glands, gland plates, inter connecting arrangement of teeoff breaker with transformer, cable termination kits & supporting arrangement of cable, with the load break switches etc.

❖ Gas monitoring device for sealed gas unit.

❖ Pad locks for locking the panels.

❖ Handles for normal operation, spring charging & other tools required for normal operation.

❖ Arrangement of control supply for breaker / load break closing / tripping, motor charging indications etc.

❖ All the necessary indicating lamps.

❖ SF6 pressure monitoring unit.

❖ Analysis unit for dielectric monitoring of SF6 gas.

❖ Any other item not included above but required for the operation shall be deemed to be included though specifically not mentioned, without any financial liability to purchaser.

❖ Any other item mentioned in text or any other item required for successful operation but not included here shall be deemed to be included.

11. DRY TYPE TRANSFORMER

i. General

The distribution transformer in CSS shall be indoor Dry Type (VPI) Transformer, complete with all accessories / fittings and spare parts as specified herein.

Three-phase transformers shall be Dry Type (VPI), class F insulation system with natural (AN) cooling for indoor installation, for use in three-phase HV/LV distribution systems.

- Technical Datasheet

S.No	Description	Technical Data	
1.	Rated KVA	As per CSS Rating	
2.	Number of phases	Three	
3.	Type of installation	Indoor	
4.	Frequency	50	
5.	Cooling medium	AN	
6.	Rated Voltage		
	High voltage winding	11 kV (DELTA)	
	Low voltage	0.433 kV (STAR) with Neutral	
7.	Highest Continuous System Voltage		
	High Voltage	12kV	
	Low Voltage	0.440kV	
8.	Method of System Earthing		
	High Voltage	Unearthed	
	Low Voltage	Solidly grounded	
9.	Type of tap changer	OFF CIRCUIT GANG OPERATED	
10.	Range of tapping	+5% to -5% with 5 steps of 2.5% on 11 kV side	
11.	Impedance at rated KVA : As per relevant IS at 75°C	As per relevant IS	
12.	Insulation and level	HV	LV
	Type of insulation	Uniform	Uniform
	One minute power frequency withstand test voltage (kV)	28	3
	Impulse withstand test voltage (kVp)	75	8
13.	Winding Connection	Delta (HV), Star (LV)	
14.	Material	Aluminium	
15.	Vector group	Dyn-11	
16.	Terminal details		
17.	HV Termination	Suitable for tee-off Breaker of RMU	

	LV Termination	Suitable for phase and neutral connection between transformer and LT board through an insulated copper bus bar or a sand witched copper bus bar enclosed in a non-segregated bus duct. The size of the neutral bus shall be same as phase bus.
18.	LT Neutral earthing	A separate Neutral point to be provided for earthing.
19.	Minimum Clearance in Air	11 kV & 0.433 kV
	Phase to phase (mm)	As per IEC
	Phase to earth (mm)	As per IEC
20.	Design Ambient temperature	50oC
21.	Maximum Temperature Rise of winding over an ambient of 50°C and 1000m altitude, not to exceed 90°C Maximum Temp of insulation	150°C
22.	Over load capacity	As per IEC
23.	Noise level at rated voltage & frequency	As per NEMA Pub. Tr-1

- Transformer Losses

  The guaranteed losses of the transformer shall not exceed as given in the Energy Conservation Building Code [ECBC], as per latest guidelines of the Bureau of Energy Efficiency [BEE] for the required rating of distribution transformer or as per the Bureau of Indian Standards [BIS] for transformers having energy efficiency level-3. Transformers not complying with BEE / BIS loss guidelines shall not be accepted. The guaranteed values of no load losses and load losses shall be stated in the bid and these shall be firm.

- Performance

  Transformer shall be capable of withstanding for two seconds the short circuit at its terminals as per requirements of IS-2026 without any damage. Source short circuit power on the primary of the 11/0.433 kV transformer shall be assumed as 500 MVA for the short circuit capability of the transformer. The thermal ability withstand due to short circuit shall be demonstrated by calculation.

  The maximum flux density in any part of the core and yoke at normal voltage and Frequency shall be such that the flux density under 10% over voltage condition shall not exceed 1.9 Tesla.

  Transformer shall, under exceptional circumstances, due to sudden disconnection of the load, be capable of operating at the voltage approximately 25% above normal rated voltage for a period of not exceeding one minute and 40% above normal for a period of 5 seconds.

  The transformer may be operated continuously without danger on any particular tapping at the rated KVA +/-10% of the voltage corresponding to the tapping.

- Miscellaneous

  Complete hardware for fixing the transformer as a part of packaged RMU substation shall be provided whether specifically mentioned or not.

ii. Environment: Climatic, Environmental and fire resistant Requirements

- As the equipment is to be installed in humid atmosphere the equipment and material provided must resist the corrosion likely to occur in any case.
- Further the transformer must comply to the following class requirements of clause 13 of IS 2026-11 / IEC 60076- 11.
- Class C1: Operation, transportation and storage at ambient temperature as low as - 5^{o}C
- Class E2: Frequent condensation combined with high pollution.
- Fire Class F1: Limited flammability, Self-extinguishing of the fire and to be free from halogens, emission of toxic gases, and minimum of thick smoke.
- The above classes will be indicated on the rating plate.
- Note: The manufacturer must produce a test report, complying to above clauses as per test procedure of IEC-60076-11. Test report shall be from an accredited laboratory acceptable to MITL, for a transformer of the same design.
- Name Plate: Transformer rating plate in English and Hindi language shall contain the information as given in Clause 15 of IS: 2026 (Part-I) / IEC 60076-11. The details on rating plate shall be finalised during the detailed engineering.

iii. General Technical Requirements

Dry type transformer will be manufactured in accordance with a quality system in conformity with ISO 9001 and complying to latest version of IEC 60076-11 Environmental management system is to be in conformity with ISO 14001, which shall be certified by an independent recognized organization

acceptable to MITL.

iv. Codes & Standards

Sr.No.	Standard Number	Description
1.	IS: 5	Colour for ready mixed paints and enamels.
2.	IS: 104	Ready mixed paint, brushing, zinc chrome Priming
3.	IS: 2026- [Part 1 to 11]	Transformers
4.	IS: 1180	Outdoor type three phase distribution transformer
5.	IS: 1271	Thermal evaluation and classification of Electrical Insulation
6.	IS: 1363	Hexagon head bolts, screws and nuts of Product grade C
7.	IEC: 60076-11	Dry Type Transformers
8.	IS: 2016	Plain washers
9.	IS: 2026 (Part I to IV)	Specification for Power Transformers
10.	IS: 2071	Method of high voltage test techniques
11.	IS: 2074	Ready mixed paint, air drying, red oxide-zinc chrome, primary
12.	IS: 2099	High voltage bushing for alternating voltage above 1000 V.
13.	IS: 2633	Methods for testing uniformity of coating of zinc coated articles
14.	IS: 2932	Enamel, synthetic, exterior (a) undercoating (b) finishing
15.	IS: 3043	Code of practice for earthing
16.	IS: 3347	Dimensions for transformer Bushings
17.	IS: 3639	Fittings and accessories for power transformers
18.	IS: 4257	Dimension for clamping arrangements for porcelain transformer bushings
19.	IS: 5216	Guide for safety procedures and practices in electrical work
20.	IS: 5561	Electric power connectors
21.	IS: 7421	bushing for alternating voltage upto and including 1000 V.
22.	IS: 10028	Code of practice for selection, installation and maintenance of transformers.
23.	IS: 12360	Voltage bands for electrical installation including preferred voltages and frequency.
24.	C.B.I.P. Publication	Manual on Transformers

The equipment complying with other internationally accepted standard may also be considered if they ensure performance superior to the Indian Standards.

v. Drawings

The vendor shall furnish, the following drawings / documents incorporating name of project and transformer rating for approval.

