

**NOTICE INVITING TENDER (NIT)**

**FOR**

**TURNKEY PACKAGE FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 33/11KV INDOOR GIS SUBSTATION ALONG WITH ALLIED EQUIPMENTS AND WORKS AT OMAXE SUB-STATION, CHANDNI CHOWK, DELHI**

**NIT NO CMC/BY/22-23/RS/SV/42**

**Due Date for Submission: 10.10.2022, 14:00 HRS**

**BSES YAMUNA POWER LIMITED (BYPL)  
CONTRACTS & MATERIALS DEPT.,  
SHAKTI KIRAN BUILDING, KARKARDOOMA,  
DELHI-110032  
CIN: U40109DL2001PLC111525  
WEBSITE: [www.bsesdelhi.com](http://www.bsesdelhi.com)**

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**VOLUME – I: INFORMATION TO BIDDER (ITB)**

BIDDERS

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BIDDERS

# VOLUME – I: INFORMATION TO BIDDER (ITB)

## 1.00 EVENT INFORMATION

- 1.1 BSES Yamuna Power Ltd (hereinafter referred to as "BYPL") invites sealed tenders in 2 envelopes for following scope of works:

Sr.	Description	Estimated Cost (₹)	Cost of EMD (₹)
1	TURNKEY PACKAGE FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 33/11KV INDOOR GIS SUBSTATION ALONG WITH ALLIED EQUIPMENTS AND WORKS ON TURNKEY BASIS AT OMAXE SUB-STATION, CHANDNI CHOWK, NEW DELHI	6.00 Crore	6.00 Lakh

The bidder must qualify the requirements as specified in clause 2.0 stated below.

All envelopes shall be duly super scribed "**CMC/BY/22-23/RS/SV42 - TURNKEY PACKAGE FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 33/11KV INDOOR GIS SUBSTATION ALONG WITH ALLIED EQUIPMENTS AND WORKS ON TURNKEY BASIS AT OMAXE SUB-STATION, CHANDNI CHOWK, NEW DELHI**"

Bid shall be submitted in two (02) parts. Details of part are as follow:

**Part A – Techno Commercial Bid**

**Part B – Price Bid**

- 1.1 The schedule of specifications with detail terms & conditions can be obtained from address given below against submission of non-refundable demand draft of ₹ **1,180/-** drawn in favour of BSES Yamuna Power Ltd, payable at Delhi or Online transfer of requisite amount through IMPS/NEFT/RTGS. The tender documents & detail terms and conditions can also be downloaded from the website [www.bsesdelhi.com](http://www.bsesdelhi.com) --> **BSES YAMUNA POWER LTD --> Tender --> Open Tenders**  
In case tender papers are downloaded from the above website, then the bidder has to enclose a demand draft covering the cost of bid documents.

- 1.2 Bids will be received up to **10.10.2022, 14:00 PM.** at the address given below.  
Part A of the Bid shall be opened on **11.10.2022, 16:00 PM.**

Part B of the Bid will be opened in case of Techno-Commercially qualified Bidders and the date of opening of same shall be intimated in due course. It is the sole responsibility of the bidder to ensure that the bid documents reach this office on or before the last date.

**Head of Department  
Contracts & Materials Deptt.  
BSES Yamuna Power Ltd  
Ground Floor  
Shaktikiran Building, Karkardooma  
Delhi 110032**

- 1.3 BSES Yamuna Power Ltd reserves the right to accept/reject any or all tenders without assigning any reason thereof in the event of following:  
a) Tender is received after due date and time.

- b) Tender fee of requisite value is not submitted.
- c) Earnest Money Deposit (EMD) of requisite value & validity is not deposited in shape of Bank Guarantee drawn in favor of BSES Yamuna Power Ltd, payable at Delhi or Online transfer of requisite amount through NEFT/RTGS.
- d) Price Bid as per the Price Schedule mentioned in Annexure-I is not submitted.
- e) Incomplete Bids.
- f) Necessary documents against compliance to Qualification Requirements mentioned at Section 1 Clause 2.0 of this Tender Document.
- g) Complete Technical details are not enclosed as per the Technical Bid Submission Checklist.
- h) Filled in Schedule of Deviations as per Annexure.

## 2.00 QUALIFICATION CRITERIA

The prospective bidder must qualify all of the following requirements and shall be eligible to participate in the bidding who meets following requirements and management has a right to disqualify those bidders who do not meet these requirements.

### 2.02 Technical Criteria:

SI No.	Criteria	Documents to be submitted by bidder
1	The bidder should be a manufacture of 33KV GIS.	manufacturing and factory incorporation certificate
2	The bidder should have infrastructure in India for providing service & spare support to BYPL. The relevant documents including details of manufacturing units, locations and works from where supply & spares against this tender shall be proposed to be furnished.	<ul style="list-style-type: none"> <li>i. Details of manufacturing units</li> <li>ii. details of service units</li> </ul>
3	The bidder should have established project management, field quality assurance system & safety organization designed to achieve high level of reliability at various stages of field services required for successful erection, testing & commissioning. The bidder should have successfully designed, supplied, installed & commissioned minimum two 33KV GIS Grid substations or higher rating projects in last 5 years. Details of these projects including customer name, PO number (with date), date of completion and rating (Capacity/Voltage etc) shall be provided.	<ul style="list-style-type: none"> <li>i. Turnkey Purchase order/Work order copy</li> <li>ii. Work completion certificate copy</li> </ul>
4	Performance certificate for 2 (two) year satisfactory performance from at least 2 executed projects of 33KV GIS or higher voltage rating should be submitted.  In case of bidder has a previous association with BRPL/BYPL for similar product and service, the performance feedback for that bidder by BRPL/BYPL shall only be considered irrespective of performance certificate issued by any third organization.	Performance certificates
5	Bidder shall procure equipment from the approved vendor list of BYPL for individual items (attached in Scope). The bidder is supposed to have agreement with manufacturer/service provider to provide support to BYPL	Undertaking for Back up support by OEM's

	for any service & spares related issues for time stipulated in the specification or service life of the equipment. The bidder must submit the undertaking for the same.	
6	The bidder must possess valid ISO 9001:2015 certification or above.	Valid copy of Certification
7	The bidder should possess valid Electrical Contractor License issued by competent statutory agency to undertake work in NCT Delhi. In case bidder is not having this license, suitable sub-contractor having the valid license shall be engaged for works at site where copy of valid license shall be submitted to BYPL before the start of the work OR Bidder to give the undertaking that it will be obtained by them before the start of the work at site.	i. Electrical Contractor License Copy ii. Undertaking if not available

## 2.02 Commercial Criteria:

SI No.	Criteria	Documents to be submitted by bidder
1	Bidder should have Average Annual Sales Turnover of Rs 200 Crores or more in last three (3) Financial Years (i.e., FY 2019-20, 2020-21 & 2021-22)	Balance Sheet and Duly certified CA certificate with UDIN no. to be submitted
2	The Bidder shall submit an undertaking that "No Litigation" is pending with the BYPL or its Group/Associates Companies.	Undertaking
3	An undertaking (self-certificate) that the bidder has not been blacklisted/debarred by any central/state government institution/Electricity utilities.	Undertaking
4	The bidder must have valid PAN No., GST Registration Number, in addition to other statutory compliances. The bidder must submit the copy of registrations and submit an undertaking that the bidder shall comply all the statutory compliances as per the laws/rules etc. before the start of the supply/work.	Relevant Statutory Documents Copy/ Undertaking

Notwithstanding anything stated above, BYPL reserves the right to assess bidder's capability to perform the contract, assess the capability and installed capacity of the Bidder for carrying out the supplies, should the circumstances warrant such assessment in the overall interest of the purchaser. In this regard the decision of the purchaser is final.

## 3.00 BIDDING AND AWARD PROCESS

Bidders are requested to submit their offer strictly in line with this tender document. BYPL shall response to the queries raised by various bidders and the clarification will be distributed to all participating bidders through BYPL website/email.

Vendor shall refrain from taking any deviations on this TENDER. Still in case of any deviations, all such deviations from this tender shall be set out by the Bidder, Clause by Clause in the "ANNEXURE SCHEDULE OF DEVIATIONS" and submit the same as a part of the Technical Bid. Unless **specifically** mentioned in the schedule of deviation, the bid shall be deemed to confirm the BYPL's specifications.

### 3.01 BID SUBMISSION

Please mention our NIT Number: - ..... on the Tender and drop the same in our Tender Box placed at:

INFORMATION TO BIDDER (ITB) NIT NO: CMC/BY/22-23/RS/SV/42	Page 6 of 18	BIDDERS SEAL & SIGNATURE
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**BSES Yamuna Power Ltd, Reception, Ground Floor, Shaktikiran Building, Karkardooma, Delhi 110032**

**The bids and the outer envelope shall be addressed to:**

**Head of Department**

**Contracts & Materials Deptt.**

**BSES Yamuna Power Ltd, Shaktikiran Building, Karkardooma, Delhi 110032**

Kindly Note:

- Bidder will inform BYPL through email immediately after the submission or before the due date & time of submission to TPC & Buyer:
  1. Mr Rakesh Sharma, E-mail: Rakesh.Ku.Sharma@relianceada.com
  2. Mr Sumit Verma, E-mail: sumit.ra.verma@@relianceada.com
- Tender documents shall be submitted at main gate in tender box
- Authorized person of TPC will collect the documents from tender box at scheduled time of tender submission and verify the bid documents with mails received. A confirmation of receipt shall be sent to bidder through mail by TPC on the same day
- Bidder has to ensure that tender copy is dropped in correct box designated for tender submission only
- BYPL shall not be responsible for any wrong placement of tender document by bidder

PART A :: TECHNICAL **BID** comprising of following:

Sr. No	Descriptions	Type of Documents
<b>Commercial :</b>		
1	<b>Tender Fee - Demand Draft (Rs.1180/-) (Incl GST)</b>	Non-refundable demand draft for Rs 1180/- in case the forms are downloaded from website
2	<b>EMD</b>	In prescribed format
3	<b>Power-of-Attorney</b>	In prescribed stamp paper & format
4	<b>PQR Compliances</b>	Documentary evidence in support of qualifying criteria like : <ol style="list-style-type: none"><li>1. Details of constitution of the company (Proprietary/Limited/etc along with the details), Memorandum of Association of the company</li><li>2. Bidders shall submit the certified annual Balance sheets for the last completed three (3) financial years</li><li>3. Supportive document on Positive Net worth. Credit rating/solvency certificate from competent authority.</li><li>4. Copies of Orders, Execution /Performance Certificate &amp; Other Documents to support qualification Criteria</li></ol>
5	<b>Signed Tender document</b>	Original Tender documents duly stamped & signed on each page as token of acceptance
6	<b>Black listing undertaking</b>	Bidder should submit a Self undertaking signed by its Authorized Signatories that the Bidder or any of their sub contractor has not been blacklisted/barred by any Govt. Organization or Regulatory Agencies in India or abroad.

Sr. No	Descriptions	Type of Documents
7	<b>No litigation Certificate</b>	Duly signed No Litigation Certificate as per attached format.
8	<b>Commercial Terms and Conditions</b>	Acceptance on Commercial Terms and Conditions viz Delivery schedule/period, Payment terms, PBG etc.
9	<b>Acceptance on Reverse Auction</b>	Duly signed Acceptance Form For Participation In Reverse Auction Event as per attached format
10	<b>Bid Form (Unpriced) Duly Signed</b>	Duly Signed Bid Form as per attached format
11	<b>Un price Bid Duly Signed</b>	Duly Signed Un price Bid as per attached format
<b>Technical:</b>		
12	<b>Technical Details/ Filled in GTP/Drawings</b>	Bidder shall submit duly filled GTP with all Technical documents and Drawings.
13	<b>Field Quality and assurance Plan (QAP)</b>	Bidder shall submit the detailed QAP plan in their technical proposal.
14	<b>Type Test Reports</b>	Bidders shall submit the copy of type test reports in their technical bids in support of PQR conditions
15	<b>Project Implementation Plan and Methodology</b>	Bidder shall submit detail Project Implementation plan and methodology in their technical bid.
16	<b>Testing Facilities</b>	Bidder shall submit the details of testing facilities available at their works/factory.
17	<b>Organization Chart &amp; Manpower Details.</b>	Bidder shall submit the details of Manpower to be deployed for project management with qualification and experience.
18	<b>List of Current Commitments/ Work In Progress.</b>	Bidder shall submit the list of projects (Current Commitments/Work in Progress )

- PART B** :: **FINANCIAL BID** comprising of (01 original only)
- Price strictly in the Format enclosed indicating Break up of basic price, taxes & duties, transportation etc

### 3.02 TIME SCHEDULE

The bidders should complete the following within the dates specified as under:

S. No.	Events	Due date & Time
1	Date of sale/ availability of tender documents from BYPL Website	upto 10.10.2022, 14:00 Hours
2	Date & Time of Pre-Bid Meeting Pre-Bid Meeting will be done online, Register in advance for this meeting, Zoom Meeting link: <a href="https://zoom.us/join/zoom/register/tJAvde-vqzwsGNNFQI-gimpkaU9bSe-oRHjX">https://zoom.us/meeting/register/tJAvde-vqzwsGNNFQI-gimpkaU9bSe-oRHjX</a> After registering, you will receive a confirmation email containing information about joining the meeting.	27.09.2022, 12:00 Hours
3	Last Date of receipt of pre-bid queries, if any (Queries to be submitted via e-mail)	28.09.2022 up to 17:00 Hours

S. No.	Events	Due date & Time
4	Last Date of replies to all the pre-bid queries as received	04.10.2022 up to 18:00 Hours
5	Last date and time of receipt of Complete Bids (Tender Fees, EMD, Part A & Part B)	10.10.2022, 14:00HRS
6	Date & Time of Opening of PART A – EMD and Technical Bid	11.10.2022, 16:00HRS
7	Date & Time of opening of Price/RA of qualified bids	Will be notified to the qualified bidders through our website / e-mail

This is a two part bid process. Bidders are to submit the bids in 2(Two) parts Both these parts should be furnished in separate sealed covers super scribing NIT no. DUE DATE OF SUBMISSION, with particulars as **PART-A TECHNICAL BID & COMMERCIAL TERMS & CONDITIONS** and **Part-B FINANCIAL BID** and these sealed envelopes should again be placed in another sealed cover which shall be submitted before the due date & time specified.

**Part – A::** Technical Bid should not contain any cost information whatsoever and shall be submitted within the due date.

**PART B::** This envelope will be opened internally after techno-commercial evaluation and only of the qualified bidders.

Bidder has to submit the item wise price bifurcation in bid. Un priced copy must be attached with the Part A (Technical Bid). Reverse Auction will be carried out on Lump sum Basis/Total Landed Cost i.e. Supply + Services

**REVERSE AUCTION CLAUSE ::** Purchaser reserves the right to use reverse auction as optional tool through SAP – SRM as an integral part of the entire tendering process. All techno-commercially qualified bidders shall participate in reverse auction.

Notwithstanding anything stated above, the Purchaser reserves the right to assess bidder's capability to perform the contract, should the circumstances warrant such assessment in the overall interest of the purchaser. In this regard the decision of the purchaser is final. Bidder to submit their acceptance as per format attached ANNEXURE-C

**BIDS RECEIVED AFTER DUE DATE AND TIME MAY BE LIABLE TO REJECTION**

**4.00 AWARD DECISION**

4.01 Purchaser intends to award the business on a lowest bid basis, so suppliers are encouraged to submit the bid competitively. The decision to place purchase order/LOI solely depends on purchaser on the cost competitiveness across multiple lots, quality, delivery and bidder's capacity, in addition to other factors that Purchaser may deem relevant.

4.02 In the event of your bid being selected by purchaser (and / or its affiliates) and you subsequent DEFAULT on your bid; you will be required to pay purchaser (and / or its affiliates) an amount equal to the difference in your bid and the next lowest bid on the quantity declared in NIT/RFQ.

4.03 In case any bidder is found unsatisfactory during the Project execution, the award will be cancelled and BYPL reserves the right to award other bidders who are found fit.

4.04 The purchaser reserves all the rights to award the contract to one or more bidders so as to meet the Project execution requirement or nullify the award decision without citing any reason.

4.05 Qty Variation: The purchaser reserves the rights to vary the quantities as per the actual requirements.

**5.00 MARKET INTEGRITY**

We have a fair and competitive marketplace. The rules for bidders are outlined in the Terms & Conditions. Bidders must agree to these rules prior to participating. In addition to other remedies available, we reserves the right to exclude a bidder from participating in future markets due to the bidder’s violation of any of the rules or obligations contained in the Terms & Condition. Bidders who violate the marketplace rules or engage in behavior that disrupts the fair execution of the marketplace restricts a bidder to length of time, depending upon the seriousness of the violation. Examples of violations include, but are not limited to:

- Failure to honor prices submitted to the marketplace.
- Breach of the terms of the published in Request For Quotation/NIT.