Detailed overall general arrangement drawing showing front and side elevations and plan of the transformer and all accessories including external features with details of dimensions, spacing of wheels in either direction of motion, net weights and shipping weights, crane lift for un-tanking, size of lugs and eyes, bushing lifting dimensions, clearances between HV and LV terminals and ground etc.

- Foundation plan showing loading on each wheel and lifting lugs.
- GA drawings / details of bushing and terminal connectors.
- Name plate drawing with terminal marking and connection diagrams.
- Wheel locking arrangement drawing.
- Transportation dimensions drawings.
- Interconnection diagrams both on HV & LV sides.
- Over fluxing withstand time characteristic of transformer.
- Technical leaflets of major components and fittings.
- As built drawings of schematics, wiring diagram etc.

- Setting of winding temperature indicator.
- Completed technical data sheets.
- Details including write-up of tap changing gear.
- H.V. bushing.
- Bushing Assembly.
- B-metallic connector for connection to specified conductor / bus-bar /in bus-duct.
- Assembly.
- wo earthing terminals & core earthing
- Thermometer pockets
- Inspection cover

All drawings / documents, technical data sheets and test certificates / results / calculations shall be furnished.

vi. General Constructional Features

- All material used shall be of best quality and of the class most suitable for working under the conditions specified and shall withstand the variations of temperature and atmospheric conditions without distortion or deterioration or the setting up of undue stresses which may impair suitability of the various parts for the work which they have to perform.
- Similar parts, particularly removable ones, shall be interchangeable.
- Screws, studs, nuts and bolts used for external connections shall be as per the relevant standards. Bolts and nuts exposed to atmosphere shall be of stainless steel.
- Exposed parts shall not have pockets where water can collect due to moisture or otherwise.
- Labels, indelibly marked, shall be provided for all identifiable accessories. All label plates shall be of in-corrodible material.
- All internal connections and fastenings shall be capable of operating under overloads allowed as per specified standards without injury.
- Transformer and accessories shall be designed to facilitate proper operation, inspection, maintenance and repairs.
- No patching, plugging, shimming or other such means of overcoming defects, discrepancies or errors will be accepted.
- The galvanizing if required shall be of minimum 610 gm zinc per square meter and it should be hot dip galvanized.

vii. Painting [as applicable]

- The structural steel work shall be cleaned of all scale and rust by shot-blasting. Steel surfaces exposed to the weather shall be thoroughly cleaning and have a priming coat of zinc chromate applied. The second coat shall be of a glossy oil and weather resisting non fading, paint of shade No. 631 as per IS: 5.
- Metal parts not accessible for painting shall be made of corrosion resistant material. All paints shall be carefully selected to withstand heat, rain, hot humid atmosphere and extremes of weather. The paint shall not scale off or crinkle or be removed by abrasion due to normal handling.
- In case finish paint chips off or crinkle during transit or installation, the vendor shall arrange for repainting transformer at site at his cost. The paint for repainting shall be supplied by the vendor.

viii. Under Carriage

The transformer shall be supported on non- corrosive steel structure with forged steel flanged wheels suitable for moving the transformer completely. Wheels shall be provided with suitable bearings which

will resist rust and corrosion and shall be equipped with fittings for lubrication.

ix. Magnetic Core

The magnetic circuit shall be constructed from prime quality high grade cold rolled, nonageing, grain oriented silicon steel lamination. The manufacture shall submit the following documents to prove only Prime quality Core are used:

- Invoice of the supplier
- Mill's test Certificate
- Packing list
- Bill of loading
- Bill of entry certificate to custom
- The manufacturers shall indicate whether they have in-house core cutting facilities or not, if not, they shall indicate place of cutting.
- To reduce the noise produced by the magnetic core, it is to be equipped with noise-damping devices.
- To reduce the no-load losses, the magnetic core is to be stacked using overlapping interlocking technology.
- The laminations shall be free of all burns and sharp projections. Each sheet shall have an insulating coating.
- The insulation structure for the core to bolts and core to clamp plate shall be such as to withstand a voltage of 2000 V for one minute.
- The completed core and coil shall be so assembled that the axis and the plane of the outer surface of the core stack shall not deviate from the vertical plane by more than 25 mm.
- All steel sections used for supporting the core shall be thoroughly shot or sand blasted, after cutting, drilling and welding.
- The finally assembled core with all the clamping structures shall be free from deformation and shall not vibrate during operation.
- The core clamping structure shall be designed to minimise eddy current loss.
- The core shall be carefully assembled and rigidly clamped to ensure adequate mechanical strength.
- The core shall be provided with lugs suitable for lifting the complete core and coil assembly.
- The design of magnetic circuit shall be such as to avoid static discharges, development of short circuit paths within itself or to the earthed clamping structure and production of flux component at right angle to the plane of the lamination which may cause local heating. The construction is to be of 'core' type.

x. Internal Earthing

- All internal metal parts of the transformer, with the exception of individual laminations, core bolts and their individual clamping plates shall be earthed.
- The magnetic circuit shall be connected to the clamping structure at one point only and this shall be brought out. A dis-connecting link shall be provided on transformer to facilitate disconnections from ground for IR measurement purpose.
- Coil clamping rings of metal at earth potential shall be connected to the adjacent core clamping structure on the same side as the main earth connections.

xi. Winding

- LV windings

  The LV winding shall be of Aluminium foils in order to cancel out axial stress during short circuit. This foil will be insulated between each layer using a heat-reactivated class F preimpregnated epoxy resin film including the ends of the winding. The whole windingassembly is to be polymerized at suitable temperature to ensure high level of resistance environment and to have excellent dielectric strength.

- HV windings

  HV winding shall be separated from the LV winding to give an air gap between the MV and LV circuits for easy maintenance.

  HV winding shall have linear potential gradient from top to bottom to have low stress between adjacent conductors, with high dielectric strength and low partial discharge.

  HV winding shall be of Aluminium wire with class F insulation cast in vacuum with fire proof / flame retardant epoxy resin.

  The interior and exterior of the windings will be reinforced with a combination of glass fibre or similar material to provide thermal shock withstand.

- HV winding support spacers

  Winding support spacers are meant to provide sufficient support in transport, operation, short circuit and earthquake conditions.

  These spacers will be circular in shape for easy cleaning. They will give an extended tracking line to give better dielectric withstand under humid or high dust conditions.

  These spacers will include an Elastomer cushion that will allow it to absorb expansion as peer load conditions. This Elastomer cushion will be incorporated in the spacer to prevent it being deteriorated by air or UV.

- HV Connections

  The connections shall be of copper and made from the top to give a safe and neat connection. A terminal plate shall be provided.

  The HV connections will be made from the top connection bars. Each bar will be drilled with a hole for connection of cable lugs on terminal plates.

  The HV connection bars will be in rigid copper bars protected by heat shrinkable tubing.

  HV connections in cables are not allowed, in order to avoid all risk of contact, due to cables flapping.

  Depending upon the design of the manufacturer the arrangement shall be approved by the MITL.

- LV Connections

  The LV connections with copper bars will be made from top of coils on the opposite side to the HV connections.

  Connection of the LV neutral will be directly made to the LV terminals between the LV phase bars. There shall be a separate earth point connected to neutral.

  Depending upon the design of the manufacturer the arrangement shall be approved by the MITL.

xii. Transformer Thermal and Overload Protection

PTC type sensors [minimum 6] shall be placed in the winding to measure the winding temperature.

The transformer shall be equipped with an overload and thermal protection device with sensors to continuously monitor the LV and HV winding temperature for each phase. Digital monitoring thermometers shall be installed locally in the CSS on LV Board, with a provision for monitoring the temperatures at remote SCADA. Necessary alarms and trip contacts along with warning LEDs shall be provided to protect the transformers from high temperature.

Sensors shall be so placed that it shall be possible to replace the same very easily. All sensors along with enclosures, digital thermometers, transducers, sensing relays, connecting leads, etc. complete in all respects shall be in the scope of supply. For this purpose Security & Communication vendor shall lay a fibre optic cable from CSS to SCADA control Centre, termination of which to such devices shall be in the scope of vendor.

Provision shall be made that In case of fire the transformer circuit breaker should be tripped.

xiii. Off Circuit Tap Changer

There shall not be a bolting arrangement for selecting the taps and shifting the copper bars. Instead the off circuit tap changer shall be operatable by means of an operating handle / ring brought out-side the tank operable from ground level. It shall be equipped with an indicating device to show the tap in use and shall be provided with a locking arrangement to lock the switch in position. The arrangement shall be such that an operator can change the tap while standing at ground level with complete ease. There shall be separate cover for tap changer.

xiv. Safety of Personnel

Transformer shall be properly fenced/protected in case the maintenance personnel are likely to come near the live parts while carrying out normal maintenance or monitoring activities near the transformer.

xv. Fittings

The following fittings shall be provided on the transformers:

Separate LV neutral point, with two joined points for double earthing of neutral along with tinned copper strip compatible to transformer short circuit current rating for earthing.

xvi. One danger Plate

Temperature indicating device, sensors etc. complete in all respects with contacts for remote/ local indication.

Lifting eyes or lugs for the top cover, core and coils and for the complete transformer.

Platform lugs / haulage lugs on under carriage.

xvii. Marshalling box.

Rating and connection diagram plate.

Two numbers earthing terminals on opposite sides, associated nuts, bolts and tinned copper earth strip of suitable section for connections to purchaser’s grounding strip.

4 bidirectional rollers.

Thermal and overload protection devices and equipment, along with necessary transducers, sensors etc. for local and remote SCADA indication, Alarm / trip contacts, LED indicators complete in all respects.

Note: The fittings listed above are indicative and any other fittings which are generally required for satisfactory operation of the transformer are deemed to be included in the quoted price of the transformer.

xviii. Radio Interference and Noise Level

Transformers shall be designed with particular care to suppress at least the third and fifth harmonic voltages so as to minimise interference with communication circuits. Transformer noise level, when energised at normal voltage and frequency shall be as per NEMA stipulations.

xix. Mandatory Spare Parts

The mandatory spare parts shall be included in the offer along with costs.

xx. Recommended Spare Parts

vendor shall provide a list of recommended spare parts for 5 years operations.

xxi. Tests

The Transformers shall be completely factory tested before despatch in accordance with the standards and with such other tests as may be necessary to ensure that the equipment is satisfactory and is in accordance with this specification.

− Routine Tests

Transformer routine tests shall include tests stated in latest issue of IS: 2026 / IEC 60076-11. These tests shall also include but shall not be limited to the following:

• Measurement of winding resistance.

• Voltage ratio on each tapping and check of voltage vector relationship.

• Impedance voltage at all tapping.

• Magnetic circuit test

• (After routine tests, each core shall be tested for 1 minute at 2 kV between all bolts, side plates and structural steel work. Immediately prior to the despatch of the transformer, the magnetic circuit shall be pressure tested for 1 minute at 2 kV A.C. between the core and the earth).

− Load losses.

− No load losses and no load current.

• Absorption index i.e. insulation resistance for 15 seconds and 60 seconds (R60/R15) and polarization index i.e. Insulation Resistance for 10 minutes and one minute (R10 mt/R1 mt).

− Separate source voltage withstand test (applied potential).

− Induced voltage test.

− Measurement of partial discharges.

Partial discharges less than or equal to 10 pC at 1.30 Un, or

Partial discharges less than or equal to 5 pC at 1.30 Un (Special test)

− Measurement of acoustic noise level.

− Measurement of Zero sequence impedance.

All routine and type tests should be done free of cost. If it is to be done on the cost basis, the same may be indicated in the schedule of price and delivery and this will be taken into account for evaluation of prices.

When transformers are equipped with a protection enclosure, these shall be tested in their enclosure.

Moreover, in addition to the routine tests, the transformer shall be subjected to the following type tests:

− Lightning Impulse Test

This test shall be carried in accordance with clause 12 of the latest issue of IS: 2026 (Part-III). The

vendor shall quote separate price for lighting impulse test on HV and LV windings. (one limb only).

− Temperature Rise Test

The temperature rise test shall be carried out in accordance with IS: 2026 /IEC-60076. The Temperature rise shall not exceed the values as in the IS: 2026 / IEC 60076-11

− Noise Level Test:

It shall be carried out as per IEC-60076-10

− Environmental and Firefighting tests

Certificates for tests carried out for Compliance to Class C1, E2 and F1 as per IEC 60076-11.

− Short Circuit Test

It shall be carried out as per IEC 60076-5. Alternatively employer at its discretion can ask for calculations instead of actual test.

− Test Waiver, Procedures and Costs

The MITL, at his option, may waive impulse tests, provided type test reports of impulse tests, carried out on essentially identical units in their factory in India or at an accredited lab overseas, during the last three years are furnished by the manufacturer and are acceptable to MITL.

No load losses and exciting current shall be measured at rated voltage, rated frequency and at 90% and 110% of rated voltage, both before and after the lightning impulse tests.

The method of test loading shall be described in the test report for determination of both average and hottest spot temperature. Where the winding temperature equipment are specified, data shall also be included for calibration of hottest spot temperature indicator.

Resistance of each winding of each phase shall be measured at principal and at all the taps and corrected to 75^0C.

Impedance voltage shall be measured at principal and at all taps.

No load Loss Measurement at 415 Volt.

The vendor shall indicate separately the cost of each of the following type tests:

Lightning impulse test separately for HV and LV winding.

Temperature rise test.

− Test on Associated Equipment

Bushings, Transformer thermal and overload protection devices, sensors, digital thermometers, OFF LOAD tap changer, control devices, and other associated equipment shall be tested by the vendor in accordance with relevant IS or IEC. If such equipment are purchased by the vendor, he shall have them tested to comply with these requirements.

− Test Measurements

Certified test report and oscillograms shall be furnished to the MITL for evaluation as per the schedule of distribution of documents. Manufacturer′s Test Certificates in respect of all associated auxiliary and ancillary equipment shall be furnished. The vendor shall state in his proposal the testing facilities available at his works. In case full testing facilities are not available, the vendor shall state the method proposed to be adopted so as to ascertain the transformer characteristics corresponding to full capacity testing.

− Witnessing of Tests

The MITL reserves the right to witness any or all tests. If required, visits can be made to the works of manufacturer to ensure that the approved quality ensuring programme is being followed. In this regard all the necessary facilities shall be arranged by manufacturer at his end and cost borne by the vendor.

− Site Tests

After the transformer is installed, the following pre-commissioning tests and checks shall be done before putting the transformer in service.

Visual checks for connections etc.

Dry out test

PI / Resistance measurement of windings

Ratio test

Tap changer test

Temperature Indicators & alarms

Magnetising current

Earth connections are made.

− Rejection

The MITL can reject any transformer if during tests or service any of the following conditions arise:

No load loss exceeds the guaranteed value.

Load loss exceeds the guaranteed value.

Impedance value exceeds the guaranteed value by ± 10% or more.

The difference in impedance values of any two phases during single phase short circuit impedance test exceeds 2% of the average value guaranteed by the vendor.

Winding temperature rise exceeds the specified value.

Transformer fails on impulse test.

Transformer fails on power frequency voltage withstand test.

Transformer is proved to have been manufactured not in accordance with the agreed specification.

xxii. Instructions Manual

Six sets of the instruction manuals shall be supplied at least four (4) weeks before the actual despatch of equipment. The manuals shall be in bound volumes and shall contain all the drawings and information required for erection/construction, testing, operation and maintenance of the transformer. The manuals shall include amongst others, the following particulars:

Marked erection/construction prints identifying the components, parts of the transformer as despatched with assembly drawings.

Detailed dimensions, assembly and description of all auxiliaries.