**6.00 SUPPLIER CONFIDENTIALITY**

All information contained in this RFQ is confidential and shall not be disclosed, published or advertised in any manner without written authorization from BYPL. This includes all bidding information submitted.

All RFQ documents remain the property of BYPL and all suppliers are required to return these documents to BYPL upon request.

Suppliers who do not honor these confidentiality provisions will be excluded from participating in future bidding events.

**7.00 CONTACT INFORMATION**

Technical clarification, if any, as regards this RFQ shall be sought in writing and sent by post/courier to following address. The same shall not be communicated through phone

Address	Name/ Designation	E-mail Address
<b>Technical</b>		
CES Dept. 3 <sup>rd</sup> Floor, B-Block, BSES Yamuna Power Ltd Shaktikiran Building, Karkardooma, Delhi 110032	Abhishek Harsh DGM (CES)	abhishek.harsh@relianceada.com
	Srinivas Gopu GM (CES)	srinivas.gopu@relianceada.com
	Gaurav Sharma AVP (HOD-CES)	gaurav.a.sharma@relianceada.com
<b>Commercial</b>		
C&M Dept. 3 <sup>rd</sup> Floor, A-Block, BSES Yamuna Power Ltd Shaktikiran Building, Karkardooma, Delhi 110032	Sumit Verma GM (C&M)	sumit.ra.verma@relianceada.com
	Santosh Singh Addl. VP (Head-Procurement)	santosh.kum.singh@relianceada.com
	Robin Sebastian VP (HOD-C&M)	robin.sebastian@relianceada.com

## **SECTION – II: INSTRUCTION TO BIDDERS**

### **A. GENERAL**

1.00 BSES Yamuna Power Ltd, hereinafter referred to as "The Purchaser" are desirous of implementing the various Systems Improvement/Repair & Maintenance works at their respective licensed area in Delhi. The Purchaser has now floated this tender for procurement of material notified earlier in this bid document.

### **2.00 SCOPE OF WORK**

The scope shall include survey, design, engineering, manufacturing, shop testing, inspection, packing & dispatches, transportation, loading, unloading, storage at site, erection & installation, associated civil works, commissioning, handing over to bypl including comprehensive marine cum storage cum insurance policy (mse) on "single point responsibility basis" for grid substation "on turnkey basis"

### **3.00 DISCLAIMER**

3.01 This Document includes statements, which reflect various assumptions, which may or may not be correct. Each Bidder/Bidding Consortium should conduct its own estimation and analysis and should check the accuracy, reliability and completeness of the information in this Document and obtain independent advice from appropriate sources in their own interest.

3.02 Neither Purchaser nor its employees will have any liability whatsoever to any Bidder or any other person under the law or contract, the principles of restitution or unjust enrichment or otherwise for any loss, expense or damage whatsoever which may arise from or be incurred or suffered in connection with anything contained in this Document, any matter deemed to form part of this Document, provision of Services and any other information supplied by or on behalf of Purchaser or its employees, or otherwise arising in any way from the selection process for the Supply.

3.03 Though adequate care has been taken while issuing the Bid document, the Bidder should satisfy itself that Documents are complete in all respects. Intimation of any discrepancy shall be given to this office immediately.

3.04 This Document and the information contained herein are Strictly Confidential and are for the use of only the person(s) to whom it is issued. It may not be copied or distributed by the recipient to third parties (other than in confidence to the recipient's professional advisors).

### **4.00 COST OF BIDDING**

The Bidder shall bear all cost associated with the preparation and submission of its Bid and Purchaser will in no case be responsible or liable for those costs.

### **B. BIDDING DOCUMENTS**

5.01 The Scope of Work, Bidding Procedures and Contract Terms are described in the Bidding Documents. In addition to the covering letter accompanying Bidding Documents, the Bidding Documents include:

- (a) Request for Quotation (RFQ)
- (b) Instructions to Bidders
- (c) General Terms & Conditions of Contract (T&C)

- (d) Delivery schedule
- (e) Price Formats & Summary T&C
- (f) Bid Form
- (g) Acceptance Format – RA
- (h) EMD BG Format
- (i) Vendor code of conduct
- (j) Appendix
- (k) Technical Specifications (TS)

5.02 The Bidder is expected to examine the Bidding Documents, including all Instructions, Forms, Terms and Specifications. Failure to furnish all information required by the Bidding Documents or submission of a Bid not substantially responsive to the Bidding Documents in every respect will may result in the rejection of the Bid.

**6.0 AMENDMENT OF BIDDING DOCUMENTS**

6.01 At any time prior to the deadline for submission of Bids, the Purchaser may for any reasons, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding Documents by Amendment.

6.02 The Amendment shall be part of the Bidding Documents, pursuant to Clause 5.01, and it will be notified in web site [www.bsedelhi.com](http://www.bsedelhi.com) and the same will be binding on them.

6.03 In order to afford prospective Bidders reasonable time in which to take the Amendment into account in preparing their Bids, the Purchaser may, at its discretion, extend the deadline for the submission of Bids. The same shall be published as a corrigendum in website [www.bsedelhi.com](http://www.bsedelhi.com)

6.04 Purchaser shall reserve the rights to following:

- a) extend due date of submission,
- b) modify tender document in part/whole,
- c) cancel the entire tender

6.05 **Bidders are requested to visit website regularly for any modification/clarification/corrigendum/addendum of the bid documents.**

**C. PREPARATION OF BIDS**

**7.0 LANGUAGE OF BID**

The Bid prepared by the Bidder, and all correspondence and documents relating to the Bid exchanged by the Bidder and the Purchaser, shall be written in the English Language. Any printed literature furnished by the Bidder may be written in another Language, provided that this literature is accompanied by an English translation, in which case, for purposes of interpretation of the Bid, the English translation shall govern.

**8.0 DOCUMENTS COMPRISING THE BID**

The Bid prepared and submitted by the Bidder shall comprise the following components:

- (a) Bid Form, Price & other Schedules (STRICTLY AS PER FORMAT) and Technical Data Sheets completed in accordance with Technical Specification.
- (b) All the Bids must be accompanied with the required EMD as mentioned in the Section-I against each

INFORMATION TO BIDDER (ITB) NIT NO: CMC/BY/22-23/RS/SV/42	Page <b>12</b> of <b>18</b>	BIDDERS SEAL & SIGNATURE
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tender.

- (c) Tender documents duly stamped and signed on each page by authorized signatory.

## 9.0 **BID FORM**

- 9.01 The Bidder shall submit one "Original" and one "Copy" of the Bid Form and the appropriate Price Schedules and Technical Data Sheets duly filled in as per attached specification enclosed with the Bidding Documents.

## 9.02 **EMD**

Pursuant to Clause 8.0(b) above, the bidder shall furnish, as part of its bid, a EMD amounting to as specified in the Section-I. The EMD is required to protect the Purchaser against the risk of Bidder's conduct which would warrant forfeiture.

The EMD shall be denominated in any of the following form:

- (a) Bank Guarantee drawn in favour of BSES Yamuna Power Ltd, payable at Delhi.
- (b) EMD shall be valid for One Hundred Eighty (180) days after due date of submission drawn in favour of BSES Yamuna Power Ltd

The EMD may be forfeited in case of:

- (a) the Bidder withdraws its bid during the period of specified bid validity

or

- (b) the case of a successful Bidder, if the Bidder does not

- (i) Accept the Purchase Order, or
- (ii) Furnish the required performance security BG.

## 10.0 **BID PRICES**

- 10.01 Bidders shall quote for the entire Scope of Supply with a break-up of prices for individual items. The total Bid Price shall also cover all the Supplier's obligations mentioned in or reasonably to be inferred from the Bidding Documents in respect of Design, Supply, Transportation to site, all in accordance with the requirement of Bidding Documents the Bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total Price.

- 10.02 The prices offered shall be inclusive of all costs as well as Duties, Taxes and Levies paid or payable during execution of the supply work, breakup of price constituents, should be there.

Prices quoted by the Bidder shall be "**Firm**" and not subject to any price adjustment during the performance of the Contract. **A Bid submitted with an adjustable price/ Price Variation Clause will be treated as non -responsive and rejected.**

## 11.0 **BID CURRENCIES**

- 11.01 Prices shall be quoted in Indian Rupees Only.

**12.0 PERIOD OF VALIDITY OF BIDS**

12.01 Bids shall remain valid for 180 days from the due date of submission of the Bid.

12.02 Notwithstanding Clause 12.01 above, the Purchaser may solicit the Bidder's consent to an extension of the Period of Bid Validity. The request and the responses thereto shall be made in writing and sent by post/courier

**13.0 ALTERNATIVE BIDS**

13.01 Bidders shall submit Bids, which comply with the Bidding Documents. Alternative Bids will not be considered. The attention of Bidders is drawn to the provisions regarding the rejection of Bids in the terms and conditions, which are not substantially responsive to the requirements of the Bidding Documents.

**14.0 FORMAT AND SIGNING OF BID**

14.01 The original Bid Form and accompanying documents (as specified in Clause 5.0), clearly marked "Original Bid" plus Duplicate Soft copy in USB flash drive must be received by the Purchaser at the date, time and place specified pursuant to Clauses 15.0 and 16.0. In the event of any discrepancy between the original and the copies, the original shall govern.

14.02 The original and copy of the Bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorized to sign on behalf of the Bidder. Such authorization shall be indicated by written Power-of-Authority accompanying the Bid. The Bid submitted on behalf of companies registered with the Indian Companies Act, for the time being in force, shall be signed by persons duly authorized to submit the Bid on behalf of the Company and shall be accompanied by certified true copies of the resolutions, extracts of Articles of Association, special or general Power of Attorney etc. to show clearly the title, authority and designation of persons signing the Bid on behalf of the Company. Satisfactory evidence of authority of the person signing on behalf of the Bidder shall be furnished with the bid. A bid by a person who affixes to his signature the word 'President', 'Managing Director', 'Secretary', 'Agent' or other designation without disclosing his principal will be rejected.

The Bidder's name stated on the Proposal shall be the exact legal name of the firm.

14.03 The Bid shall contain no interlineations, erasures or overwriting except as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the Bid.

**D. SUBMISSION OF BIDS**

**15.0 SEALING AND MARKING OF BIDS**

15.01 Bid submission: One original (hard copies) & One Duplicate Soft copy in USB flash drive of all the Bid Documents shall be sealed and submitted to the Purchaser before the closing time for submission of the bid.

15.02 The Technical Documents and the EMD shall be enclosed in a sealed envelope and the said envelope shall be superscribed with — "Technical Bid & EMD". The price bid shall be inside another sealed envelope with superscribed "Financial Bid". Both these envelopes shall be sealed inside another big envelope. All the envelopes should bear the Name and Address of the Bidder and marking for the Original and Copy. The envelopes should be superscribed with — "Tender Notice No. & Due date of



opening”.

15.03 The Bidder has the option of sending the Bids in person. Bids submitted by Email/Telex/Telegram /Fax will be rejected. No request from any Bidder to the Purchaser to collect the proposals from Courier/Airlines/Cargo Agents etc shall be entertained by the Purchaser.

**16.0 DEADLINE FOR SUBMISSION OF BIDS**

16.01 The original Bid, together with the required copies, must be received by the Purchaser at the address on or before the due date & time of submission.

16.02 The Purchaser may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Documents in accordance with Clause 6.0, in which case all rights and obligations of the Purchaser and Bidders previously subject to the deadline will thereafter be subject to the deadline as extended

**17.0 ONE BID PER BIDDER**

17.01 Each Bidder shall submit only one Bid by itself. No Joint venture is acceptable. A Bidder who submits or participates in more than one Bid will cause all those Bids to be rejected.

**18.0 LATE BIDS**

18.01 Any Bid received by the Purchaser after the deadline for submission of Bids prescribed by the Purchaser, pursuant to Clause 16.0, will be declared "Late" and may be rejected and returned unopened to the Bidder.

**19.0 MODIFICATIONS AND WITHDRAWAL OF BIDS**

19.01 The Bidder is not allowed to modify or withdraw its Bid after the Bid's submission subject to any corrigendum/addendum/modifications in the tender documents uploaded in website.

**E. EVALUATION OF BID**

**20.0 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. Any effort by a Bidder to influence the Purchaser's processing of Bids or award decisions may result in the rejection of the Bidder's Bid.

**21.0 CLARIFICATION OF BIDS**

To assist in the examination, evaluation and comparison of Bids, the Purchaser may, at its discretion, ask the Bidder for a clarification of its Bid. All responses to requests for clarification shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted.

**22.0 PRELIMINARY EXAMINATION OF BIDS / RESPONSIVENESS**

22.01 Purchaser will examine the Bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, and whether the Bids are generally in order. Purchaser may ask for submission

of original documents in order to verify the documents submitted in support of qualification criteria.

- 22.02 Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price per item that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price per item will be corrected. If there is a discrepancy between the Total Amount and the sum of the total price per item, the sum of the total price per item shall prevail and the Total Amount will be corrected.
- 22.03 Prior to the detailed evaluation, Purchaser will determine the substantial responsiveness of each Bid to the Bidding Documents including production capability and acceptable quality of the Goods offered. A substantially responsive Bid is one, which conforms to all the terms and conditions of the Bidding Documents without material deviation.
- 22.04 Bid determined as not substantially responsive will be rejected by the Purchaser and/or the Purchaser and may not subsequently be made responsive by the Bidder by correction of the non-conformity.

23.0 **EVALUATION AND COMPARISON OF BIDS**

- 23.01 The evaluation of Bids shall be done based on the delivered cost competitiveness basis.
- 23.02 The evaluation of the Bids shall be a stage-wise procedure. The following stages are identified for evaluation purposes: In the first stage, the Bids would be subjected to a responsiveness check. The Technical & qualifying Proposals and the Conditional ties of the Bidders would be evaluated.

Subsequently, the Financial Proposals along with Supplementary Financial Proposals, if any, of Bidders with Techno-commercially Acceptable Bids shall be considered for final evaluation.

- 23.03 The Purchaser's evaluation of a Bid will take into account, in addition to the Bid price, the following factors, in the manner and to the extent indicated in this Clause:
- (a) Delivery Schedule
  - (b) Conformance to Qualifying Criteria
  - (c) Deviations from Bidding Documents

Bidders shall base their Bid price on the terms and conditions specified in the Bidding Documents.

The cost of all quantifiable deviations and omissions from the specification, terms and conditions specified in Bidding Documents shall be evaluated. **The Purchaser will make its own assessment of the cost of any deviation for the purpose of ensuring fair comparison of Bids.**

- 23.04 Any adjustments in price, which result from the above procedures, shall be added for the purposes of comparative evaluation only to arrive at an "Evaluated Bid Price". Bid Prices quoted by Bidders shall remain unaltered.

**F. AWARD OF CONTRACT**

24.0 **CONTACTING THE PURCHASER**

- 24.01 If any Bidder wishes to contact the Purchaser on any matter related to the Bid, from the time of Bid

opening to the time of contract award, the same shall be done in writing only.

24.02 Any effort by a Bidder to influence the Purchaser and/or in the Purchaser's decisions in respect of Bid evaluation, Bid comparison or Contract Award, will result in the rejection of the Bidder's Bid.

**25.0 THE PURCHASER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS**

Submission of bids shall not automatically construe qualification for evaluation. The Purchaser reserves the right to accept or reject any Bid and to annul the Bidding process and reject all Bids at anytime 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 Purchaser's action.

**26.0 AWARD OF CONTRACT**

The Purchaser will award the Contract to the successful Bidder whose Bid has been Determined to be the lowest-evaluated responsive Bid, provided further that the Bidder has been determined to be qualified to satisfactorily perform the Contract. Purchaser reserves the right to award order to other bidders in the tender, provided it is required for timely execution of project & provided he agrees to come to the lowest rate. Purchaser reserves the right to distribute the entire tender quantity at its own discretion without citing any reasons thereof.

**27.0 THE PURCHASER'S RIGHT TO VARY QUANTITIES**

The Purchaser reserves the right to vary the quantity i.e. increase or decrease the numbers/quantities without any change in terms and conditions during the execution of the Order.

**28.0 LETTER OF INTENT/ NOTIFICATION OF AWARD**

The letter of intent/ Notification of Award shall be issued to the successful Bidder whose bids have been considered responsive, techno-commercially acceptable and evaluated to be the lowest (L1). The successful Bidder shall be required to furnish a letter of acceptance within 7 days of issue of the letter of intent /Notification of Award by Purchaser.

**29.0 CONTRACT PERFORMANCE BANK GAURANTEE**

Within 15 days of the receipt of Notification of Award/ Letter of Intent from the Purchaser, the successful Bidder shall furnish the Performance Bank Guarantee for an amount of 10% (Ten percent) of the Contract Price. The Performance Bond shall be valid upto contract completion. Upon submission of the performance security, the EMD shall be released.