Detailed views of the core and winding assembly, winding, connections and tapping's, tap changer construction etc. These drawings are required for carrying out overhauling operation at site.

Salient technical particulars of the transformer.

Copies of all final approved drawings.

Detailed O&M instructions with periodical check lists etc.

xxiii. Completeness of Equipment

All fittings and accessories, which may not be specifically mentioned in the specification but are necessary for the satisfactory operation of the equipment, shall be deemed to be included in the specification. These shall be furnished by the vendor without extra charges. The equipment shall be complete in all details, whether such details are mentioned in the specification or not.

All deviations from this specification shall be separately listed under the requisite schedules, in the absence of which it shall be presumed that all the provisions of the specifications are accepted by the vendor.

Tools & Tackles

All the necessary tools and tackles required for the normal operation shall be supplied by the vendor.

12. LV SWITCHBOARD FOR COMPACT SUB-STATIONS

i. General

The LV switchboard for CSS shall be indoor 3-Phase, 4-wire, 440 V, 50 HZ, neutral solidly grounded, complete in all respects including base channels, foundation bolts and other hardware for various packaged RMU distribution sub-stations.

ii. Codes & Standards

The equipment covered in these specifications shall conform to the latest revisions / replacements of the following Indian Standard Specifications. The equipment complying with other internationally accepted standards shall also be considered, if they ensure performance equivalent to or superior to Indian Standards.

Sr.No.	Standard Number	Description
1.	IS: 5	Colour for ready mixed paints and enamels.
2.	IS: 722	AC Electricity Meters
3.	IS: 1554	PVC insulated (heavy duty) electric cables
4.	IS: 2147	Degrees of protection provided by enclosures for Low voltage switchgear and control gear
5.	IS: 2419	Dimensions for panel mounted electrical indicating & recording electrical instrument
6.	IS: 2551	Danger notice plates
7.	IS: 2633	Methods for testing uniformity of coating of Zinc coated articles
8.	IS: 2705	Current Transformers
9.	IS: 3156	Voltage Transformers
10.	IS: 3231	Specification for electrical relays for power system protection
11.	IS: 4237	General requirements for Switchgear & Control gear for voltage not exceeding1000 volts.
12.	IS: 4794	Push buttons
13.	IS: 5082	Wrought aluminium and aluminium alloy bars rods, tubes, sections plates, sheets for electrical application
14.	IS: 5578	Guide for making of insulated conductors
15.	IS: 6005	Code of practice for phosphate coatings of iron and steel (First Revision)
16.	IS: 6875	Control switches (switching devices for control and auxiliary circuit including vendor relays) for voltages up to and including 1000 V AC and 1200 V DC
17.	IS: 8623	Low voltage Switchgear and Control gear assemblies
18.	IS: 8828	Electrical accessories circuit breakers for over current protection for home load and similar installations.
19.	IS: 9000	Basic environmental testing procedures for electronic and electrical items
20.	IS: 10580	Service conditions for electrical equipment
21.	IS: 11353	Guide for uniform system of marking and identification of conductors & apparatus terminals
22.	IS: 13703	Low voltage fuses for voltages not exceeding 1000 V AC or 1500 V DC

23.	IS: 13942	Low voltage switchgear and control gear
24.	SP: 39	Guide for insulation coordination within low voltage system
25.	IEC -60364	Low Voltage Electrical Installations [All applicable series of IEC-60364]
26.	IEC: 60664	Insulation coordination within low voltage system including clearance and creepage distance for equipment.

iii. System Details

The L.V. Distribution Board shall be a part of a packaged RMU substation having transformer rating as in the single line diagram for that location and technical data as given under Specific Technical Requirements. Only the standard size of transformer shall be selected. Broadly the LV distribution board shall have the following configuration:

- Connection to LV side of Transformer

  Connection to LV side of distribution transformer shall be through insulated, three phase, four wire tinned Copper bars. Alternatively tinned Copper bars may be considered with a non-segregated three phase four wire bus duct, or with sand-witched bus bars, conforming to relevant IS Standard as per current requirements.

- Incomer and Board Bus bar

  Incomer shall be Air Circuit Breaker, draw out type, electrically operated, equipped with microprocessor based electronic trip units, complete with CTs & metering. It shall be possible to operate this breaker from remote through SCADA also. Transformer incomer rating shall be same as that of bus rating. LV Bus bars shall be three phase, 4wire, and of tinned copper. Size of neutral conductor shall be same as of phase bars. The LV Board shall be designed for fault level as given in the Specific Technical Requirements.

- Outgoing Feeders

  No HRC fuses are envisaged. All the outgoing feeders shall be equipped with Moulded Case Circuit Breakers of appropriate rating.

- External Cabling

  The external, three phase, four core, LV cables of required size shall be terminated to the outgoing terminals of LV switch board. Necessary cable supports shall be provided in the cable alley of the board.

iv. Design and Standardization

- **General**

  The equipment shall be designed to ensure satisfactory operation of the system in whichcontinuity and quality of service is the first consideration. It shall also be designed to withstand sudden load variations due to short circuits and fault conditions or for any other reason.

  All mechanism shall be made of such materials as to prevent sluggishness due to rust or corrosion. All connections and contacts shall be of ample section and have sufficient surface area for carrying continuously the specified current without undue heating and shall be secured rigidly and locked in position. Standard sizes of stainless steel bolts, screws, pipes and other fittings are to be used and number of sizes is to be kept to the minimum.

  Cast Iron shall not be used for any part of the equipment which may be subjected to mechanical stresses.

All apparatus shall be so designed and constructed as to obviate the risks of short circuits of the live parts by lizards, vermin′s etc. Metal cubicles, housing and covers shall be 100% weather / vermin proof and shall be able to provide the degree of protection IP-54 in accordance with latest version of IS-2147.

All parts shall be manufactured in accordance with relevant standard specifications of IEC / I.S. Corresponding parts of similar equipment and apparatus shall be mutually interchangeable.

All apparatus, connections and cabling shall be designed and arranged to minimize the risk of fire and any damage which might be caused in the event of such an eventuality.

- **Specific Technical Particulars**

The standard technical particulars (which must be modified considering the climatic conditions as given in relevant standards) for the LV Switchboard, are given below:

AC System: 3 phase, 4 wire, solidly earthed

Transformer secondary Voltage : 433V

System Nominal Voltage : 415 volts ±6%

Frequency : 50 Hz ± 5%

Combined variation in absolute sum of Voltage & frequency : ±10%

Bus bar

Electrolytic Copper, tinned, Continuous rating [as per transformer rating]

250 KVA : 800 A

500kVA : 1200 A

800kVA : 1600 A

Short time (1 Sec) : 50 kA rms

One Minute Power Frequency / Impulse Withstand Voltage

Power circuits : 2.5 kV (rms)

Control circuits : 2.5 kV (rms)

Basic Insulation Level, kVp : 8

Flush Mounted Moulded Case Circuit Breaker (MCCB, TPN) with rotary handle AC

Voltage : 3-Phase, 415 V (-6 to +9%)

Frequency : 50 Hz

Short Circuit Performance : P2

Short Circuit Capability : 50 kA (rms) for 1 Sec.

Making capacity : 62.5 kAp

Operating Mechanism : Manual, trip free

Temperature rise : As per IS: 2516

Mechanical : As per IS: 2516

Auxiliary contacts : 4 No., 4 NC

Current Rating : As per Single Line Drawing

Multi-function Meters

Accuracy class : 1

One Minute Power Frequency Withstand Voltage : 2 kV (rms)

Current Transformers

Type : Cast resin, Bar primary

Secondary circuit : 1 Amp.

Voltage class and Frequency : 1100 V, 50 Hz

Class of insulation : E or better

Accuracy :

Accuracy class of metering CT &VA : Class 1, 10 VA

Accuracy class of of protection CT & VA : 5 P 15, 10 VA

Short time current rating : 50 kA (rms) for 1 sec.

Dynamic rating : 120 kA (peak)

One Minute Power Frequency Withstand Voltage : 2.5 kV (rms)

Voltage Transformers

Type : Cast resin

Rated voltage :

Primary : 415 V / $\sqrt{3}$

Secondary : 110 V / $\sqrt{3}$

Accuracy class and VA burden

Metering : 1.0, 25 VA

Protection : 3 P, 25 VA

Method of connection

Primary : Star

Secondary : Star

Rated voltage factor : 1.1 continuous, 1.5 for 3 sec.

Class of insulation : E or better

One minute power Frequency withstand voltage Relay : 2.5 kV (rms)

One Minute Power Frequency withstand Voltage : 2.0 kV (rms)

Cubicle Colour Finish

Interior : Glossy White

Exterior : Grey shade No. 631 of IS: 5

Accessories

Plug point with MCB.

Space heater PTC type.

Name plate on front & rear

Danger plates.

Cubicle Construction

Minimum thickness of CRCA sheet steel 2 mm

Base Frame channel 100mm x 50mm x 6mm

Degree of protection IP-54

Rubber mat between Panel & base 15mm

- **Clearance and Creepage Distances**

  The clearances and creepage distances shall be in accordance with Indian Standard for condensing humidity and highly polluted environment.

- **Labels and Marking of Connections**

  All equipment, control gear and the apparatus mounted thereon shall be clearly labelled indicating, their purpose and the 'ON' 'OFF' and 'EARTH' positions. The labels shall be clearly lettered on enameled surface or other approved materials. Brass should not be used for labels. Each phase of alternating current and connections shall be coloured to distinguish phase, neutral and earth. The colouring shall be respectively for red, yellow, blue for phases black for neutral and green for earth.

  Each phase of alternating current and connections shall be have coloured heat shrinkable sleeve. The LT switchboards shall be labelled as per designation shown in the single line diagram. The labelling shall be finalised after the arrangement for the same, is got approved by the successful vendor during detailed engineering.

- **Drawings and Literature**

  Four sets of tentative G.A., Schematic drawings and detailed literature of equipment shall be submitted with the tender clearly giving the scope of supply and bill of material to enable the MITL to scrutinise all aspects of design including arrangement and support of cable accessibility for maintenance work and future additions, cable connections, general appearance etc. In addition, the vendor shall submit drawings & literature are to be furnished by successful tenderer / vendor within 2 weeks after the award of contract, which shall include the following:

  Complete assembly drawings of the boards, showing plan, elevation, typical section, location of terminal blocks for external wiring connections and mounting details of various devices with dimension.

  Foundation plan, embedment channel frame with associated holes and suitable size of bolts for fixing to channel frame.

  Wiring diagrams including terminal wiring design and cable schedule.

  Schematic control diagram, details of relays, instruments, space heaters, cubicle illumination and receptacle etc.

  Bill of material of each LV board.

  Layout plan of each LV board.

- **Bought out Items**

  All bought out items such as switches, MCCBs, MCB′s meters, terminal blocks, cables etc. shall be of

reputed make. MITL reserves the right to accept only materials of proven make at its sole discretion.

- **Details of L.V. Switchboard**

  - Constructional Details :

The Switchboard shall be made of cold rolled sheet steel of 2 mm thick having different compartments for bus-bars, cable alley and instrumentation. The board shall be floor mounted, self-supporting.

The bus-bars shall be rectangular, of tinned electrolytic copper and of approved size for current rating for phases as well as for neutral. The bus bars shall be suitably supported on non-hygroscopic insulators to withstand forces arising from short circuits in the system. These shall be suitable for harsh environmental conditions.

The switch boards shall be of compact design. All doors and covers shall be fully gasketed. Individual feeder compartments shall be provided with stainless steel hinged doors, bolted type doors shall not be acceptable. Indicating instruments shall be of 96x96 mm.

The interconnections between bus-bars and MCCBs unit shall be solid insulated, tinned copper strip permanently bolted with the bus-bars and MCCBs. The bus-bar joints shall be given a thin coating of conducting grease after fully cleaning both the surfaces. The terminals shall be of substantial mechanical strength & shall provide adequate electrical contact area and the contact pressure is maintained permanently. The bus-bars / tee off shall be insulated with heat shrinkable sleeve tapes with red, yellow, blue colours for 3 phases and black for neutral. All the bus-bar tapping & markings shall be in accordance with relevant IS.

The gland plate shall be of Aluminium minimum thickness of 3 mm and detachable type. A strong supporting channel of 100 x 50 x 6 mm shall be provided beneath the switchboard shell besides anti-vibration rubber gasket of 15 mm thickness.

The connection from 11/0.433 kV transformers to the LV switchboard shall be through a LV non-segregated bus duct [alternatively sandwiched bus duct] or through insulated copper bus bars as per requirement.

The bus-bars shall have non-hygroscopic support insulators. The bus bar shall be insulated with heat shrinkable insulating kits.

The short circuits withstand capacity of all the bus-bars and tap-connection shall be 50 KA for one second.

- Details of Circuits

Each switchboard shall have the following circuit arrangement.

Incoming

1 no. 3 phase, 4 wire incomer four pole air circuit breaker, electrically operated with microprocessor based trip circuit release. The breaker shall conform to IEC 61439.

It shall be withdrawal type. The control supply can be provided from a line connected PT from the LV connection from the transformer or any other arrangement given by vendor can also be considered during detailed engineering.

3 Nos. – Metering CTs of required ratio, 10 VA Class 1, with ISF less than 5.

3 Nos. – Protection CTs

The incomer breaker shall have numerical relay having three over currents of setting 50% to 100% of 1A rating with IDMTL; current Vs time characteristics. Short circuit instantaneous trip shall be included. Alternatively the built in microprocessor based trip units having Overload protection

[IDMTL, IEC characteristics], short circuit trip [time delayed], Instantaneous short circuit protection, Ground Fault Protection can also be considered.

1 no. 96 x 96 mm flush mounted multi-function meter. Meter shall measure unbalanced neutral current also along with three phase currents simultaneously.

1 no. digital bus voltmeter scale 0-500 V with three line reading.

If required, 1 no. Automatic Power factor controller [APFC], connected to y-phase metering CT, with SCADA communication, and five steps to switch on capacitor banks for power factor improvement to 0.95.

Note: Number of steps is tentative and shall be finalised during detailed engineering.

LED type lamps to indicate breaker closed, open, auto trip, protection operation, spring charged etc. indications.

Outgoing feeders

3 phase, 4 wire, outgoing cable circuits are envisaged from the switchboard and each circuit shall have the following items, indicating instruments, terminal connectors etc.

4 pole withdrawable type Moulded Case Circuit Breakers of appropriate, rating as indicated in the single line diagrams.

Earth leakage relay.

3 nos. metering current transformers of secondary rating 1A & 1.0 accuracy class having primary current as per SLD.

1 no. 96x96mm flush mounted multifunction meter as per CT rating.

Termination points for 4C XLPE, Al. Armoured cables with lugs.

The LV board must have sufficient space of not less than 100 mm between two termination points for external cables.

Cable alley along with necessary clamping arrangement for the outgoing feeder cables.

Indicating LED lights – red, yellow and blue for the supply.

- **Capacitor Bank & Automatic Power Factor Controller [APFC] (If Required)**

  Considering the transformer capacity and load power factor as 0.8, a suitable size of switched capacitor bank shall be mounted inside the LT compartment to improve the power factor to 0.95. Necessary calculations, number of steps and switching details shall be provided for approval.

  Capacitor units shall be fuse-less, with loss not exceeding 0.5W / kVAR, with metallised polypropylene film, double casing insulation, self-healing feature, non-flammable and with nontoxic material. Reactors shall be non- resonance, dry type resin embedded. Capacitor unit shall with automatic operation steps as required, built in discharge resistor and mounted on stainless steel frame. APFC shall also be supplied by the same manufacturer.