**30.0 CORRUPT OR FRADULENT PRACTICES**

30.01 The Purchaser requires that the Bidders observe the highest standard of ethics during the procurement and execution of the Project. In pursuance of this policy, the Purchaser:

(a) Defines, for the purposes of this provision, the terms set forth below as follows:

(i) "Corrupt practice" means behavior on the part of officials in the public or private sectors by which they improperly and unlawfully enrich themselves and/or those close to them, or induce others to do so, by misusing the position in which they are placed, and it includes the offering, giving, receiving, or soliciting of anything of value to influence the action of any such official in the procurement process or in contract execution; and

(ii) "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Purchaser, and includes collusive practice among Bidders (prior to or after Bid submission) designed to establish Bid prices at

artificial non -competitive levels and to deprive the Purchaser of the benefits of free and open competition .

- (b) Will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;
- (c) Will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, a contract.

30.02 Furthermore, Bidders shall be aware of the provision stated in the Terms and Conditions of Contract.

31.00 **GENERAL**

**All the Bids shall be prepared and submitted in accordance with these instructions.**

31.01 Bidder shall bear all costs associated with the preparation and delivery of its Bid, and the Purchaser will in no case shall be responsible or liable for these costs.

31.02 The Bid should be submitted by the Bidder in whose name the bid document has been issued and under no circumstances it shall be transferred /sold to any other party.

31.03 The Purchaser reserves the right to request for any additional information and also reserves the right to reject the proposal of any Bidder, if in the opinion of the Purchaser, the data in support of NIT requirement is incomplete.

31.04 The Bidder is expected to examine all instructions, forms, terms & conditions and specifications in the Bid Documents. Failure to furnish all information required in the Bid Documents or submission of a Bid not substantially responsive to the Bid Documents in every respect may result in rejection of the Bid. However, the Purchaser's decision in regard to the responsiveness and rejection of bids shall be final and binding without any obligation, financial or otherwise, on the Purchaser.

**APPENDIX I**

**(FORMAT FOR EMD BANK GUARANTEE)**

*(To be issued in a Non Judicial Stamp Paper of Rs.50/-purchased in the name of the bank)*

Whereas [*name of the Bidder*] (herein after called the "Bidder") has submitted its bid dated [*date of submission of bid*] for the supply of [*name and/or description of the goods*] (here after called the "Bid").

KNOW ALL PEOPLE by these presents that WE [*name of bank*] at [*Branch Name and address*],having our registered office at [*address of the registered office of the bank*](herein after called the "Bank"),are bound unto BSES Yamuna Power Ltd., with it's Corporate Office at Shaktikiran Building, Karkardooma, Delhi -110032, (herein after called —the "Purchaser")in the sum of Rs..... (Rupees..... only) for which payment well and truly to be made to the said Purchaser, the Bank binds itself, its successors, and assigns by these presents.

Sealed with the Common Seal of the said Bank 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 on the Bid Form ; or
2. If the Bidder, having been notified of the acceptance of its Bid by the Purchaser during the period of bid validity:
  - (a) fails or refuses to execute the Contract Form ,if required; or
  - (b) fails or refuses to furnish the performance security, In accordance with the Instructions to Bidders/ Terms and Conditions;

We undertake to pay to the Purchaser up to the above amount upon receipt of its first written demand, without the Purchaser having to substantiate its demand, provided that is its demand the purchaser will note that amount claimed by it is due to it, owing to the occurrence of one or both of the two condition(s), specifying the occurred condition or condition(s).

This guarantee will remain in force up to and including One Hundred Eighty (180) days after the due date of submission bid, and any demand in respect thereof should reach the Bank not later than the above date.

(Stamp & signature of the bank)

Signature of the witness

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**BID FORM**

To

Head of Department  
Contracts & Material Deptt.  
BSES Yamuna Power Ltd  
Shaktikiran Building, Karkardooma,  
Delhi 110032

Sir,

1 We understand that BYPL is desirous of procuring..... for its licensed distribution network area in Delhi

2 Having examined the Bidding Documents for the above named works, we the undersigned, offer to deliver the goods in full conformity with the Terms and Conditions and technical specifications for the sum indicated in Price Bid or such other sums as may be determined in accordance with the terms and conditions of the contract .The amounts are in accordance with the Price Schedules attached herewith and are made part of this bid.

3 If our Bid is accepted, we under take to deliver the entire goods as) as per delivery schedule mentioned in Section IV from the date of award of purchase order/letter of intent.

4 If our Bid is accepted, we will furnish a performance bank guarantee for an amount of 10% (Ten)percent of the total contract value for due performance of the Contract in accordance with the Terms and Conditions.

5 We agree to abide by this Bid for a period of 180 days from the due date of bid submission and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

6 We declare that we have studied the provision of Indian Laws for supply of equipments/materials and the prices have been quoted accordingly.

7 Unless and until Letter of Intent is issued, this Bid, together with your written acceptance there of, shall constitute a binding contract between us.

8 We understand that you are not bound to accept the lowest, or any bid you may receive.

9 There is provision for Resolution of Disputes under this Contract, in accordance with the Laws and Jurisdiction of Contract.

Dated this..... day of..... 20

Signature..... In the capacity of .....

.....duly authorized to sign for and on behalf of

(IN BLOCK CAPITALS) .....

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## ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT

(To be signed and stamped by the bidder)

BSES Yamuna Power Ltd (hereinafter referred to as "**BYPL**") intends to use the reverse auction through SAP-SRM tool as an integral part of the entire tendering process. All the bidders who are found as techno commercial qualified based on the tender requirements shall be eligible to participate in the reverse auction event.

The following terms and conditions are deemed as accepted by the bidder on participation in the bid event:

1. BYPL shall provide the user id and password to the authorized representative of the bidder. (Authorization letter in lieu of the same be submitted along with the signed and stamped acceptance form)
2. BYPL will make every effort to make the bid process transparent. However, the award decision by BYPL would be final and binding on the bidder.
3. The bidder agrees to non-disclosure of trade information regarding the purchase, identity of BYPL, bid process, bid technology, bid documentation, bid details, and etc.
4. The bidder is advised to understand the auto bid process to safeguard themselves against any possibility of non-participation in the auction event.
5. In case of bidding through internet medium, bidders are further advised to ensure availability of the entire infrastructure as required at their end to participate in the auction event. Inability to bid due to telephone line glitch, internet response issues, software or hardware hangs; power failure or any other reason shall not be the responsibility of BYPL.
6. In case of intranet medium, BYPL shall provide the infrastructure to bidders, further, BYPL has sole discretion to extend or restart the auction event in case of any glitches in infrastructure observed which has restricted the bidders to submit the bids to ensure fair & transparent competitive bidding. In case of an auction event is restarted, the best bid as already available in the system shall become the start price for the new auction.
7. In case the bidder fails to participate in the auction event due any reason whatsoever, it shall be presumed that the bidder has no further discounts to offer and the initial bid as submitted by the bidder as a part of the tender shall be considered as the bidder's final no regret offer. Any offline price bids received from a bidder in lieu of non-participation in the auction event shall be out rightly rejected by BYPL.
8. The bidder shall be prepared with competitive price quotes on the day of the reverse auction event.
9. The prices as quoted by the bidder during the auction event shall be inclusive of all the applicable taxes, duties and levies and shall be FOR Landed Cost basis at BYPL site.
10. The prices submitted by a bidder during the auction event shall be binding on the bidder.
11. No requests for time extension of the auction event shall be considered by BYPL.
12. The original price bids of the bidders shall be reduced on pro-rata basis against each line item based on the final all inclusive prices offered during conclusion of the auction event for arriving at contract amount.

Signature & seal of the Bidder

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**LITIGATION HISTORY**

Year	Name of client	Details of contract & date	Cause of Litigation/arbitration and dispute	Disputed amount

**CURRENT CONTRACT COMMITMENTS / WORK IN PROGRESS**

Year	Name of client	Details of contract & date	Value of outstanding work	Estimated completion date

**FINANCIAL DATA**

(Duly Certified by Chartered Accountant)

	Actual in previous 5 financial years				
	FY 21-22	FY 20-21	FY 19-20	FY 18-19	FY 17-18
Total assets					
Current assets					
Total Liability					
Current Liability					
Profit before taxes					
Profit after taxes					



## **ANNEXURE - SCHEDULE OF DEVIATIONS**

Vendor shall refrain from taking any deviations on this TENDER. Still in case of any deviations, all such deviations from this tender shall be set out by the Bidder, Clause by Clause in this schedule and submit the same as a part of the Technical Bid.

Unless **specifically** mentioned in this schedule, the tender shall be deemed to confirm the BYPL's specifications:

### **Technical Deviations:-**

SL No.	Clause No.	NIT Page No.	NIT Clause descriptions	Details of Clarification/deviation with justifications

### **Commercial Deviations:-**

SL No.	Clause No.	NIT Page No.	NIT Clause descriptions	Details of Clarification/deviation with justifications

By signing this document we hereby withdraw all the deviations whatsoever taken anywhere in this bid document and comply to all the terms and conditions, technical specifications, scope of work etc. as mentioned in the standard document except those as mentioned above.

**Seal of the Bidder:**

**Signature:**

**Name:**

**Technical Bid Submission Check List**

<b>S. No.</b>	<b>Description</b>	<b>BYPL Requirement</b>	<b>Bidder's Compliance</b>
<b>1</b>	<b>Tender No.</b>	Required	
<b>2</b>	<b>Technical Specification reference number</b>	Required	
<b>3</b>	<b>Communication Details</b>		
3.1	Name of the Bidder	Required	
3.2	Name of Authorized contact person	Required	
3.3	Contact No. of Authorized contact person	Required	
3.4	E-mail id of Authorized contact person	Required	
<b>4</b>	<b>Document Submission Format</b>		
4.1	Documents shall be submitted in Box file/spiral binding. Any other format is not acceptable	Required	
4.2	Index of documents with page numbers for each document	Required	
4.3	Separator with document description shall be provided before each document	Required	
<b>5</b>	<b>Qualifying Requirement Compliance</b>		
5.1	Summary of compliance of qualifying criteria in tabular form along with summary of documentary proof provided	Required	
5.2	Detailed Documents supporting compliance of qualifying criteria	Required	
<b>6</b>	<b>Drawings/ Documents as per Technical Specification.</b>		
6.1	Signed copy of technical specification	Required	
6.2	Type Test reports of offered model/ type/ rating	Required	
6.3	Guaranteed Technical particulars (GTP)	Required	
6.4	Deviation Sheet	Required	
6.5	Detailed Drawings	Required	
6.6	Manufacturer's quality assurance plan	Required	
6.7	Other drawing/ documents mentioned in technical specification	Required	
<b>7</b>	<b>Soft copy of complete technical bid in pen drive</b>	Required	
<b>8</b>	<b>Samples as per technical specification.</b>	Required	

**Note: Submission of Technical bid check list along with all items mentioned in the check list is mandatory. Order of documents shall be strictly as per the technical bid check list. Bids with incomplete/ wrong information are liable for rejection.**

## VENDOR CODE OF CONDUCT

Purchaser is committed to conducting its business in an ethical, legal and socially responsible manner. To encourage compliance with all legal requirements and ethical business practices, Purchaser has established this Vendor Code of Conduct (the "Code") for Purchaser's Vendors. For the purposes of this document, "Vendor" means any company, corporation or other entity that sells, or seeks to sell goods or services, to Purchaser, including the Vendor's employees, agents and other representatives.

Fundamental to adopting the Code is the understanding that a business, in all of its activities, must operate in full compliance with the laws, rules and regulations of the countries in which it operates. This Code encourages Vendors to go beyond legal compliance, drawing upon internationally recognized standards, in order to advance social and environmental responsibility.

### I. Labour and Human Rights

Vendors must uphold the human rights of workers, and treat them with dignity and respect as understood by the international community.

- . Fair Treatment - Vendors must be committed to a workplace free of harassment. Vendors shall not threaten workers with or subject them to harsh or inhumane treatment, including sexual harassment, sexual abuse, corporal punishment, mental coercion, physical coercion, verbal abuse or unreasonable restrictions on entering or exiting company provided facilities.

- . Antidiscrimination - Vendors shall not discriminate against any worker based on race, colour, age, gender, sexual orientation, ethnicity, disability, religion, political affiliation, union membership, national origin, or marital status in hiring and employment practices such as applications for employment, promotions, rewards, access to training, job assignments, wages, benefits, discipline, and termination. Vendors shall not require a pregnancy test or discriminate against pregnant workers except where required by applicable laws or regulations or prudent for workplace safety. In addition, Vendors shall not require workers or potential workers to undergo medical tests that could be used in a discriminatory way except where required by applicable law or regulation or prudent for workplace safety.

- . Freely Chosen Employment - Forced, bonded or indentured labour or involuntary prison labour is not to be used. All work will be voluntary, and workers should be free to leave upon reasonable notice. Workers shall not be required to hand over government-issued identification, passports or work permits as a condition of employment.

- . Prevention of Under Age Labor - Child labor is strictly prohibited. Vendors shall not employ children. The minimum age for employment or work shall be 15 years of age, the minimum age for employment in that country, or the age for completing compulsory education in that country, whichever is higher. This Code does not prohibit participation in legitimate workplace apprenticeship programs that are consistent with Article 6 of ILO Minimum Age Convention No. 138 or light work consistent with Article 7 of ILO Minimum Age Convention No. 138.

- . Juvenile Labor - Vendors may employ juveniles who are older than the applicable legal minimum age for employment but are younger than 18 years of age, provided they do not perform work likely to jeopardize their health, safety, or morals, consistent with ILO Minimum Age Convention No. 138.

- . Minimum Wages - Compensation paid to workers shall comply with all applicable wage laws, including those relating to minimum wages, overtime hours and legally mandated benefits. Any Disciplinary wage deductions are to conform to local law. The basis on which workers are being paid is to be clearly conveyed to them in a timely manner.

- . Working Hours - Studies of good manufacturing practices clearly link worker strain to reduced productivity, increased turnover and increased injury and illness. Work weeks are not to exceed maximum set by local law. Further, a work week should not be more than 60 hours per week, including overtime, except in emergency or unusual situations. Workers should be allowed at least one day off per seven-day week.

- . Freedom of Association - Open communication and direct engagement between workers and management are the most effective ways to resolve workplace and compensation issues. Vendors are to respect the rights

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of workers to associate freely and to communicate openly with management regarding working conditions without fear of reprisal, intimidation or harassment. Workers' rights to join labour unions seek representation and or join worker's councils in accordance with local laws should be acknowledged.

## **II. Health and Safety**

Vendors must recognize that in addition to minimizing the incidence of work-related injury and illness, a safe and healthy work environment enhances the quality of products and services, consistency of production and worker retention and morale. Vendors must also recognize that ongoing worker input and education is essential to identifying and solving health and safety issues in the workplace.

The health and safety standards are:

- . Occupational Injury and Illness - Procedures and systems are to be in place to prevent, manage, track and report occupational injury and illness, including provisions to: a) encourage worker reporting; b) classify and record injury and illness cases; c) provide necessary medical treatment; d) investigate cases and implement corrective actions to eliminate their causes; and e) facilitate return of workers to work.
- . Emergency Preparedness - Emergency situations and events are to be identified and assessed, and their impact minimized by implementing emergency plans and response procedures, including: emergency reporting, employee notification and evacuation procedures, worker training and drills, appropriate fire detection and suppression equipment, adequate exit facilities and recovery plans.
- . Occupational Safety - Worker exposure to potential safety hazards (e.g., electrical and other energy sources, fire, vehicles, and fall hazards) are to be controlled through proper design engineering and administrative controls, preventative maintenance and safe work procedures (including lockout/tagout), and ongoing safety training. Where hazards cannot be adequately controlled by these means, workers are to be provided with appropriate, well-maintained, personal protective equipment. Workers shall not be disciplined for raising safety concerns.
- . Machine Safeguarding - Production and other machinery is to be evaluated for safety hazards. Physical guards, interlocks and barriers are to be provided and properly maintained where machinery presents an injury hazard to workers.
- .Industrial Hygiene - Worker exposure to chemical, biological and physical agents is to be identified, evaluated, and controlled. Engineering or administrative controls must be used to control overexposures. When hazards cannot be adequately controlled by such means, worker health is to be protected by appropriate personal protective equipment programs.
- .Sanitation, Food, and Housing - Workers are to be provided with ready access to clean toilet, facilities potable water and sanitary food preparation, storage, and eating facilities. Worker dormitories provided by the Participant or a labour agent are to be maintained clean and safe, and provided by the Participant or a labour egress, hot water for bathing and showering, and adequate heat and ventilation and reasonable personal space along with reasonable entry and exit privileges.
- . Physically Demanding Work - Worker exposure to the hazards of physically demanding tasks, including manual material handling and heavy or repetitive lifting, prolonged standing and highly repetitive or forceful assembly tasks is to be identified, evaluated and controlled.

## **III. Environmental**

Vendors should recognize that environmental responsibility is integral to producing world class products In manufacturing operations, adverse effects on the environment and natural resources are to be minimized while safeguarding the health and safety of the public.

The environmental standards are:

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- . Product Content Restrictions - Vendors are to adhere to applicable laws and regulations regarding prohibition or restriction of specific substances including labeling laws and regulations for recycling and disposal. In addition, Vendors are to adhere to all environmental requirements specified by Purchaser.
- . Chemical and Hazardous Materials -Chemical and other materials posing a hazard if released to the environment are to be identified and managed to ensure their safe handling, movement storage, recycling or reuse and disposal.
- . Air Emissions - Air emissions of volatile organic chemicals, aerosols, corrosives, particulates, ozone depleting chemicals and combustion by-products generated from operations are to be characterized, monitored, controlled and treated as required prior to discharge.
- . Pollution Prevention and Resource Reduction -Waste of all types, including water and energy, are to be reduced or eliminated at the source or by practices such as modifying production, maintenance and facility processes, materials substitution, conservation, recycling and re-using materials.
- . Wastewater and Solid Waste - Wastewater and solid waste generated from operations industrial processes and sanitation facilities are to be monitored, controlled and treated as required prior to discharge or disposal.
- . Environmental Permits and Reporting - All required environmental permits (e.g. discharge monitoring) and registrations are to be obtained, maintained and kept current and their operational and reporting requirements are to be followed.

#### **IV. Ethics**

Vendors must be committed to the highest standards of ethical conduct when dealing with workers, Vendors, and customers.

- . Corruption, Extortion, or Embezzlement - Corruption, extortion, and embezzlement, in any form, are strictly prohibited. Vendors shall not engage in corruption, extortion or embezzlement in any form and violations of this prohibition may result in immediate termination as an Vendor and in legal action.
- . Disclosure of Information - Vendors must disclose information regarding its business activities, structure financial situation, and performance in accordance with applicable laws and regulations and prevailing industry practices.
- . No Improper Advantage - Vendors shall not offer or accept bribes or other means of obtaining undue or improper advantage.
- . Fair Business, Advertising, and Competition - Vendors must uphold fair business standards in advertising, sales, and competition.
- . Business Integrity - The highest standards of integrity are to be expected in all business interactions. Participants shall prohibit any and all forms of corruption, extortion and embezzlement. Monitoring and enforcement procedures shall be implemented to ensure conformance.
- . Community Engagement - Vendors are encouraged to engage the community to help foster social and economic development and to contribute to the sustainability of the communities in which they operate.
- . Protection of Intellectual Property - Vendors must respect intellectual property rights; safeguard customer information; and transfer of technology and know-how must be done in a manner that protects intellectual property rights.

#### **V. Management System**

Vendors shall adopt or establish a management system whose scope is related to the content of this Code. The management system shall be designed to ensure (a) compliance with applicable laws, regulations and customer requirements related to the Vendors' operations and products; (b) conformance with this Code; and (c) identification and mitigation of operational risks related to this Code. It should also facilitate continual improvement.

The management system should contain the following elements:

- . Company Commitment - Corporate social and environmental responsibility statements affirming Vendor's commitment to compliance and continual improvement.
- . Management Accountability and Responsibility - Clearly identified company representative[s] responsible for ensuring implementation and periodic review of the status of the management systems.

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- Legal and Customer Requirements - Identification, monitoring and understanding of applicable laws, regulations and customer requirements.
- Risk Assessment and Risk Management - Process to identify the environmental, health and safety and labour practice risks associated with Vendor's operations. Determination of the relative significance for each risk and implementation of appropriate procedural and physical controls to ensure regulatory compliance to control the identified risks.
- Performance Objectives with Implementation Plan and Measures - Areas to be included in a risk assessment for health and safety are warehouse and storage facilities, plant/facilities support equipment, laboratories and test areas, sanitation facilities (bathrooms), kitchen/cafeteria and worker housing /dormitories. Written standards, performance objectives, and targets an implementation plans including a periodic assessment of Vendor's performance against those objectives.
- Training - Programs for training managers and workers to implement Vendor's policies, procedures and improvement objectives.
- Communication - Process for communicating clear and accurate information about Vendor's performance, practices and expectations to workers, Vendors and customers.
- Worker Feedback and Participation - Ongoing processes to assess employees' understanding of and obtain feedback on practices and conditions covered by this Code and to foster continuous improvement.
- Audits and Assessments - Periodic self-evaluations to ensure conformity to legal and regulatory requirements, the content of the Code and customer contractual requirements related to social and environmental responsibility.
- Corrective Action Process - Process for timely correction of deficiencies identified by internal or external assessments, inspections, investigations and reviews.
- Documentation and Records - Creation of documents and records to ensure regulatory compliance and conformity to company requirements along with appropriate confidentiality to protect privacy.

The Code is modeled on and contains language from the Recognized standards such as International Labour Organization Standards (ILO), Universal Declaration of Human Rights (UDHR), United Nations Convention against Corruption, and the Ethical Trading Initiative (ETI) were used as references in preparing this Code and may be useful sources of additional information

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# **SPECIAL CONDITIONS OF CONTRACT**

## **1.0 PRIORITY OF CONTRACT DOCUMENTS:**

The several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies, the same shall be explained and adjusted by the Purchaser, who shall thereupon issue to the Contractor instructions thereon. In such event, unless otherwise provided in the Contract, the priority of the documents forming the Contract shall be as follows:

1. The Contract Agreement
2. The Letter of Acceptance/ Intent
3. Agreed Minutes of the Contract Negotiation Meetings
4. Agreed Minutes of the contract Technical Meetings
5. Instruction To Bidders (ITB)
6. Special Condition of Contract (SCC)
7. General Condition of Contract (GCC)
8. Erection Conditions of Contract (ECC)
9. The Priced Bill of Quantities
10. The Particular Technical Specifications
11. The General Technical Specifications
12. The Submitted Tender, including all Appendices and/or Addenda, the latest taking precedence.

## **2.0 SCOPE OF WORK:**

The scope of work under this contract shall include the turnkey execution on End to End Basis, including but not limited to design, manufacturing, inspection & testing, dispatches, loading, unloading, storage at site, erection & installation, testing of the installation, associated civil work, commissioning, Handing over to the purchaser including comprehensive marine cum storage cum erection Insurance (MSE) on "Single Point Responsibility Basis"

The entire scope of work under the contract shall be executed strictly as per the NIT conditions and the technical specification.

Scope of work shall mainly include:

1. The Scope of work under the package shall include all Supply, Survey, Design, Engineering, Manufacturing, Shop testing, Inspection, packing, dispatch, loading, unloading and storage at site, Marine cum Storage cum Erection Insurance policy, assembly, Erection, Structural and Civil work, complete pre-commissioning checks, testing and commissioning at site, obtaining statutory clearance & certification from Electrical Inspector and any other statutory authority for charging the substation and handing over of complete package.
2. The scope shall also include supply at site of all barricading, free-issued materials if any (including installation, transportation, loading & unloading), dewatering, watch and ward and transportation of scrap (generated at Site), balance free-issued material, dismantled material from site to site, site to BYPL store including loading & unloading and no additional charges shall be paid against these activities. Used barricading material will be taken back by contractor soon after job is handed over or as directed by BYPL Engineering Incharge.

No additional cost for these items will be paid to the Bidder. Any leakage, pilferage and damage of the material shall be in vendor's scope.

3. Contractor shall submit the detailed PERT chart/L2 Network for the execution of the package awarded for BYPL review and approval with major intermediate milestone as mentioned in Annexure- I. Contractor shall strictly adhere to the implementation schedule as per the project plan submitted and approved.
4. All the materials supplied against this contract shall be as per BYPL approved "Makes" and "Specifications" ONLY.
5. Permission for road cutting from Road owning agencies, Tree cutting and other statutory clearances (including all coordination and liasoning) shall be obtained by Bidder. However, All direct Fee shall be borne by BYPL.
6. Wherever BYPL specifications are not available, relevant IS/IEC to be followed. All Drawings mentioned in the Tender Specification and others required for completion of the work shall be submitted and approval of BYPL Engineer in Charge obtained before commencement of any job. Drawing submission process shall not be deemed complete until all the requirements are complied during the submission of the same.
7. The Contractor shall have own Safety equipment like Neon Tester, Portable Earth, Earthing discharge rod etc. along with valid Calibration Certificates of all the equipment.
8. Any material not specifically mentioned In BOQ but required for successful Erection, Testing and Commissioning of the package awarded shall be deemed to be in the scope of the bidder.
9. Successful Bidder shall depute Safety officer and Quality officer at site separately for each package and for the entire duration of the project and they shall submit the safety report and quality report to BYPL Site In charge on weekly basis.
10. Any item/work, not specifically mentioned in the NIT condition and technical specification but essentially required for completion of the work shall be the responsibility of the contractor
11. All Statuary Compliances (wherever applicable) required to complete the work as defined above are in the scope of contractor.
12. Electrical inspection clearance certification from BSES Electrical Inspector and any other statutory authority for charging the substation are in scope of Contractors.

### **3.0 CONTRACT PRICES:**

The contract price shall be including all the detailed scope as specified in the contract for the package awarded and shall be inclusive of all taxes and duties (GST) as applicable.

Prices are inclusive of all taxes and duties including labour cess.

However, IT as per applicable rate will be deducted from your bills as Tax Deduction at Source (TDS).

GST is included in the contract price awarded , however GST payment shall be made on submission of GST Registration and self declaration on your letter head stating that contractor have deposited/or will deposit the Tax as per the applicable GST laws. Contractor shall furnish your GST registration number.

**4.0 QUANTITIES VARIATION UNDER THE AWARDED CONTRACT:**

**Contract Unit rate shall applicable for the any addition/reduction in quantities:**  
Quantities may vary as per the site requirements

**5.0 FIRM CONTRACT PRICES:**

The contract price shall remain "Firm" throughout the contract execution. No Price Variation and/or escalation on any account shall be payable to the Contractor for any reason whatsoever.

**6.0 STATUARY VARIATION IN TAXES:**

The total order value shall remain **FIRM**. However in case of any statutory variation in GST, or Taxes, duties and Levies imposed by Competent Authorities by way of fresh notification(s) shall be borne by BYPL on submission of the documentary evidence.

Any variation in taxes shall be applicable only to the direct/price breakup as mentioned in the contract.

**7.0 COMPLETION TIME:**

Package Name	Total Months for Handing over of the Package, From Zero Date	Total No. of Day for Handing over of the Package From Zero Date
TURNKEY PACKAGE FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 33/11KV INDOOR GIS SUBSTATION ALONG WITH ALLIED EQUIPMENTS AND WORKS AT OMAXE SUB-STATION, CHANDNI CHOWK, DELHI	7 months	210 days

Detailed Execution schedule, including intermediate milestone for the execution of the Package is attached as "**Annexure- I**".

**8.0 BANK GUARANTEE:**

Bank Guarantee	To be submitted on	Valid Upto (tentative)
Contract Performance Guarantee (10% of total Contract value)	Within 15 days of Issue of Order.	Valid till 90 days beyond the Project Completion period/Handing Over.

Bank Guarantee against Advance (For the advance amount)	Invoice for Advance amount along with advance bank guarantee.	Valid till Completion of supplies/work under the contract.
Equipment Performance Bank Guarantee (10% of total Contract value)	Time of claiming the last payment and Issuance of Final Taking over certificate from Purchaser / Owner,	Valid till Completion of Defect Liability Period plus 3 months.

**9.0 LIQUIDATED DAMAGES:**

**9.1 LD FOR DELAY IN COMPLETION OF WORK:**

Time is essence of the Contract.

After issuance of the Letter of Intent, the contractual network / L2 network will be finalized and approved by the BYPL. Contractor shall strictly adhere to the completion schedule and intermediate milestones agreed.

If the Contractor fails to successfully hand over the Packages awarded within the agreed contract completion schedule the contractor shall pay to the Purchaser/ Owner, Liquidated damages for the delayed period at the rate of 0.5% of the total contract price per each week of delay or Pro-rata thereof, by which the Completion is delayed.

Maximum LD for delay is 10% of Contract Value.

It is agreed that liquidated damages are a genuine Pre-estimate of damages and not by way of penalty.

**9.2 LD ON INTERMEDIATE MILESTONE:**

Liquidated Damages shall be applicable on the delay in achieving Intermediate milestone as agreed in the L2 Network which shall be at the rate of **0.5% of the total contract price per each week of delay of Intermediate milestone or Pro-rata** thereof, by which the Milestones are delayed.

LD on delay in milestone activities shall be redeemable if the delays are covered subsequently and the package is handed over within the agreed schedule .

**9.3 OVER ALL LIQUIDATED DAMAGES:**

The overall Maximum LD for delay is 10% of Contract Value.

However, the total Liquidated Damages for delay will be limited as hereinafter provided below.

Notwithstanding the above, in the event the Contractor fails to complete the package as per the schedule; and delays the "Handling Over" of the package up to a period for which the liquidated damage for time delay becomes more than ten percent (10%) of the Contract Price, then the Purchaser at his sole discretion, shall be entitled to treat the failure as an act of default by the Contractor and same shall entitle the Purchaser to terminate the Contract.

The liquidated damages for delay will be recovered at the sole discretion of the Purchaser from the Contract Price or from other securities/BG's available with the Purchaser or jointly.

**10.0 LIABILITY & DAMAGES:**

- 10.1 Limitation of Liability for Clause 9.1 and 9.2 above: The aggregate amount of Supplier liability to Purchaser for all Late Completion Liquidated Damages and Performances (Considered in aggregate), shall not exceed 10% of Contract Price.
- 10.2 Aggregate Liability of Supplier: Supplier's / Contractor liability to Purchaser under or in connection with the Supply and Erection Contract shall not exceed 100% of the respective Contract Price.

**11.0 WARRANTEE/DEFECT LIABILITY PERIOD:**

Warranty /Defect Liability Period shall be of **Twenty Four (24) months** from the date of Final Take over of Packages by Purchaser.  
The Contractor shall be liable to rectify all defects in the works done by the Contractor under this Contract, or from any act or omission of the contractors during Warranty / Defect Liability Period.

Contractor shall replace/ Repair all the materials / items supplied under the contract against any defect or failure, which arise due to faulty materials, workmanship or design for the entire defects liability period.

If during the defects liability period any materials / items are found to be defective, these shall be replaced or rectified by the bidder at his own cost within the agreed time schedule from the date of receipt of intimation. The bidder shall depute their service personnel within 48 hours in case of emergency and shall ensure the availability of manpower/spares for the same during warranty period.

**12.0 LATENT DEFECT LIABILITY PERIOD:**

At the end of warranty period, the Supplier's Liability ceases except for latent defects.

Notwithstanding the completion of the Warranty Period, the Supplier shall be responsible for expeditiously making good by repair or replacement at its option and at its cost and expense any Latent Defect which appears before the expiry of the Latent Defects Liability Period.

The Contractor's Liability for latent defects warranty shall be limited to a period of Five (5) years from end of Warranty Period for all the supply items and the work executed under the contract.

For the purpose of this clause, the latent defects shall be the defects inherently lying within the material or arising out of design deficiency or the design deficiency of the implementation process adopted, which do not manifest themselves during Warranty period.

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### **13.0 INSURANCE:**

Contractor shall, at his own cost shall take Comprehensive Marine cum Storage cum Erection insurance policy for the total Project cost.

Contractor shall take, at his own cost, Third party insurance and suitable insurance policy for his own men and material.

The insurance covers to be taken by the Contractor shall be in a joint name of Purchaser and the Contractor. The Contractor shall, however, be authorized to deal directly with Insurance Company or companies during the contract period and shall be responsible in regard to maintenance of all insurance covers.

Any loss or damage to the equipment during handling, transportation, storage, erection, putting into satisfactory operation and all activities to be performed till the successful completion of and handling over Performance Guarantee tests of the plant shall be to the account of the Contractor. The Contractor shall be responsible for preference of all claims and make good for the damage or loss by way of repairs and/or replacement of the equipment, damaged or lost.

For all the insurance policies taken, Contractor shall be responsible for settlement of claims with the underwriters without any liability on the purchaser and will arrange replacements / rectification expeditiously without waiting for the settlement of insurance claim, at contractor's own cost and this shall not entitle the Contractor for any extension of Time and Cost Overrun.

**Marine Transit risk on supply of material on 100% of captioned value & Erection all risk cover on 100% of Project cost which cover include any loss or damage not limited to AOG perils, earthquake and act of terrorism.**

### **14.0 DRAWINGS/DOCUMENTS:**

Drawings will be supplied to the Contractor by Purchaser as per Agreed Master Documents List (MDL), Technical Specifications, BOQ and as mentioned in GCC.

### **15.0 TERMS OF PAYMENT:**

#### **A) FOR SUPPLY OF EQUIPMENT AND MATERIALS:**

- A. 5% of the total supply contract price shall be paid as initial interest free advance on fulfillment against 1) acceptance of LOI/PO, 2) submission of BG of equivalent amount valid upto completion period/handing over, whichever is earlier plus 3 months claim period and 3) Submission of Contract Performance Bank Guarantee of 10% of the contract price valid upto completion period/handing over, whichever is earlier plus 3 months claim period. In case of delay, the BG shall be extended suitably. The advance shall be adjusted against R/Bills.
- B. 10% of the total supply contract price shall be paid as interest free advance against submission of BG of equivalent amount valid upto completion period/handing over, whichever is earlier plus 3 months claim period, approval of drawings under Category-1 of major drawings (shall be mutually

agreed at the time of award), Quality Plans, Pert Chart, Network Diagram, Field Quality Plan, posting of project Manager and commencement of the first mile stone of the work mutually agreed. In case of delay, the BG shall be extended suitably. The advance shall be adjusted against R/Bills.