  APFC shall have LCD display, programmable, with monitoring of all parameters locally as well as at remote SCADA on mod bus via fibre optic cable. It shall be with built in cabinet placed in the cubicle of LV board with easy access doors.

- **Earthing**

  The LV switchboard shall be provided with two separate earthing terminals at the ends. With minimum rated for 50kA for 3 sec running in the board. All metal parts, enclosure, transformer and neutral have to be interconnected and ready for connection to the external earthing arrangement.

The earthing terminals shall be identified by means of proper embossed sign marks adjacent to the terminals.

In the cable gland area provision shall be made at cable gland for armour earthing and then connecting it to main earth bar in a proper way. There shall be a continuous tinned copper earth bus bar in the board. The size of the earth bus bar shall be suitable to carry 50 kA for 3 second. The bus bar shall not be visible or removable from outside the switchboard. The earth bus bar shall have necessary holes, nuts & bolts including washers for making earth connection of cable glands / armouring of the cables.

- **Switchboard Lighting & Heating**

A lamp holder with a 11 W LED lamp and operated by an internal SP-MCB shall be fitted for internal illumination. In addition, a 3 pin 6A/25A socket shall also be provided with a separate SP-MCB. Space heater of suitable rating of PTC type, and with SP MCB shall also be provided to avoid any moisture condensation inside the switchboard.

- **Danger Notice Plates**

An enamelled sheet steel danger plate of approved design as per IS: 2551 shall be fixed on the middle upper front of the switchboard.

- **Tests**

All tests as required in relevant Indian standard shall be carried out on the LV switchgear. MITL shall witness the tests at the works of the manufacturer.

- Type Tests

Manufacturer to be conduct the following type tests on one of the AC Boards.

Verification of temperature rise limits test

Verification of rain test to determine the degree of protection against rain.

Verification of dielectric properties.

Necessary type tests as per IS on all the individual items such as ACB's, MCB's, MCCB's,

instruments, links etc.

- Short circuit test.

The MITL, at its option, may waive the above type tests provided type test reports of the above type tests carried out on essentially identical unit in their factory / approved testing laboratory are furnished by the manufacturer.

- Routine Tests

The switchboard shall be subjected to all the routine tests as per Indian Standard [IS] and witnessed by the MITL. For power frequency voltage the test voltage to be applied shall be for a period of one minute. Insulation tests with 500 volts megger before and after the high voltage test shall be carried out on the switchboard.

Routine tests, as per IS shall be carried out on the bought out items viz. MCCB′s, MCBs, meters etc.

- Verification of wiring & earth continuity

Voltage test on auxiliary circuits.

Tests for mechanical operation, control & interlocks.

Commissioning Site Tests

Necessary site tests at site shall be carried out to ensure its satisfactory operation after installation at

site.

v. Terminations of Incoming and Outgoing Circuits

The cable termination arrangements shall be located at the lowest point above the cable clamps, for ease of termination.

Cable support shall be provided by a suitable clamp at the bottom of the panel. These cable supports shall be adequate to support the outgoing cable in normal service and when subjected to the short circuit current specified. The distance between these cable supports and the gland plate shall be at least 200 mm.

The outgoing cables to be terminated in the switchboard shall be XLPE insulated PVC sheathed armoured and with aluminium conductors. The cables shall have bottom entry to the switchboard.

vi. Air Circuit Breaker (ACB)

415 V four pole air circuit breakers shall be withdrawal type with manually / electrically operated mechanism. It shall be supplied for controlling the LV side of the 11/0.433 kV, distribution transformer. Air circuit breakers shall have symmetrical short circuit rating of 50 kA for 1 sec. The circuit breaker shall be fitted with direct acting microprocessor based electronic release. It shall be provided with instantaneous and adjustable short circuit trip.

The adjustment of the setting should be possible without disrupting the supply. The releases shall be ambient temperature compensated type. The release shall have IEC IDMTL characteristics. The breaker mechanism should be robust, quick making quick breaking and trip free. It should be possible to close and trip the breaker without opening the compartment & door. It shall have auxiliary contacts for indications along with spare contacts.

The detailed specifications of Air Circuit Breaker shall be as under:

No. of poles : Four

Service voltage : 415 Volts

Normal current : As per SLD

Frequency : 50 Hz

Rated Symmetrical Breaking Capacity at 415 V AC/50 Hz : 50 kA for 1 Sec.

Making current : 120 kA

Rated insulation voltage : 1000 V

Max Breaking time : 30 ms

Max Making time : 80 ms

− ACB Connection to Transformer

The air circuit breakers shall be suitably earthed with the main earth bus. The air circuit breakers of the LV board shall be connected to the LV side of the distribution transformer as specified. In case bus duct is provided the connections at both the ends shall be through proper clamps preferably bimetallic. Suitable arrangement shall be provided in the bus duct to take care of the expansion.

− LV Moulded Case Circuit Breaker

All the LV outgoing underground feeders from the sub-station shall be controlled by 4 pole draw out type moulded case circuit breakers, provided in the LV switchboard.

The moulded case circuit breakers shall be of robust construction and shall comprise of switching mechanism, contact system, arc extinguishing device and a tripping unit contained in a compact moulded case and cover. The insulating case and cover shall be made of high strength, heat-resistance

and flame-retardant thermo-setting insulating material.

The switching mechanism shall be quick-make / quick break type, and should be trip-free.

The arc extinguishing device shall comprise of a series of grid plates mounted in parallel between supports of insulating material. The arc shall be drawn from the moving contact into the divide chamber and extinguished.

The moulded case circuit breakers shall have a thermo-magnetic type tripping mechanism, where the heating effect and the electromagnetic effect of current are made use of to provide protection against overload and short-circuit conditions respectively. The heated-bimetal strip in each phase of the MCCB shall actuate the tripping system following on inverse-time shortcircuits, the system shall trip instantaneously. The tripping element provided on each pole of the MCCB shall operate on a common trip bar, thereby preventing single phasing in the event of fault occurring on any of the phases. The tripping device shall be ambient temperature compensated type.

The MCCB shall have a minimum Ics rupturing capacity of 50 kA. Positive indication about the position of the MCCB i.e. whether 'ON' 'OFF' or TRIPPED shall be provided.

The short circuit breaking capacity and operation mechanism of the MCCB shall be supported by test certificates.

All the MCCBs used in LV switchboards for controlling the outgoing feeders shall have a Thermal current setting of 50 to 100% of its rated current and magnetic setting of 500% to 1000%

The detailed specifications of the MCCBs shall be as under:

No. of poles 4 pole

Service voltage 415 Volts

Normal current [In] As per SLD

Frequency 50 Hz

Service [Ics] Breaking capacity at 415V AC, 50 Hz : 50 kA

Making current 120 kA

MCCB shall be provided with rotary handle for manual operation.

− Internal Wiring

The LV AC distribution boards shall be supplied with complete internal wiring. The central wiring shall be of 1100 V grade, FRLS, PVC insulated. Stranded tinned (not less than 48 strands) copper conductor cables of 1.5 mm2 size shall be used for control circuits and 2.5 mm2 for CT circuits. Engraved identification ferrules, marked to correspond with the wiring diagram shall be fitted at both ends of each wire. All wiring shall be terminated on terminal blocks. Terminal blocks shall be one piece moulded and suitable for 500 V and of recommended make. Terminals shall be adequately rated for the short circuit current.

Typically terminals of 'Phoenix' make shall be provided which shall be approved by MITL during detailed engineering.

For CT circuits, shorting type terminals shall be provided. It shall be possible to measure the CT current through clip-on-ammeters.

vii. Pre-fabricated Enclosure for Packaged RMU Substations

- **General**

The enclosure for the compact substation also includes the base frame/ channels and all the necessary fixing hardware accessories required at site. The enclosure shall be compartmentalized and house

RMU, dry distribution transformer, LV distribution board with capacitor bank and their interconnections both external and internal. Engineer at its are found to be better or equivalent to the ones given hereunder.