- C. 65% prorata of supply value item wise shall be payable against R/A bills for supply of equipments and materials within 45 days against receipt & acceptance of material at site and submission of following documents duly certified by BYPL Project-in-charge, complete in all respects:
- a) Signed copy of accepted Purchase Order (for first payment)
  - b) LR / RR / BL as applicable
  - c) Challan as applicable
  - d) Two (02) copies of Supplier's detailed Recipient Invoice showing Commodity description, quantity, unit price, total price and basis of delivery, and being 100% of the value of the consignment claimed.
  - e) Two (02) copies of Supplier's transporter invoice duly receipted by BYPL Stores & Original certificate issued by BYPL confirming receipt of the subject material at Stores/Site and acceptance of the same as per the provisions of the contract.
  - f) Two (02) copies Packing List / Detailed Packing List
  - g) Approved Test certificates / Quality certificates, if applicable
  - h) Certificate of Origin, if applicable
  - i) Material Dispatch Clearance Certificate (MDCC)
  - j) Insurance Policy / Certificate, if applicable
  - k) Warranty / Guarantee Certificate, if applicable
  - l) Check list for bill submission.
- D. 10% prorata on account of supply value of the actual executed value after installation/erection of material duly certified by BYPL Project-in- charge.
- E. Balance 10% on account of supply value of the actual executed value shall be paid in 45 days after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by BYPL Engineer-in-Charge specified in the tender and on submission of performance Bank Guarantee of 10% amount, in our format valid up to a defect liability period from the date of handing over of the scheme including submission of Electrical Inspector Clearance Certificate, Compliance of final punch point, No Demand Certificate, Letter of Indemnity by the supplier (The format of No Demand Certificate and Letter of Indemnity are attached as Annexure) and after reconciliation & adjustments of payments, if any towards quantities of materials issued from purchaser's stock and consumed by the contractor for expeditious completion of the job.

**B) FOR ERECTION, INSTALLATION AND TESTING & COMMISSIONING/CIVIL:**

Payment shall be made to you as under:

- (i) 5% of the total services contract price shall be paid as initial interest free advance on fulfillment against 1) acceptance of LOI/PO, 2) submission of BG of equivalent amount valid upto completion period/handing over, whichever is earlier plus 3 months claim period and 3) Submission of Contract Performance Bank Guarantee of 10% of the contract price valid upto completion period/handing over, whichever is earlier plus 3 months claim period. In case of delay, the BG shall be extended suitably. The advance shall be adjusted against R/Bills.

- (ii) 85% prorata of total services value shall be payable against R/A bills payable within 45 days after completion duly certified by Engineer in charge.
- (iii) Balance 10% on account of total services value of the actual executed value shall be paid in 45 days after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by BYPL Engineer-in-Charge specified in the tender and on submission of performance Bank Guarantee of 10% amount, in our format valid up to a defect liability period for 24 months from the date of handing over of the scheme including submission of Electrical Inspector Clearance Certificate, Compliance of final punch point, No Demand Certificate, Letter of Indemnity by the supplier (The format of No Demand Certificate and Letter of Indemnity are attached as Annexure) and after reconciliation & adjustments of payments, if any towards quantities of materials issued from purchaser's stock and consumed by the contractor for expeditious completion of the job.

**16.0 ARBITRATION:**

The venue of arbitration shall be New Delhi.

**17.0 UNFORESEEABLE SUB-SURFACE CONDITIONS:**

Notwithstanding anything contained elsewhere in the contract, if during the execution stage, the Contractor encounters on the Site any sub-surface conditions that are different from those envisaged from the soil testing / data available at the site, or the Contractor's own testing, which necessitates corrective action / changes in the method(s) of work, all costs related with such changes shall be borne by the Contractor. These conditions shall no way be compensated either for time, or costs, by the Purchaser.

**18.0 FORCE MAJEURE:**

**Force Majeure Events:**

For the purpose of this Agreement, Force Majeure means any act, event or circumstance, or combination of acts, events or circumstances, which materially and adversely affects the affected

Party's performance of its obligations pursuant to the terms of this Agreement, but only if and to the extent that such acts, events or circumstances are not within the affected Party's reasonable control, were not reasonably foreseeable and could not have been prevented or overcome by the affected Party through the exercise of reasonable skill or care.

**18.1 Political Force Majeure Events:**

Which shall comprise the following acts, events and circumstances:

- i) Act of war (whether declared or undeclared), invasion, armed conflict or act of foreign enemy, blockade, embargo, revolution, riot insurrection, civil commotion, act of terrorism or sabotage, in each case occurring inside or directly involving India:



ii) Strikes, lockouts or other difficulties, which are politically motivated (rather than motivated primarily by a desire to improve compensation or working conditions of those involved) or are caused in whole or part by another event of Political Force Majeure or are part of a nation-wide or regional strike, or other generalised labour action occurring within India; (excluding such events which are site specific and attributable to the Supplier);

iii) Radioactive contamination or ionising radiation or chemical contamination originating from a source in India or resulting from another Political Force Majeure Event;

**18.2 Non Political Force Majeure events comprising the following acts, events and circumstances:**

i) Flood, cyclone, lightning, earthquake, drought, storm or any other extreme effect of the natural elements;

ii) Epidemic, or plague;

iii) Fire or explosion;

iv) Strikes, lockouts or other labour difficulties not included above (excluding such events which are Site specific and attributable only to the contractor)

v) Air crash, shipwreck or trainwreck or loss of or damage to any major component of the Facility arising in the course of transit.

**18.3 Burden of Proof:**

In the event that the Parties are unable in good faith to agree that a Force Majeure Event has occurred, the Parties shall submit the dispute for resolution pursuant to clause , provided that the burden of proof as to whether a Force Majeure Event has occurred shall be upon the Party claiming a Force Majeure Event.

**18.4 Excused Performance:**

The Party claiming Force Majeure shall give notice to the other Party of any Force Majeure Event as soon as reasonably practical after becoming aware of its existence, but not later than **twenty four (24)hours** after the date on which such Party knew or should reasonably have known of the commencement of the Force Majeure Event. Notwithstanding the above, if the Force Majeure Event results in a breakdown of communications rendering it not reasonably practicable to give notice within the applicable time limit specified herein, then the Party claiming Force Majeure shall give such notice as soon as reasonably practicable after the reinstatement of communications, but not later than forty eight (48) hours after such reinstatement.

(a) The Party claiming Force Majeure shall give notice to the other Party of:

i)The cessation of the relevant Force Majeure Event; and

ii) The cessation of the effects of such Force Majeure Event on the enjoyment by such Party of its rights or the performance by it of its obligations under this Agreement; as soon as practicable after becoming aware thereof.

(b) The suspension of performance shall be of no greater scope and of no longer duration than is reasonably required by the Force Majeure Event.

(c) No liability of either Party which arose before the occurrence of the Force Majeure Event causing the suspension of performance shall be excused as a result of the occurrence, including, without limitation, liability for the timely payment of money otherwise due and earned by performance of tasks required under this Agreement by any Party.

(d) Any Party claiming Force Majeure shall use its reasonable efforts to mitigate and overcome the effects of any act, event or circumstance of Force Majeure as soon as practicable after the occurrence of a Force Majeure Event, including by mutual agreement the expenditure of reasonable sums of money, and to co-operate with the other Party to develop and implement a plan of remedial and reasonable alternative measures to remove the Force Majeure Event, provided, however, that no Party shall be required under this provision, to settle any strike or other labour dispute on terms it reasonably considers to be unfavourable to it. The Party claiming Force Majeure shall furnish weekly written reports to the other Party with respect to its progress in overcoming the effects of the act, event or circumstance of Force Majeure together with such supporting documentation and information as the other Party reasonably requires regarding the claim of Force Majeure.

(e) When the affected Party is able to resume performance of its obligations under this Agreement that Party shall give the other Party written notice to that effect and shall promptly resume performance hereunder.

### **18.5 Limitations:**

Anything in this Agreement to the contrary notwithstanding:

(a) The affected Party shall not be relieved from obligations under this Agreement to the extent that the gross negligence of the affected Party (or, in the case of Supplier, The

Purchaser's Suppliers or any Subcontractor) contributes to or aggravates the Force Majeure Event ; and

(b) The existence of a Force Majeure Event shall not excuse the affected Party from its obligations to make payment of any monies otherwise due and payable by the affected Party pursuant to this Agreement.

### **18.6 Consequences of Force Majeure**

Neither Party shall be considered in default or in breach of its obligations under this Agreement to the extent that performance of such obligations is prevented by any circumstances of a Force Majeure Event.

**19.0 SUSPENSION OF WORK:**

Purchaser reserves the right to suspend and reinstate execution of the whole or any part of the Works without invalidating the provisions of the Contract. Orders for suspension or reinstatement of the works will be issued to the Contractor in writing. The time for Completion of the Works will be extended for a period equal to duration of the suspension.

For an aggregate suspension period of less than Six (6) months the Contractor shall not claim any reimbursement. Any necessary and demonstrable costs incurred by the Contractor, as a result of suspension of the Works beyond the above period, will be paid by The Purchaser, provided such costs are substantiated to the satisfaction of The Purchaser. For this purpose, only the direct costs incurred shall be considered and this shall exclude any overheads, incidentals or profit. The Purchaser's decision in this regard will be final and binding. The Purchaser shall not be responsible for any liability if suspension or delay is due to some default on the part of the Contractor or its sub-contractor. Purchasers decision in this regard shall be final and binding. Purchaser shall not be responsible for any liability if suspension is caused due to some default on the part of the supplier and its sub suppliers.

**20.0 FINAL TAKING OVER OF THE PACKAGES:**

Upon successful completion of testing and Commissioning of the all the items/work under the package awarded and all the testing conducted to the Purchaser/Owner's satisfaction, the Purchaser shall issue to the Contractor a "Taking over Certificate" as a proof of the final acceptance of the packages only after receipt of such certificate from the Owner to Purchaser.

**21.0 CONSTRUCTION WATER AND POWER:**

Construction Water and power shall be arranged by Contractor at his own cost.

## **ANNEXURE - I**

### **EXECUTION SCHEDULE**

Contractor shall submit the detailed PERT chart/L2 Network for the execution of the package awarded for BYPL review and approval.

However the major milestone shall be as under:

SL NO	DESCRIPTION OF MATERIAL	TIMELINE
1	Zero Date (Letter of Award)	Zero Date
2	Mobilization of manpower	15 days from Zero Date
3	Submission of Drawings/Documents/calculations for Engineering Approval	30 days from Zero Date
4	Engineering Approval	60 days from Zero Date
5	Civil Works	120 days from Zero Date
6	Procurement/Supplies	150 days from Zero Date
7	Equipment Erection	180 days from Zero Date
9	Testing & Commissioning of entire substation	200 days from Zero Date
10	Handing Over	210 days from Zero Date

**GENERAL CONDITIONS OF CONTRACT  
(GCC-SUPPLY)**

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BIDDERS

# **GENERAL CONDITIONS OF CONTRACT (GCC)-SUPPLY**

The General Condition of Contract shall form a part of specifications, contract document.

## **1. PRIORITY AND CONTENT OF CONTRACT DOCUMENTS:**

The several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies, the same shall be explained and adjusted by the Purchaser, who shall thereupon issue to the Contractor, instructions thereon. In such event, unless otherwise provided in the Contract, the priority of the documents forming the Contract shall be as follows:

1. The Contract Agreement
2. The Letter of Acceptance/ Intent
3. Agreed Minutes of the Contract Negotiation Meetings.
4. Agreed Minutes of the contract Technical Meetings.
5. Instruction To Bidders (ITB)
6. Special Condition of Contract (SCC)
7. General Condition of Contract (GCC)
8. Erection Conditions of Contract (ECC)
9. The Priced Bill of Quantities
10. The Particular Technical Specifications
11. The General Technical Specifications
12. The Submitted Tender, including all Appendices and/or Addenda, the latest taking precedence.

All the materials, literature, data and information of any sort given by the contractor along with its bid proposal subject to the approval of the purchaser.

## **2. CONTRACT LANGUAGE:**

All documents, instructions, catalogues, brochures, pamphlets, design data, norms and calculations, drawings, operation, maintenance and safety manuals, reports, labels, on deliveries and any other data shall be in English Language only.

The Contract documents and all correspondence between the BYPL, Third Parties associated with the contract, and the Bidder shall be in English language.

However, all signboards required indicating "Danger" and/or security at site and otherwise statutory required shall be in English, Hindi.

## **3. DEFINITIONS AND INTERPRETATION:**

Definitions TO BE FOLLOWED UNDER THE CONTRACT shall have following meanings:

3.1 COMPANY / PURCHASER / OWNER: Means BSES Yamuna Power Ltd, a company incorporated under the Companies Act 1956 and having its office at Shaktikiran Building, Karkardooma, Delhi -110032, which expression shall include its authorized representatives, agents, successors and assigns.



3.2 CONTRACTOR: Shall mean the successful Tenderer / vendor to whom the contract has been awarded.

3.3 Rate: The unit rates for the work to be carried out at site shall be as per finalized unit rates through tender. The finalized rates shall be firm for the entire duration of work to be carried out by the Contractor under the work order and are not subject to escalation for any reason whatsoever.

3.4. CONTRACT SPECIFICATION: The terms "CONTRACT Specification" shall mean the Technical specification of the work as agreed by you and description of work as detailed in Annexure-I enclosed herewith and all such particulars mentioned directly/referred to or implied as such in the contract.

3.5. SITE: The terms "Site" shall mean the working location in BYPL area. Under this tender, working location shall be as mentioned elsewhere.

3.6. ENGINEER IN CHARGE: "Engineer In-charge" means the Company's authorized representative for the purpose of carrying out the work.

3.7 APPLICABLE LAW: Applicable Laws means the constitution of India and any act, rule, regulations, directive, notification, code, order or instruction having its force of law enacted or issued by any competent legislature or Governmental Agency (including those related to taxes, duties, assessments, expropriation and compulsory acquisition) as may be in effect from time to time the implications thereof shall be deemed a Change in Law or Change in Permits.

3.8 OTHER CLEARANCES: Means any consent, approval, permit or other authorisation which is required to be granted by authorities (local, government or any other) essential to start/complete the work.

3.9 DEFECT LIABILITY PERIOD: Shall mean the period during which the contractor shall remain liable for repair or replacement of any defective part of the work performed under the contract, free of cost.

3.10 TENDER SPECIFICATION: The terms "Tender Specification" shall mean the Indian Standard specification of the work and description of work as detailed in Tender document/Tender enclosed and all such particulars mentioned directly/referred to or implied as such in the Tender.

3.11. CONTRACT PRICE shall mean the price referred to in the "Letter of Intent/Purchase Order".

3.12 CONTRACT PERIOD shall mean the period during which the "Contract" shall be executed as agreed between the Supplier and the Purchaser in the Contract inclusive of extended contract period for reason beyond the control of the Supplier and/or Purchaser due to force majeure.

3.13 CODES AND SPECIFICATION shall mean all the applicable codes and standards as indicated in the Specification.

3.14 CHANGE OF WORK means any addition to, deletion from, suspension of or other modification, to the Work, or to the quality, function or as delineated in this Contract, including any such addition, deletion, suspension or other modification, which requires a change in one or more of the Technical Specifications and the completion schedule

3.15 EPC means Engineering, Procurement and Construction wherein the EPC contractor is made responsible for all the activities from design, procurement, supply, storage construction, commissioning and handover of the project to owner.

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3.16 EFFECTIVE DATE OF CONTRACT means the date of issue/award of contract shall be the Effective Date of Contract or Contract Commencement date.

3.17 CONTRACT COMMENCEMENT DATE means the date of issue/award of contract shall be the Effective Date of Contract or Contract Commencement date.

3.18 CONTRACT COMPLETION DATE means the date of expiry of Guarantee/defect liability Period shall be deemed as the Contract Completion Date.

**4. EXAMINATION OF SITE AND LOCAL CONDITIONS:**

The contractor is deemed to have visited the site of the work and ascertained therefore all site conditions and information pertaining to his work.

Before submitting the bid, all bidders will at their expenses make or obtain any additional information, investigations, explorations, test and studies and obtain any additional information and data which pertains to the physical conditions at or contiguous to the site or otherwise which may affect cost, progress, performance of the work and which the bidder deems necessary to determine its Bid for performing the work in accordance with the time and other terms and conditions of the tender/contract documents.

The company shall not accept any claim whatsoever arising out of the difficult site/terrain/local conditions, if any

**5. LANGUAGE AND MEASUREMENT:**

The CONTRACT issued to the contractor by the company and all correspondence and documents relating to the CONTRACT placed on the Contractor shall be written in English language.

Metric System shall be followed for all dimension, units etc.

**6. TIME – THE ESSENCE OF CONTRACT:**

The time and the date of Contract Execution completion of the "Package" as stipulated in the Letter of Intent/ Purchase order issued to the Supplier shall be deemed to be the essence of the "Contract". The "Entire Package" has to be completed and handed over not later than the aforesaid Schedule.

**7. PROGRESS REPORT:**

The supplier shall submit weekly/fortnightly/monthly progress report as desired by the Purchaser's Engineer in Charge and in the format mutually agreed between the parties.

**8. SCOPE OF WORK:**

The scope of work under this contract shall include the turnkey execution on End to End Basis, including but not limited to design, manufacturing, inspection & testing, dispatches, loading , unloading ,storage at site, erection & installation, testing of the installation, associated civil work ,commissioning ,handing over to the purchaser

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including comprehensive marine cum storage cum erection Insurance (MSE) on "Single Point Responsibility Basis" on turnkey Basis

Brief Scope of Work related to all the supplies for the successful completion, testing & commissioning and final handover for the above packages shall be as per the NIT conditions with the following salient details.

Any item/work, not specifically mentioned in the NIT condition and technical specification but essentially required for completion of the work shall be the responsibility of the contractor. The "Scope of Supply" shall be on the basis of Bidder's responsibility, completely covering the obligations, responsibility and supplies provided in this Bid enquiry whether implicit or explicit.

**9. QUANTITY VARIATION AND EXTRA ITEM/WORK:**

The purchaser reserves the rights to vary the quantity as per the site requirements.

The Bill of Quantity break-up shown else-where in Price Schedule is tentative. The bidder shall ascertain himself regarding material required for completeness of the entire work. Any item not indicated but is required to complete the job, shall be deemed to be included in the prices quoted.

Payment will be made on the basis of actual quantity of supplies/actual measurement of works accepted by BYPL and not on the basis of contract quantity.

**10. FIRM CONTRACT PRICES:**

The rates finalized for this order shall be firm for the entire duration of work carried out by the Contractor under the order and are not subject to any variation and escalation for any reason whatsoever.

**11 CONTRACT RATES:**

The rates finalized for this order shall be firm for the entire duration of work carried out by the Contractor under the order and are not subject to any variation and escalation for any reason whatsoever.

The cost of insurance during loading/unloading of materials/ equipments during its storage and handling/erection at site for installation is included in the contractor's scope and value is included in the unit rates finalized.

The unit rates finalized are also inclusive of Insurance policy taken as defined in Special Conditions Contracts (SCC) Though Bidders shall indicate the value separately.

Cost of operation as per the requirement specified in NIT , for the duration of Six (6) months are included in the contract prices, However Bidder shall indicate the separate value for the same.

**12 TAXES AND DUTIES:**

Prices are inclusive of all taxes and duties including labour cess.

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GST is included in the contract price awarded , however GST payment shall be made on submission of GST Registration and self declaration on your letter head stating that contractor have deposited/or will deposit the Tax as per the applicable GST laws. Contractor shall furnish your GST registration number.

**13 STATUTORY VARIATION:**

Any statutory variations i.e. increase/decrease in Taxes / Duties introduces by central Govt. / State Govt. of shall be reimbursed/recovered to/from Contractor against documentary evidence and proof. Any variation in taxes shall be applicable only to the direct/price breakup as mentioned in the contract.

**14 CHANGE OF LAW:**

"Change in Law" means:

- a) any enactment or issue of any new Applicable Law,
- b) any amendment, alteration, modification, or repeal of any existing Applicable Law or any new or modified directive or order there under,
- c) any change or variation in taxes payable in connection with and under this Agreement in each case with respect to a), b), and c) above coming into effect after the date of this Agreement.

**15 SPECIFICATIONS AND STANDARDS:**

The Bidder shall follow all codes and standards referred in the Contract Document. Codes and standards not specifically mentioned in the Contract Document may be followed by the Bidder with the prior written approval of BYPL, provided materials, supplies and equipment according to the standard are equal to or better than the corresponding standards specified in the Contract.

Product manufactures /makes names mentioned in the Contract documents are for the purpose of establishing the type and quality of products to be used. The Bidder shall not change the brand name and qualities of the bought out items without the prior written approval of the BYPL. All such products and equipment shall be used or installed in strict accordance with original manufacturer's recommendations, unless otherwise directed by the BYPL. In any circumstances the codes, specimen and standards prescribed by any government agency should not be violated.

**16 QUALITY ASSURANCE AND INSPECTION:**

Immediately on award of contract, the bidder shall prepare detailed quality assurance plan/test procedure identifying the various stages of manufacture, quality checks performed at each stage, raw material inspection and the Customer hold points. The document shall also furnish details of method of checking, inspection and acceptance standards / values and get the approval of Purchaser before proceeding with manufacturing. However, Purchaser shall have right to review the inspection reports, quality checks and results of suppliers' in house inspection department which are not Customer hold points and the supplier shall comply with the remarks made by purchaser or his representative on such reviews with regards to further testing, rectification or rejection, etc. In case of standard items, BYPL shall forward the standard QAP which is to be followed by vendor during manufacturing.

Witness and Hold points are critical steps in manufacturing, inspection and testing where the supplier is obliged to notify the Purchaser in advance so that it may be witnessed by the Purchaser. Final

inspection is a mandatory hold point. The supplier to proceed with the work past a hold point only after clearance by purchaser or a witness waiver letter from BYPL.

The performance of waiver of QA activity by Purchaser at any stage of manufacturing does not relieve the supplier of any obligation to perform in accordance with and meet all the requirements of the procurement documents and also all the codes & reference documents mentioned in the procurement document nor shall it preclude subsequent rejection by the purchaser.

On completion of manufacturing, the items can only be dispatched after receipt of dispatch instructions issued by the Purchaser.

All in-house testing and inspection shall be done without any extra cost. The in-house inspection shall be carried out in presence of BYPL/BYPL authorized third party inspection agency. Cost of Futile/abortive visit(s) shall be debited from the invoices.

Purchaser reserves the right to send any material being supplied to any recognized laboratory for testing, wherever necessary and the cost of testing shall be borne by the Bidder. In case the material is found not in order with the technical requirement / specification, the charges along with any other penalty which may be levied is to be borne by the bidder.

**17 ERRORS AND OMISSIONS:**

The Supplier shall be responsible for all discrepancies, errors and omissions in the drawings, documents or other information submitted by him, irrespective of whether these have been approved, reviewed or otherwise accepted by the BYPL or not. However any error in design/drawing arising out of any incorrect data/written information from BYPL will not be considered as error and omissions on part of the Supplier.

**18 PACKING, PACKING LIST & MARKING:**

**Packing:** Supplier shall pack or shall cause to be packed all Commodities in crates/boxes/drums/containers/cartons and otherwise in such a manner as shall be reasonably suitable for shipment by road or rail to BYPL, Delhi/New Delhi stores/site without undue risk of damage in transit. All the packaging materials as prescribed shall be supplied preferably with bio-degradable packing- materials.

**Packing List:** The contents of each package shall be itemized on a detailed list showing the exact weight, extreme outside dimensions (length, width & weight) of each container/box/drum/carton, Item SAP Code, PO No & date. One copy of the packing list shall be enclosed in each package delivered.

**19 PRICE BASIS FOR SUPPLY OF MATERIALS:**

Bidders shall quote their prices on Landed Cost Basis and separate price for each item.

Bidders shall quote FIRM prices for supply to BYPL Delhi/New Delhi stores inclusive of all packing, forwarding, loading at manufacturer's premises, unloading at site/stores and payment of GST. Storage of material is under the bidder Scope. Bidder shall arrange transit Insurance as per clause nos. 8 mentioned in Volume -1 Special Condition of Contract (SCC).

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**20 TERMS OF PAYMENT AND BILLING – SUPPLY:**

Terms of payment and Billing shall be as specified in Volume –I, Special Condition of Contract.

**21 COMMISSIONING SPARES AND TOOLS & TACKLES:**

Commissioning Spares shall be deemed to be included in the quoted price.

**22 RETURN, REPLACEMENT OR SUBSTITUTION:**

BYPL shall give Supplier notice of any defective Commodity promptly after becoming aware thereof. BYPL may in its discretion elect to return defective Commodities to Supplier for replacement, free of charge to BYPL, or may reject such Commodities and purchase the same or similar Commodities from any third party. In the latter case BYPL shall furnish proof to Supplier of the cost of such substitute purchase. In either case, all costs of any replacement, substitution, shipping, labour and other related expenses incurred in connection with the return and replacement or for the substitute purchase of a Commodity hereunder should be for the account of Supplier. BYPL may set off such costs against any amounts payable by BYPL to Supplier. Supplier shall reimburse BYPL for the amount, if any, by which the price of a substitute Commodity exceeds the price for such Commodity as quoted in the Bid.

**23 PERFORMANCE GUARANTEE:**

Performance Guarantee shall be as specified in Volume –I, Special Condition of Contract.

**24 WARRANTY/DEFECTS LIABILITY PERIOD:**

All supplies made/Work executed shall be guaranteed against any defect or failure which may arise due to faulty materials, design or workmanship for a period of 24 months from the date of final handing over of the entire package as defined in SCC.

If during the Defect Liability Period any work are found to be defective, shall be immediately rectified or repaired, upto BYPL satisfaction, by the contractor at his own cost within 10 days from the date of receipt of intimation from BYPL.

Under no circumstances any extra claim in terms of time and cost shall be entertained for such repair/rectification.

**25 SUPPORT BEYOND THE GUARANTEE PERIOD:**

The Bidder shall ensure availability of spares and necessary support for a period of at least Twenty (20) years post completion of guarantee period of equipments supplied against the contract.

**26 DOCUMENTATION:**

The Bidder's shall procure all equipment from BYPL approved sources as per attached specifications. The Bidder shall submit 5 copies of Material/Type Test Certificates, O&M Manuals, and Approved & As-

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built drawings. The Bidder shall ensure for the strict compliance to the specifications and Field Quality Procedures issued by BYPL Engineer in-charge.

**27 FORFEITURE:**

Each Performance Bond established under the contract shall contain a statement that it shall be automatically and unconditionally forfeited without recourse and payable against the presentation by BYPL of this Performance Bond, to the relevant bank referred to above, together with a simple statement that supplier has failed to comply with any term or condition set forth in the Contract.

Each Performance BG established under will be automatically and unconditionally forfeited without recourse if BYPL in its sole discretion determines that supplier has failed to comply with any term or condition set forth in the contract.

**28 SUSPENSION OR EXTENSION:**

Purchaser reserves the right to suspend and reinstate execution of the whole or any part of the Works without invalidating the provisions of the Contract. Orders for suspension or reinstatement of the works will be issued to the Contractor in writing. The time for Completion of the Works will be extended for a period equal to duration of the suspension.

For an aggregate suspension period of less than Six (6) months the Contractor shall not claim any reimbursement. Any necessary and demonstrable costs incurred by the Contractor, as a result of suspension of the Works beyond the above period, will be paid by The Purchaser, provided such costs are substantiated to the satisfaction of The Purchaser. For this purpose, only the direct costs incurred shall be considered and this shall exclude any overheads, incidentals or profit. The Purchaser's decision in this regard will be final and binding. The Purchaser shall not be responsible for any liability if suspension or delay is due to some default on the part of the Contractor or its sub-contractor. Purchasers decision in this regard shall be final and binding. Purchaser shall not be responsible for any liability if suspension is caused due to some default on the part of the supplier and its sub suppliers.

**29 TERMINATION DUE TO CONTRACTORS DEFAULT:**

The Purchaser may terminate the contract after giving 7(seven) days notice if any of following occurs

- a) Contractor fails to complete execution of works within the approved schedule of works, terms and conditions
- b) In case the contractor commits any Act of Insolvency, or adjudged insolvent
- c) Has abandoned the contract
- d) Has failed to commence work or has suspended the progress of works
- e) Has failed to proceed the works with due diligence and failed to make such due progress

**30 EVENTS OF DEFAULT:**

BYPL may, without prejudice to any of its other rights or remedies under the Work Order or in law, terminate the whole or any part of this Work Order by giving written notice to the Contractor, if in the opinion of BYPL, contractor has neglected to proceed with the works with due diligence or commits a breach of any of the provisions of this work order including but not limited to any of the following cases:

- a) Failing to complete execution of work within the terms specified in this work order.
- b) Failing to complete works in accordance with the approved schedule of works.

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- c) Failing to meet requirements of specifications, drawings, and designs as approved by BYPL.
- d) Failing to comply with any reasonable instructions or orders issued by BYPL in connection with the works.
- e) Failing to comply with any of the terms or conditions of this work order.
- (f) Supplier fails or refuses to deliver supplies conforming to this NIT / specifications, or fails to deliver supplies within the period specified in PO or any extension thereof
- (g) Supplier becomes insolvent or unable to pay its debts when due, or commits any act of bankruptcy, such as filing any petition in any bankruptcy, winding-up or reorganization proceeding, or acknowledges in writing its insolvency or inability to pay its debts; or the Supplier's creditors file any petition relating to bankruptcy of Supplier;
- (i) Supplier otherwise fails or refuses to perform or observe any term or condition of the Contract and such failure is not remediable or, if remediable, continues for a period of 30 days after receipt by the Supplier , of notice of such failure from BYPL.

In the event BYPL terminates this work order, in whole or in part, on the occurrence of any event of default, BYPL reserves the right to engage any other subcontractor or agency to complete the work or any part thereof, and in addition to any other right BYPL may have under this work order or in law including without limitation the right to penalize for delay under clause 15.0 of this work order, the contractor shall be liable to BYPL for any additional costs that may be incurred by COMPANY for the execution of the Work.

**31. CONSEQUENCES OF DEFAULT:**

- (a) If an Event of Default shall occur and be continuing, BYPL may forthwith terminate the Contract by written notice.
- (b) In the event of an Event of Default, BYPL may, without prejudice to any other right granted to it by law, or the Contract, take any or all of the following actions;
- (c) present for encashment to the bank the relevant Performance Bond;
- (d) Purchase the same or similar Commodities from any third party; and/or
- (e) Recover any losses and/or additional expenses BYPL may incur as a result of Supplier's default

**32. RISK & COST:**

If the Contractor of fails to execute the work as per NIT specification / as agreed in the contract within the scheduled period and even after the extended period, the contract shall got terminated and BYPL reserves the right to get the work executed from any other source at the Risk & Cost of the Contractor.

The Extra Expenditure so incurred shall be debited to the Contract.

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**33 ARBITRATION:**

To the best of their ability, the parties hereto shall endeavor to resolve amicably between themselves all disputes arising in connection with this LOA. If the same remain unresolved within thirty (30) days of the matter being raised by either party, either party may refer the dispute for settlement by arbitration. The arbitration to be undertaken by two arbitrators, one each to be appointed by either party. The arbitrators appointed by both the parties shall mutually nominate a person to act as presiding arbitrator before entering upon the reference in the event of a difference between the two arbitrators and the award of the said presiding arbitrator in such a contingency shall be conducted in accordance with this provisions of the Indian Arbitration & Conciliation Act, 1996 and the venue of such arbitration shall be in the city of New Delhi only.

**34 TERMINATION FOR CONVENIENCE OF BYPL:**

34.1 BYPL at its sole discretion may terminate the contract by giving 30 days prior notice in writing or through email to the Supplier. BYPL shall pay the Supplier for all the supplies/ services rendered till the actual date of contract termination against submission of invoice by the Supplier to that effect.

34.2 Payment of such compensation is the sole and exclusive remedy of the supplier for termination of this Agreement by Purchaser hereunder and the supplier shall not be entitled to, and hereby waives, claims for lost profits and all other damages and expenses.

34.3 Supplier hereby agrees that substantiation for settlement of any claims submitted by supplier shall be complete and in sufficient detail to allow Purchaser's evaluation. Terminate all sub contracts except those have been/ to be assigned to the Purchaser all rights, title and benefits of the Suppliers/Vendor as the case may be.

**35 LIQUIDATED DAMAGES:**

Liquidated damages shall be as per Volume –I, Special Condition of Contract.

**36 TRANSFER AND SUB-LETTING:**

The Supplier shall not sublet, transfer, assign or otherwise part with the Contract or any part thereof, either directly or indirectly, without prior written permission of the Purchaser

**37 RECOVERIES:**

Whenever under this contract any money is recoverable from and payable by the bidder, the purchaser shall be entitled to recover such sum by appropriating in part or in whole by deducting any sum due to which any time thereafter may become due from the supplier in this or any other contract. Should the sum be not sufficient to cover the full amount recoverable the bidder shall pay to the purchaser on demand the remaining balance.

**38 WAIVER:**

Failure to enforce any condition herein contained shall not operate as a waiver of the condition itself or any subsequent breach thereof.