- **Standards**

The equipment shall conform (but shall not be limited) to IEC 6227-202 standard. The requirements of standards for necessary clearances, ventilation etc. shall also be complied with.

- **Specific Technical Requirements**

Typical size : 2 x 2.5 m (5 m2) with 2 m height [Vendor may quote its own size, if different]

Construction : Self- standing on concrete base

Steel base frame : 4mm thick base [hot dip electro-galvanized steel, with epoxy paint]- suitable for local e

Lifting eyes : 4 Nos from the bottom.

Housing enclosure : 2 mm corrosion resistant Zinc / Aluminium alloy coated sheet steels

Degree of Protection : HV Compartment : IP-54

Transformer Compartment : IP-23

LV Compartment : IP-54

All hinges, supports Nuts, washers etc. : Stainless steel

Paint : Epoxy

Roof Design Load [min] : 250 Kg/m2

Roof Design : Slanting on the sides

Top of Roof : Removable

Ventilation : With louvers (no exhaust fans shall be used)

Sound Level : 60 dB

Standard Applicable : IEC 62271-202

Number of earths : Two (at opposite ends)

Compartments : Three with independent doors

- **Construction**

- **General**

The enclosure shall be self-standing on a concrete base. Necessary civil requirements to be satisfied for the concrete base shall be provided by the vendor. The levelling of ground and construction of the concrete base and associated civil works shall also be in the scope of the vendor.

The compact substation is completely self-contained, mounted upon a 4 mm thick galvanised steel base frame, epoxy painted, factory assembled in a totally enclosed, aesthetically acceptable metal cladding, vandal-proof and weatherproof housing ready for placing into position upon a concrete base.

The lifting arrangement should be with four lifting eyes from the bottom of the enclosure & not from the top.

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. In case 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 equipment inside the enclosure. The complete

housing assembly with four lifting eyes should be easy to lift and position the whole unit at the site by the use of crane. The substation can be lifted without damage or distortion. The transformer is located in the middle of the substation while the HV and LV compartments are located at both ends of the substation adjacent to the corresponding bushings of the transformer. The arrangement is subject to the approval of the MITL.

There shall be adequate ventilation inside the enclosure so that hot air inside enclosure is 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 only. No forced cooling / ventilation is acceptable.

The enclosure must be weather proof installation with proper measures against rusting.

The enclosure must also be vermin proof to prevent the entry of rodents, reptiles, & flying insects, which are prevalent in the area.

The enclosure should be pre-fabricated such that fire from one compartment MUST NOT spread to other compartments.

It should have easy access to all the equipment inside the enclosure, viz RMU, transformer, LV switchboard, capacitor bank, connections, and terminations of HV & LV cables.

The metal base and all supporting channels shall be hot dip galvanized. These should ensure rigidity, ease in transportation to sites and installation.

The outdoor panel envelope may be made of electro-galvanised mild steel with nominal thickness of not less than 3 mm. The housing of the enclosure shall be made of 2 mm corrosion resistant Zinc / Aluminium alloy coated steel sheets.

All hardware such as hinges, supports, screws, nuts, bolts, washers etc. should be made of stainless steel. All locking bolts shall be accessible from inside to prevent the unauthorised dismantling.

All the enclosures shall be or of similar type & design.

The colour of the enclosure shall be decided by MITL during detailed engineering, if different from the one given. The last finish coat shall be of epoxy paint.

The roof of the substation enclosure shall be designed to support loads up to 250 kg/m2. The roof shall be sloped on the sides so that the rain water cannot stay on roof during rainy days.

The pre-fabricated roof of the enclosure shall be removable whenever required. The locking nuts, bolts to allow the removal of roof shall be only accessible from inside the enclosure.

- 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 in 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.

Door closing shall be by means of a three point linkage arrangement (i.e. Centre, top and bottom) and controlled by a centrally located stainless steel operating handle. Pad locking facilities along with Master pad locks shall be provided. Master pad locks shall be operated by a master key for all the substations.

The outer doors of the enclosure shall be wide and provided with heavy duty hinges to prevent distortion and misalignment. A robust door restraint shall be provided to hold each door in the 950 open positions. The restraint shall be of a captive design so that it cannot be easily removed and shall be self-strong

when the door is closed such that it cannot rattle.

With the door in this position, operation of LV and HV switchgear shall be possible without endangering operator's hands, etc.

When doors are closed, they are firmly locked; as such entry of dust, vermin and rainwater is completely prevented. Neoprene gaskets are to be used.

The HV doors are provided with a drawing pocket to keep drawing inside.

A weatherproof nameplate shall be provided on the door.

The edges of the doors are bended at both sides to assure they fit properly so that the door jams and misalignment is prevented.

The transformer, low voltage and HV compartments are completely separated by steel sheet.

The barrier between the HV switchgear and the transformer is provided with pressure relief flaps.

All compartments are individually accessible by their own doors from outside.

Labyrinthine louvers form the sidings of the transformer room to assure free entry and exhaust of air, as such the inside temperature is kept within limits. Openings located at the lower and upper sides of the slanted roof shall allow air circulation as part of the ventilation design.

No exhaust fans shall be used. Ventilation louvers shall be required to provide sufficient ventilation.

All compartments are equipped with internal lighting consisting of 25 watts LED lamps controlled by their respective door micro switches. MCB shall be provided to control the supply.

Space heaters shall be provided to control condensing type humidity.

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.

The substation forms a complete metallic structure bolted together and each compartment is to be provided with tinned copper, grounding bus-bar. Bonding and interconnection of the grounding buses shall be made of 70 mm2 bare stranded copper tinned conductors. The ring main unit shall have 25x8 mm grounding bus while the low voltage switchgear shall have 30 x 10 mm tinned copper grounding buses to which connection to the grounding system at site can be made. At least two grounding points for bolting to ground conductor shall be provided on opposite ends.

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 :

The enclosure of Unitized / prefabricated substation.

The enclosure of High voltage switchgear & control gear from the terminal provided for the purpose.

The metal screen & the low - high voltage cable earth conductor.

The transformer tank or metal frame of transformer.

The frame &/or enclosure of low voltage switchgear.

- Dimensions

The overall typical dimensions of the enclosure may be around 2.5 m x 2.0 m (or 5m2) having height of about 2 m. To achieve necessary clearances, vendor may propose alternate size of the enclosure depending upon the dimensions of the equipment supplied.

- Enclosure Requirements

The enclosure must be totally safe to the personnel in the populated areas as the packaged substation shall be established in the residential townships.

The equipment in the enclosure must be accommodated with necessary clearances, easy access to the RMU, and transformer, LT switchgear and capacitor bank for testing, maintenance, removal and normal operation (including operation with normal switchgear handles).

There shall be unhindered access to the transformer, operation of OFF load tap changer and other normal operating requirements. Similarly termination & removal of cables, withdrawals of ACB from LV board should be easy & comfortable.

It shall be the sole responsibility of the contrator to satisfy all the statutory clearances and to provide safety measures against all possible hazards to the equipment in the enclosures, such as internal arcing faults in the enclosure considering environmental conditions existing at site.

Failure within the unitized substation due either to a defect, 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 at least 20KA for 1 second as per latest IEC 62271-202 standard. The enclosure must be so designed that internal arc faults are directed away from places where personnel or public may be present.

Test certificates from a recognised national/international test house [acceptable to MITL] shall be supplied for internal arc.

Testing of incoming & outgoing cables and use of testing equipment for the same shall not entail the dismantling the sides or the roof of the enclosure.

There shall be sufficient space for termination & removal of cables from Load Break Switches & also from the LV board.

Sufficient clearance must be kept between the top of any equipment installed in the prefabricated substation and the roof of the substation for ventilation and operational purposes.