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**39 INDEMNIFICATION:**

Notwithstanding contrary to anything contained in this NIT, Supplier shall at his costs and risks make good any loss or damage to the property of the Purchaser and/or the other Supplier engaged by the Purchaser and/or the employees of the Purchaser and/or employees of the other Supplier engaged by the Purchaser whatsoever arising out of the negligence of the Supplier while performing the obligations under this contract.

**40 PATENT RIGHTS AND ROYALTY:**

If, in the course of performance of its functions and duties as envisaged by the scope of the present GCC, the Bidder acquires or develops, any unique knowledge or information which would be covered, or, is likely to be covered within the definition of a trademark, copyright, patent, business secret, geographical indication or any other form of intellectual property right, it shall be obliged, under the terms of this present GCC, to share such knowledge or information with BYPL. All rights, with respect to, or arising from such intellectual property, as afore mentioned, shall solely vest in BYPL.

Moreover, the Bidder undertakes not to breach any intellectual property right vesting in a third party/parties, whether by breach of statutory provision, passing off, or otherwise. In the event of any such breach, the Bidder shall be wholly liable to compensate, indemnify or make good any loss suffered by such third party/parties, or any compensation/damages arising from any legal proceeding/s, or otherwise. No liability of BYPL shall arise in this respect, and any costs, damages, expenses, compensation payable by BYPL in this regard to a third party/parties, arising from a legal proceeding/s or otherwise, shall be recoverable from the Bidder.

**41 CONFIDENTIALITY:**

Bidder and its employees or representatives thereof shall strictly maintain the confidentiality of various information they come across while executing the contract as detailed below.

**Documents**

All maps, plans, drawings, specifications, schemes and other documents or information related to the Contract/Project and the subject matter contained therein and all other information given to the Bidder by BYPL in connection with the performance of the contract shall be held confidential by the Bidder and shall remain the property of the BYPL and shall not be used or disclosed to third parties by the Bidder for any purpose other than for which they have been supplied or prepared. The Bidder may disclose to third parties, upon execution of confidentiality agreements, such part of the drawings, specifications or information if such disclosure is necessary for the performance of the Work provided such third parties agree in writing to keep such information confidential to the same extent and degree as provided herein, for the benefit of the BYPL.

**Geographical Data**

Maps, layouts and photographs of the site including its surrounding regions showing vital installation for national security of country or those of BYPL shall not be published or disclosed to the third parties or taken out of the country without prior written approval of the BYPL and upon execution of confidentiality agreements satisfactory to the BYPL with such third parties prior to disclosure.

**Violation**

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In case of violation of this clause, the Bidder is liable to pay compensation and damages as may be determined by the competent authority of BYPL.

**42 DISPUTE RESOLUTION & ARBITRATION:**

To the best of their ability, the parties hereto shall endeavor to resolve amicably between themselves all disputes arising in connection with this contract. If the same remain unresolved within thirty (30) days of the matter being raised by either party, either party may refer the dispute for settlement by arbitration. The arbitration to be undertaken by two arbitrators, one each to be appointed by either party. The arbitrators appointed by both the parties shall mutually nominate a person to act as presiding arbitrator before entering upon the reference in the event of a difference between the two arbitrators and the award of the said presiding arbitrator in such a contingency shall be conducted in accordance with the provisions of the Indian Arbitration & Conciliation Act, 1996 and the venue of such arbitration shall be in the city of New Delhi only. The language of proceedings, documents and communication shall be English.

**Suspension of Work on Account of Arbitration**

The reference to negotiation/arbitration shall proceed notwithstanding that the Works shall not then be or be alleged to be complete, provided always that the obligations of the Purchaser and the Supplier shall not be altered by reasons of arbitration being conducted during the progress of the Works. In no event shall the Supplier be entitled to suspend the Execution of the Works or part of the Works to which the Dispute relates on account of arbitration and payments to the Supplier shall continue to be made in terms of the Contract.

**The laws and jurisdiction of contract**

Where recourse to a Court is to be made in respect of any matter, the courts at Delhi shall have exclusive jurisdiction.

**ERECTION CONDITIONS OF CONTRACT  
(ECC)**

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## **GENERAL TERMS & CONDITIONS - ERECTION, TESTING & COMMISSIONING**

The Erection Condition of the contract shall form a part of the specifications, contract documents.

### **1. PRIORITY OF CONTRACT DOCUMENTS:**

The several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies, the same shall be explained and adjusted by the Purchaser, who shall thereupon issue to the Contractor, instructions thereon. In such event, unless otherwise provided in the Contract, the priority of the documents forming the Contract shall be as follows:

1. The Contract Agreement
2. The Letter of Acceptance/ Intent
3. Agreed Minutes of the Contract Negotiation Meetings.
4. Agreed Minutes of the contract Technical Meetings.
5. Instruction to Bidders (ITB)
6. Special Condition of Contract (SCC)
7. General Condition of Contract (GCC)
8. Erection Conditions of Contract (ECC)
9. The Priced Bill of Quantities
10. The Particular Technical Specifications
11. The General Technical Specifications
12. The Submitted Tender, including all Appendices and/or Addenda, the latest taking precedence.

All the materials, literature, data and information of any sort given by the contractor along with its bid proposal subject to the approval of the purchaser.

### **2. DEFINITIONS AND INTERPRETATION:**

Definitions TO BE FOLLOWED UNDER THE CONTRACT shall have following meanings:

2.1 COMPANY / PURCHASER / OWNER: Means BSES YAMUNA Power Ltd, a company incorporated under the Companies Act 1956 and having its office at Shaktikiran Building, Karkardooma, Delhi -110032, which expression shall include its authorized representatives, agents, successors and assigns.

2.2 CONTRACTOR: Shall mean the successful Tenderer / vendor to whom the contract has been awarded.

2.3 Rate: The unit rates for the work to be carried out at site shall be as per finalized unit rates through tender. The finalized rates shall be firm for the entire duration of work to be carried out by the Contractor under the work order and are not subject to escalation for any reason whatsoever.

2.4. **CONTRACT SPECIFICATION:** The terms "CONTRACT Specification" shall mean the Technical specification of the work as agreed by you and description of work as detailed in Annexure-I enclosed herewith and all such particulars mentioned directly/referred to or implied as such in the contract.

2.5. **SITE:** The terms "Site" shall mean the working location in BYPL area. Under this tender, working location shall be as mentioned elsewhere

2.6. **ENGINEER IN CHARGE:** "Engineer In-charge" means the Company's authorized representative for the purpose of carrying out the work.

2.7 **APPLICABLE LAW:** Applicable Laws means the constitution of India and any act, rule, regulations, directive, notification, code, order or instruction having its force of law enacted or issued by any competent legislature or Governmental Agency (including those related to taxes, duties, assessments, expropriation and compulsory acquisition) as may be in effect from time to time the implications thereof shall be deemed a Change in Law or Change in Permits.

2.8 **OTHER CLEARANCES:** Means any consent, approval, permit or other authorisation which is required to be granted by authorities (local, government or any other) essential to start/complete the work.

2.9 **DEFECT LIABILITY PERIOD:** Shall mean the period during which the contractor shall remain liable for repair or replacement of any defective part of the work performed under the contract, free of cost.

2.10 **TENDER SPECIFICATION:** The terms "Tender Specification" shall mean the Indian Standard specification of the work and description of work as detailed in Tender document/Tender enclosed and all such particulars mentioned directly/referred to or implied as such in the Tender.

2.11. **CONTRACT PRICE** shall mean the price referred to in the "Letter of Intent/Purchase Order".

2.12 **CONTRACT PERIOD** shall mean the period during which the "Contract" shall be executed as agreed between the Supplier and the Purchaser in the Contract inclusive of extended contract period for reason beyond the control of the Supplier and/or Purchaser due to force majeure.

2.13 **CODES AND SPECIFICATION** shall mean all the applicable codes and standards as indicated in the Specification.

2.14**CHANGE OF WORK** means any addition to, deletion from, suspension of or other modification, to the Work, or to the quality, function or as delineated in this Contract, including any such addition, deletion, suspension or other modification, which requires a change in one or more of the Technical Specifications and the completion schedule

2.15**EPC** means Engineering, Procurement and Construction wherein the EPC contractor is made responsible for all the activities from design, procurement, supply, storage construction, commissioning and handover of the project to owner.

2.16 EFFECTIVE DATE OF CONTRACT means the date of issue/award of contract shall be the Effective Date of Contract or Contract Commencement date.

2.17 CONTRACT COMMENCEMENT DATE means the date of issue/award of contract shall be the Effective Date of Contract or Contract Commencement date.

2.18 CONTRACT COMPLETION DATE means the date of expiry of Guarantee/defect liability Period shall be deemed as the Contract Completion Date.

**3 EXAMINATION OF SITE AND LOCAL CONDITIONS:**

The contractor is deemed to have visited the site of the work and ascertained therefore all site conditions and information pertaining to his work.

Before submitting the bid, all bidders will at their expenses make or obtain any additional information, investigations, explorations, test and studies and obtain any additional information and data which pertains to the physical conditions at or contiguous to the site or otherwise which may affect cost, progress, performance of the work and which the bidder deems necessary to determine its Bid for performing the work in accordance with the time and other terms and conditions of the tender/contract documents.

The company shall not accept any claim whatsoever arising out of the difficult site/terrain/local conditions, if an

**4 LANGUAGE AND MEASUREMENT:**

The CONTRACT issued to the contractor by the company and all correspondence and documents relating to the CONTRACT placed on the Contractor shall be written in English language.

Metric System shall be followed for all dimension, units etc.

**5 SCOPE OF WORK:**

The scope of work under this contract shall include the turnkey execution on End to End Basis , including but not limited to design, manufacturing, inspection & testing, dispatches, loading , unloading ,storage at site, erection & installation, testing of the installation, associated civil work ,commissioning ,handing over to the purchaser including comprehensive marine cum storage cum erection Insurance (MSE) on "Single Point Responsibility Basis.

Brief Scope of Work related to Erection and Installation work including testing and commissioning and final handover for the above packages shall be as per the NIT conditions with the following salient details.

5.1 Survey, design, engineering, manufacture, shop testing, inspection, packing, dispatch, loading, unloading and storage at site including comprehensive SCE (Storage cum Erection ) insurance, assembly, erection, civil structural, architectural work, complete

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pre-commissioning checks, testing & commissioning at site, also includes all statutory clearances & certification from Electrical Inspector, Municipal corporation department, Fire officer, Horticulture department , various local bodies like RWA and handing over to the Owner after satisfactory commissioning of complete Packages as defined above **on Turnkey Basis.**

- Schedule of work shall be as mentioned in the Bill of quantity attached herewith.
- After completion of Erection, Testing & Commissioning of the package awarded, contractor has to obtain the Electrical Inspectorate's Clearance from the Electrical Inspector of BYPL.
- Contractor shall arrange any permission like Road cutting clearance etc. from the Delhi Civic authorities. All Statutory charges and direct fees shall be borne by BYPL.
- All the Labour, plant appliance, ladder, scaffoldings, materials, tool, tackles etc are included in your scope of work.
- Adequate number of engineers, supervisors and labours shall be posted at site and the list of the same along with certificate of Qualification of technical staff should be submitted by the Contractor to the Engineer In Charge for checking the adequacy immediately (within seven days) after award of contract. Detailed Organisation chart, along with the qualification of the manpower to be deployed shall submitted along with Bid.
- The Contractor shall also make his own arrangement for the accommodation/conveyance requirements for its staff at site.
- Contractor shall arrange storage for storing the materials, tools, tackles etc. Contractor shall be responsible for all the unloading of the material, marking, staking and storage at site. The insurance for all the storage material shall be included in the policy taken by Contractor. Contractor shall submit the copy of insurance policy to BYPL. In case of any mishappening/damage to the storage material contractor shall be responsible to lodge the claim. Under no circumstances no delay in execution shall be allowed and contractor shall immediately arrange for the replacement without waiting for the settlement.
- All the incoming and outgoing materials, equipment, tools, tackles and any other items related to said work shall be entered into the register kept for this purpose and shall be in the custody of Contractor, however company does not hold any responsibility for any loss or damage of Contractor's material etc.
- All loading/unloading, of materials at work-site shall be contractors responsibility. Involvement of Crane/Hydra/Tractor/Trailer for this type of work shall be in contractors scope. Adequate weather protection shall be provided by the contractor to keep the materials safe from sun & rain by providing covered storage space as well as using tarpaulins.

**6 CONTRACT RATES:**

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The rates finalized for this order shall be firm for the entire duration of work carried out by the Contractor under the order and are not subject to any variation and escalation for any reason whatsoever.

The cost of insurance during loading/unloading of materials/ equipments during its storage and handling/erection at site for installation is included in the contractor's scope and value is included in the unit rates finalized.

The unit rates finalized are also inclusive of barricading and watch & ward during execution and no separate charges shall be paid for the same.

The cost of training of BYPL Official shall be included in the prices quoted by vendor.

## **7 TAXES AND DUTIES:**

Prices are inclusive of all taxes and duties including labour cess.

However, IT as per applicable rate will be deducted from your bills as Tax Deduction at Source (TDS).

GST is included in the contract price awarded , however GST payment shall be made on submission of GST Registration and self declaration on your letter head stating that contractor have deposited/or will deposit the Tax as per the applicable GST laws. Contractor shall furnish your GST registration number.

Any statutory variations i.e. increase/decrease in Taxes / Duties introduces by central Govt. / State Govt. of shall be reimbursed/recovered to/from Contractor against documentary evidence and proof.

Any variation in taxes shall be applicable only to the direct/price breakup as mentioned in the contract.

### **CHANGE OF LAW:**

"Change in Law" means:

- a) any enactment or issue of any new Applicable Law,
- b) any amendment, alteration, modification, or repeal of any existing Applicable Law or any new or modified directive or order there under,
- c) any change or variation in taxes payable in connection with and under this Agreement in each case with respect to a), b), and c) above coming into effect after the date of this Agreement.

## **8 ACCOMODATION & CONVEYENCE FOR THE STAFF:**

The Contractor shall also make his own arrangement for the accommodation/conveyance requirements for its staff at site.

## **9 STORAGE AT SITE:**

Contractor shall arrange the storage at site with the adequate open space / closed storage for contractor's site store for storing the materials, tools, tackles etc.

All the Contractor's storage will be within the site premises. All the incoming and outgoing materials, equipment, tools, tackles and any other items related to said work shall be entered into the register kept for this purpose and shall be in the custody of Contractor, however company does not hold any responsibility for any loss or damage of Contractor's material etc. All loading/unloading, of materials at work-site shall be your responsibility. Involvement of Crane/Hydra/Tractor/Trailer for this type of work shall be in your scope.

Adequate weather protection shall be provided by the contractor to keep the materials safe from sun & rain by providing covered storage space as well as using tarpaulins. Water and Electricity Power shall be arranged by the Contractor at his own. The cost of insurance during loading/unloading of materials/ equipments during its storage and handling/erection at site for installation is included in the contractor's scope and value is including in the above mentioned

Tender value. The unit rates mentioned in annexure is inclusive of barricading and watch & ward during execution and no separate charges shall be paid for the same.

**10 SECURITY, WATCH & WARD:**

The contractor, at his own cost, shall arrange for the security and watch and ward of the materials, men and machineries at site. Round the clock security alongwith the CCTV shall be provided for the materials stored at the site.

**11 DEFECT LIABILITY PERIOD:**

Work executed shall be guaranteed against any defect or failure which may arise due to faulty materials, design or workmanship for a period of Twenty Four (24) months from the date of final handing over of the entire package as defined in SCC.

If during the Defect Liability Period any works are found to be defective, shall be immediately rectified or repaired, upto BYPL satisfaction, by the contractor at his own cost within Ten (10) days from the date of receipt of intimation from BYPL.

Under no circumstances any extra claim in terms of time and cost shall be entertained for such repair/rectification.

**12 PERFORMANCE GUARANTEE:**

12.01 Bank guarantee shall be drawn in favour of "BSES YAMUNA Power Ltd" as applicable. The performance Bank guarantee shall be in the format as specified by BYPL.

12.02 Contract performance bank guarantee of total 10% of the contract price shall be submitted within 15 days of award of contract with the validity till completion of the contract period.

12.03 Contractor shall submit the workmanship / equipment performance bank guarantee equivalent to the 10% of the contract value at the time of claiming the last payment as per TERMS OF PAYMENT (Erection, Testing & Commissioning)), with the validity of the bank guarantee till Defect Liability Period i.e. 24 months from the date of Handing over of entire package plus 3 months.

**13 COMPLETION PERIOD:**

Contractor is required to mobilize your manpower and Tools & Tackles and furnish a list of equipments to be used for erection and commence the execution activity as per instructions of Engineer In-charge. The detailed schedule and milestone completion dates would be as per the contract schedules given from time to time by Engineer In-charge at site.