- Interconnection

The equipment inside the enclosure shall be interconnected as follows:

The RMU shall be directly coupled by VCB feeder to distribution transformer through insulated copper bars or cables as per manufacturer standard.

The LV side (three phases plus one neutral conductor) of distribution transformer shall be connected to LV incomer Air Circuit Breaker via flexible insulated copper bars or through a four conductor sand-witched insulated bars or with bus duct enclosure.

The HV termination to Load Break Switches shall be from 11 kV, Al. armoured XLPE cables, fitted with termination kits, for the ring system.

The earthing of pre-fabrication station shall be provided at two opposite ends for connection to the outside earth rods. It shall be a bolted connection.

- Drawings

The following drawings shall be submitted with the tender.

- ❖ The detailed sketch of the enclosure indicating general view, position of louvers etc.
- ❖ The drawing showing the layout of HV, transformer & LV switchgear along with interconnections.
- ❖ Size & position of doors in the enclosure.

- ❖ Fixing details of the enclosure including civil foundations (if any).

- Safety Measures

The enclosure shall have the following safety measures:

- ❖ Electric shock treatment chart duly framed shall be fixed in a conspicuous position inside the enclosure.
- ❖ Danger notice in English/ Hindi/ Marathi language conforming to IS: 2551 shall be fixed on all the four sides of the enclosure.
- ❖ Electric insulated rubber mat (non-skid type) with flouted top and plain border end, 12 mm thick to withstand 12kV di-electric strength shall be provided in front of HV/LV boards where people have to work.
- ❖ Two number portable fire extinguisher typically 2 litre, suitable for transformer / cable and other electrical equipment fires shall be placed & fixed in a suitable location in the enclosure, away from the place where fire is expected.

- Tests

The following tests shall be carried out on the enclosure as per IEC standard at the works of the manufacture:

- ❖ The complete prefabricated substation unit will be tested at full load for temperature rise. The maximum temperature rise on any part of the equipment placed inside the enclosure shall not exceed the value as specified in IEC 62271-202.
- ❖ Test to verify the sound level of the pre-fabricated substation, which shall be less than 60 db.
- ❖ Test to verify the degree of protection of enclosure for various compartments.

For the internal arc fault test on the enclosure the following need to be observed and tested as below:

- ❖ Internal Arc Fault tested to 20 kA 1 sec.
- ❖ Test to accessibility of Type ″B″ that is with unrestricted accessibility including that of the general public (Annex. AA.2 IEC). Although test to accessibility of Type ″A″ is not required, tenderers shall also provide adequate measures to have any hot gases directed away from the operator during switching with the door open.
- ❖ Arc initiation is made inside the SF6 gas compartment of the RMU (Annex. AA.3 IEC).
- ❖ Assessment of the internal arc fault test is based on the fulfilment of all 6 criteria as stated in Annex. AA.6 of IEC.

Other Checks

- ❖ Inspection of conformity with the specification & approved drawings.
- ❖ Inspection of devices locking out and interlocks.
- ❖ Inspection and checking electrical continuity of metallic frame and earthing system.
- ❖ Dielectric tests of M.V. and L.V. bus bar.
- ❖ Provision of two earths as per Indian Electricity Rules.
- ❖ Tests as per IEC standard.

Notes:

1) **Vendor may note that the drawings, test certificates, data and manuals mentioned here are minimum requirements only. Any additional details required in due course shall also be provided by vendor.**

Request for Qualification cum Request for proposal (RFQ cum RFP)

for

Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar.

VOLUME 2

PRICE SCHEDULE

November 2026

Managing Director

Maharashtra Industrial Township Limited
Udyog Sarathi, MIDC Office, Marol Industrial Area,
Andheri (East), Mumbai, Maharashtra State, India – 400093

LETTER OF PRICE BID

Date: [insert date of Bid submission]

To:

The Managing Director
Maharashtra Industrial Township Limited
Udyog Sarathi,MIDC Office,
Marol Industrial Area Andheri (East),
Mumbai – 400093
Maharashtra

We, the undersigned, declare that:

a) We have examined the Instructions to Bidders and Conditions of Contract, Employer's Requirements, Drawings, Addenda published and the matters set out in the Contract Data Sheet. We have understood and checked these documents and have not found any errors in them. We accordingly offer to **"Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar"** and remedy any defects therein, fit for purpose in compliance with these documents and the enclosed proposal, for the fixed lump sum amount of Rs._____[figure] (Indian Rupees_____ only) or such other sums as may be determined in accordance with the Contract. The above amounts are in accordance with the Price Schedules herewith and are made a part of this tender. We also understand that total Lump sum amount quoted only shall be considered for deciding the award of contract.

b) We agree to abide by the tender for the period of 180 (one hundred eighty) days from the date of opening of technical proposal, and it shall remain binding upon us and may be accepted at any time before the expiration of that period. We acknowledge that the Contract Data Sheet forms a part of this tender.

c) If your tender is accepted, we will provide the specified performance security, commence the work as soon as reasonably possible after receiving the Employer's Letter of Acceptance and complete the Works in accordance with the above-named documents within the time stated in the Contract Data Sheet.

d) If our Bid is accepted, we commit to obtain a Performance Security in accordance with the Bidding Documents, commence and complete the Works in accordance with the above-named documents within the time stated in the Contract Data Sheet.

e) We understand that this Bid, together with your written acceptance thereof included in your Letter of Acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed.

f) We understand that you are not bound to accept the lowest evaluated Bid or any other Bid that you may receive.

Name of the Bidder: [insert complete name of person signing the Bid]

Name of the person duly authorized to sign the Bid on behalf of the Bidder***[insert complete name of person duly authorized to sign the Bid]

Title of the person signing the Bid [insert complete title of the person signing the Bid]

Signature of the person named above [insert signature of person whose name and capacity are shown above]

Date signed [insert date of signing] day of [insert month], [insert year]

*: This form is to be attached with Financial Proposal only.
***: Person signing the Bid shall have the power of attorney given by the Bidder to be attached with the Bid.

PRICE SCHEDULE: QUOTED PRICE

Project Name: "Tender for the work of Connecting 11KV Ring of RMU No. 505A due to load enhancement of M/s JSW Mobility Ltd., Plot No. 1, Sector-22, AURIC Bidkin Industrial Area, Dist. Chhatrapati Sambhajinagar" **(T.No. MITL/SBIA/2026-27/T-11)**

Sr.No	Name of Activity	Unit	Quantity	Quoted Rate per Unit (Rs.)	Taxes as applicable (Rs.)	Total Quoted Rate (Rs.)	Total Quoted Cost (Rs.)
		A	B	C	D=C X Taxes	E=C+D	F= B X E
1	Erecting & terminating 3 x 240 sq. mm. aluminium 11 kV, XLPE armoured cable on wall/ceiling or laid in provided trench / pipe in an approved manner as per specification no. CB-HT	Mtr	1350				
2	Supplying & laying (including excavation) half round reinforced cement concrete pipe of NP-2 class of 150 mm diameter in proper line, level and slope including providing and fixing collars in cement mortar 1:2 and curing etc. complete.	Meter	750				
3	Supplying and laying (including excavation of suitable width & depth upto 90 cm) 200 mm outside dia, double wall corrugated pipes (DWC) of HDPE for enclosing cable below ground/road surface, complete.	Meter	100				
4	Providing and erecting Heat shrinkable straight through joint kit for 11 kV XLPE HT cable 3x240 to 300 sq.mm. with necessary material as per specification no. CB-JT/HT	Each	2				
5	Supply, Transport, jointing, testing and commissioning of 11 kV touchproof indoor termination suitable for 11 kV, 3C x 300 Sq. mm XLPE cable.	Each	4				
	Grand Total						

Note:

1. The total quoted cost should be inclusive of all taxes (including GST), duties, cess and any other statutory charges mentioned elsewhere in the Contract.
2. Payment for any supply of any mechanical/electrical/electromechanical equipment/item shall be done upon delivery of goods at site.