The time schedule for carrying out this work and period for mobilization shall be as under:

13.1 The Contractor's team should be mobilized at site for commencement of work immediately on receipt of the order.

13.2 The entire work under this order as indicated in the scope of work shall be carried out and completed within 180 days for entire package as defined in SCC. Total completion schedule for Engineering, manufacturing, inspection & testing, packing and forwarding and Transportation till site and Erection Testing & Commissioning shall be as per the milestones timelines defined in SCC.

13.3 A detailed L2 Schedule shall be submitted by the supplier within Fifteen (15) days of LOI. The contractor shall plan parallel working (round the clock working) for completion of work as per schedule and mobilize manpower accordingly.

13.4 Progress Review Meeting between the Contractor and the Engineer In charge shall be held at site at least once in a week. Also a weekly progress report giving the details of the manpower engaged at site and the details of the major job completion shall be submitted to Engineer In-charge.

13.5 The above time schedule must be strictly adhered to and improved upon wherever possible. In the event we find that your work is not progressing in quality or time frame as per above agreed schedule and to our satisfaction, we reserve the right to withdraw the work in whole or in part without further notice and liability of the Company.

13.6 The completion of the work shall have to be certified by Engineer In charge.

13.7 In order to maintain the time schedule, if necessary the Contractor shall carry out the work on all Sunday & Holiday except National Holiday with prior written permission from Engineer-in-Charge.

**14 CLEANLINESS & PRECAUTIONS AT SITE:**

All debris shall be removed and disposed of at assigned areas on daily basis. Surplus excavated earth shall be disposed of in an approved manner. In short, the contractor

shall be fully responsible for keeping the work site clean at all times. In case of non-compliance, company shall get the same done at Contractor's risk and costs.

While carrying out any civil work including road/ pit digging, plinth/ fence making, road restoration etc contractor shall adhere to below mentioned guidelines.

14.1 No construction material/ debris shall be stored on metalled road.

14.2 Wind breakers of appropriate height on all sides of ear marked area using CGI sheets shall be raised to ensure that no construction material dust fly outside ear marked area.

14.3 The construction material i.e. coarse sand, stone aggregates, excavated earth, cement and any other material to and from the site shall be transported under wet and covered condition to ensure their non-slippage en-route to avoid air contamination.

14.4 The contractor shall provide mask and helmet to every worker working on the construction site and involved in loading/unloading and carriage of construction material and construction debris to prevent inhalation of dust particles.

14.5 Over loading of vehicles shall be strictly prohibited.

14.6 The construction material at site shall be stored under wet and covered condition.

14.7 The dumping sites for temporarily storing the excavated earth shall be properly levelled, watered and rehabilitated by plantation to avoid flying of dust.

14.8 The worker at the site shall be sensitized to adopt / observe the dust controlled measures in true spirit.

14.9 If any C&D waste is generated at site the same will be transported to the C&D waste site only and the record for the same will be maintained by the agency.

14.10 Wet jet in grinding and stone cutting is being permitted at site.

14.11 The necessary record for dust control is being maintained by the department on day to day basis and being monitored regularly.

14.12 Bidder shall ensure that no tree shall be harmed and no tree roots shall be destroyed/cut while performing the task under contract.

14.13 Bidder shall comply the provisions of The Delhi Preservation of Trees Act 1994.

14.14 Guidelines regarding inspection & maintenance of PITS/DUGS while doing work at site in BYPL Area. The contractor shall ensure strict compliance of the following directions:

- i. The sites of all manholes, pits, holes, tanks or any other opening in the ground of any kinds shall be regularly inspected and maintained.
- ii. Schedule and protocols of inspections and maintenance shall be drawn up and notified to BYPL.
- iii. These sites shall be cordoned off to render them inaccessible to the public.

- iv. The existence of these sites shall be clearly & visibly marked by the display of signboards/ signages.
- v. If they are required to be covered, it shall be ensured that the covers are in place.
- vi. If required, as per law, prior permission from authorities shall be secured before the commencement of work.
- vii. Bidder shall follow all law of the land and prevailing borders issued by various Govt departments like Dept of Power / DERC /NGT/ Dept of forest /Dept of environment/DPCB/Court Orders etc.

14.15 The Execution vendors shall be responsible for all the preventive and protective environmental steps as per guidelines. Any violations from the above guidelines have been viewed very seriously by the authorities. Concerned agency is liable for the penalties / other action by the authorities, The Agency shall indemnify BYPL from all liabilities on this account.

**15 COMMISSIONING & ACCEPTANCE TEST:**

After completion of the work, the Contractor shall conduct trial run/ operation in the presence of Engineer In charge. During such trial run the system shall be operated under the supervision of the Contractor. If any rectification/modification required during this period the Contractor shall do all necessary measures.

On satisfactory completion of above, the system shall be deemed to have energized and placed in commercial operation. The Engineer In Charge will issue an acceptance certificate.

**16 WORK COMPLETION CERTIFICATION, HANDING OVER:**

The work carried out by the Contractor under this order has to be certified by Engineer In-charge for satisfactory completion of work allotted to the contractor with respect to specifications / Field Quality Procedures as per applicable standards. In case of modification/correction to be carried out, contractor shall carry out the said modifications/correction without additional cost. The Contractor shall remain in close contact with Engineer In-Charge at site to report the general findings of the fieldwork during the initial as well as later stage of the work at site.

The contractor shall be solely responsible for any shortage or damage of materials issued to them handling of and / or in storage and erection at site and cost of the same will be recovered from the contractor as certified by Engineer In-Charge. Contractor must submit a periodical material reconciliation statement in the approval format with every Running Bill raise by him or end of every month whichever is earlier. The contractor shall maintain an accurate and exhaustive record detailing out the list of all items received by him for the purpose of erection and keep such record open for the inspection of the company.

**17 PENALTY AND LIQUIDATED DAMAGES**

17.1 Penalty: A penalty of 2.5% of bill amount shall be levied in each case of non-compliance of safety practices and site cleanliness.

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17.2 Liquidated Damages: In the event of any delay in completion of the work beyond the stipulated time given by in order due to reasons solely attributable to the Contractor, the Contractor shall pay to the Company liquidated damages as per the clause defined in SCC

**18 SAFETY CODE:**

The Contractor shall ensure adequate safety precautions at site as required under the law of the land and shall be entirely responsible for the complete safety of their workman as well as other workers at site and premises. The contractor shall not deploy any worker below the age of 18 years.

The contractor shall observe the safety requirements as laid down in the contract and in case of sub-contract (only after written approval of company); it shall be the responsibility of main contractor that all safety requirements are followed by the employees and staff of the sub-contractor.

The contractor employing two hundred employees or more, including contract workers, shall have a safety coordinator in order to ensure the implementation of safety requirements of the contract and a contractor with lesser number of employees, including contract workers, shall nominate one of his employees to act as safety coordinator who shall liaise with the safety officer on matters relating to safety and his name shall be displayed on the notice board at a prominent place at the work site.

The contractor shall be responsible for non-compliance of the safety measures, implications, injuries, fatalities and compensation arising out of such situations or incidents.

In case of any accident, the contractor shall immediately submit a statement of the same to the owner and the safety officer, containing the details of the accident, any injury or casualties, extent of property damage and remedial action taken to prevent recurrence and in addition, the contractor shall submit a monthly statement of the accidents to the owner at the end of each month.

**19. STATUTORY OBLIGATIONS:**

The Contractor shall take all steps as may be necessary to comply with the various applicable laws/rules including the provisions of contract labour (Regulation & Abolition Act) 1970 as amended, minimum wages Act, 1984, Workman Compensation Act, ESI Act, PF Act, Bonus Act and all other applicable laws and rules framed there under including any statutory approval required from the Central/State Govt. Ministry of Labour. Broadly, the compliance shall be as detailed below, but not limited to:

- a) An Electrical license issued by Govt.of Delhi.
- b) PF Code No. and all employees to have PF A/c No. under PF every Act, 1952.
- c) All employees to have a temporary or permanent ESI Card as per ESI Act.
- d) ESI Registration No.
- e) PAN No.
- f) Work Contract Tax Registration Number/ GSTN Registration. g) Labour License under Contract Labour Act (R & A) Act 1970

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(Engineer-in-charge responsible for execution of the job should obtain a copy of Labour License before start of the work by the contractor.)

The Contractor must follow:

- a) Third party Insurance Policy before start of work.
- b) To follow Minimum Wages Act prevailing in the state.
- c) Salary / Wages to be distributed in presence of representative of Company's representative not later than 7th of each month.
- d) To maintain Wage- cum - Attendance Register.
- e) To maintain First Aid Box at Site.
- f) Latest P.F. and E.S.I. challans pertaining to the period in which work was undertaken along with a certificate mentioning that P.F. and E.S.I. applicable to all the employees has been deducted and deposited with the Authorities within the time limits specified under the respective Acts.
- g) Workman Compensation Policy. {If applicable}
- h) Labour license before start of work. {If applicable}

**20. WORKMAN COMPENSATION:**

The Contactor shall take insurance policy at his own cost under the Workman Compensation Act to cover such workers who are not covered under ESI and PF by the Contractor however engaged to undertake the jobs covered under this order and a copy of this insurance policy will be given to Company for reference and records. This insurance policy shall be kept valid at all times. In case there are no worker involve other than those who are covered under ESI and PF by the Contractor, the Contractor shall certify for the same,

The contractor shall keep the company indemnified at all times, against all claims of compensation under the provision of Workmen Compensation Act 1923 and as amended from time to time or any compensation payable under any other law for the time being workman engaged by the contractor/sub-contractor/sub-agent in carrying out the job involved under this work order and against costs and expenses, if any, incurred by the company in connection therewith and without prejudice to make any recovery.

The company shall be entitled to deduct from any money due to or to become due to the Contractor, moneys paid or payable by way of compensation as aforesaid or cost or expenses in connection with any claims thereto and the Contractor shall abide by the decision of the Company as to the sum payable by the Contractor under the provisions of this clause.

**21. STAFF AND WORKMAN:**

It shall be responsibility of contractor

- (a) To obtain Contract Labour License from the concerned authorities and maintain proper liaison with them. Necessary Forms for obtaining Labour License would be issued by the company. However you will bear all expenses for obtaining Labour license and registration in PF Department for your scope of work. You will deposit PF of your staff/laborer each month and all related documents should be furnished to us.



b) To obtain workman insurance cover against deployment of workers etc.

(II) To maintain, proper records relating to workmen employed, in the form of various Registers, namely,

- a) Register of workmen.
- b) Register of muster roll.
- c) Register of overtime.
- d) Register of wages.
- e) Any other register as per latest amendment Labour Act.

The records shall be in the prescribed formats only.

(III) To disburse monthly wages to your workers/ supervisors in time and in the presence of Company representatives or as directed by the Labour authorities.

(IV) To maintain proper liaison with the Project authorities, local police and all other government and local bodies.

(V) To pay your workmen at least not less than the minimum prescribed wages as per state/Central Labour laws as may be, applicable. The contractor shall, be responsible for compliance of all the provisions of minimum Wages Act, PF, ESIC Act workmen Compensation Act and Contract Labour Regulation & Abolition Act the rules made there under. In case of non-compliance of the statutory requirements. The company would take necessary action at the risk and cost of the Contractor.

(VI) To employ required number of skilled/semi-skilled and unskilled workmen as per site requirement to complete the entire project as per schedule. To provide safety shoes, safety helmets, safety belts, gloves etc. to your worker/staff as per requirement during erection work.

(VII) To employ necessary engineering and supervisory staff for completion of the Project in time. While day-to-day management of the site and supervision of the works shall be the responsibility of your Engineer - In charge, he will report to the Engineer in charge to assist him to discharge the overall responsibility of the execution of the project.

## **22. HUMAN RESOURCE ISSUES:**

22.1 The CONTRACTOR would execute these works through their own resources.

22.2 The CONTRACTOR shall bear all expenses/cost to be incurred towards salary, allowances, perks, traveling allowances, advances, insurance, safety measures, security, transportation and all other misc. expenses etc. of their employees/ workmen during the tenure of AMC. Also, the CONTRACTOR shall be sole responsible for making payment for Out-patient department, Hospitalization, Compensation thereof in case of any accident, injury or death.

22.3 ID CARD: No contractor will issue any ID cards to their staff on their own .All ID Cards for the workforce will be issued by BYPL Security ID Card Cell only. Contractors should maintain the records of Identity Cards of their employees and whenever any employee

quits / is removed then his/her Identity card should be collected & submitted to BYPL Security ID Card Cell. Penalty will be imposed on the vendor in case of violation of the above rule. Contractors shall submit the detail list of the employees that they are going to be hire to BYPL Security before start of the contract.

22.4 The CONTRACTOR to deploy their manpower immediately for carrying out the work as specified above.

22.5 The CONTRACTOR should ensure that there are no disputes regarding service, payment etc of the persons engaged by him, anytime during the currency of the contract. At no point of time during the currency of contract, the CONTRACTOR's employees shall insist upon the COMPANY for employment, wages, and allowances or any other related matter, payment etc.

22.6 The CONTRACTOR shall not deploy the manpower below the age of 18 years.

22.7 The CONTRACTOR shall not deploy the female manpower between 7 PM to 6 AM.

22.8 The CONTRACTOR shall be directly responsible for any / all disputes arising between him and his persons and keep the COMPANY indemnified against all losses, damages and claims arising thereof. The CONTRACTOR shall resolve any dispute of their manpower. All the legal dues of their manpower is to be paid on due date or within 8 days on the termination of manpower.

22.9 All safety wears required for the CONTRACTOR's manpower during the execution of work such as safety shoes, safety helmets, hand gloves, safety belt, goggles etc. must be provided by the CONTRACTOR at his own cost and he shall ensure that his employees regularly use such safety gears while executing COMPANY's work.

22.10 The CONTRACTOR shall be responsible for discipline of his manpower and shall adhere to the disciplinary procedure set by the COMPANY at site. The COMPANY shall be at liberty to object to the presence of any representative or employees of the CONTRACTOR at the site, if in the opinion of the COMPANY such manpower has done any act of misconduct or negligence or otherwise undesirable, then the CONTRACTOR shall remove such a person objected to and provide a competent replacement immediately.

22.11 The CONTRACTOR shall ensure that he has complied with the following:

- has paid minimum wages to his manpower as per the rate notified from time to time by the Government of National Capital Territory of Delhi.
- Contractor shall disburse the salary of his staff through ECS only.

22.12 Deduct and deposited ESI and PF contribution. Copies of the same shall be submitted.

22.13 The COMPANY reserves the right to demand the CONTRACTOR's services on holidays as well as beyond the normal working hours. The Engineer In-charge shall communicate in writing for any work required to be done during Holidays.

22.14 The CONTRACTOR will ensure that none of their person is engaged in any unlawful activities subversive of the COMPANY's interest failing which suitable action may be taken against the CONTRACTOR as per the terms and conditions of this tender.

22.15 The CONTRACTOR shall be liable for payment of all taxes and duties as applicable, to the State/ Central Govt. or any local authority.

22.16 The CONTRACTOR's employees shall not be treated as COMPANY's employees / persons for any purpose whatsoever & facilities/ benefits applicable to the COMPANY's employees shall not be applicable to CONTRACTOR's employees. If due to any reasons whatsoever the COMPANY is made liable to meet any obligation under any of the laws & enactment etc, for any reason whatsoever the same shall be recovered from the CONTRACTOR or from any of the bills payable to him or failing which it shall be recovered as per law.

22.17 The CONTRACTOR shall be responsible and shall comply with the provision of all the STATUTORY ACTS APPLICABLE. Special attention of the CONTRACTOR is drawn towards the compliance of provision of the following statutes: (along with the latest amendments/additions):

- 22.17.1 The Child Labour (Prohibition and Regulation) Act, 1986.
- 22.17.2 The Contract Labour (Regulation and Abolition) Act, 1970.
- 22.17.3 The Employee's Pension Scheme, 1995.
- 22.17.4 The Employee's Provident Funds and miscellaneous provisions Act, 1952.
- 22.17.5 The Employees State Insurance Act, 1948.
- 22.17.6 The Industrial Disputes Act, 1947.
- 22.17.7 The Maternity Benefit Act 1961.
- 22.17.8 The Minimum Wages Act, 1948.
- 22.17.9 The Payment of Bonus Act, 1965.
- 22.17.10 The Payment of Gratuity Act, 1972.
- 22.17.11 The payment of Wages Act, 1936.
- 22.17.12 The Delhi Shops & Establishment Act, 1954.
- 22.17.13 The Workmen's Compensation Act. 1923.
- 22.17.14 The Employer's Liability Act, 1938.

The Contractor shall furnish the above specified compliances as per the format attached as Annexure I.

Contractor shall adhere to the Vendor Code of Conduct as specified in the NIT.

## **23. INSURANCE:**

### **23 a) THIRD PARTY INSURANCE:**

Before commencing the execution of the work the contractor shall take third party insurance policy at his own cost to insure against any damage or loss or injury which may occur to any property / public property or to any person or any employee or representative of any outside Agency/ the company engaged or not engaged for the work of the company, by or arising out of the execution of the work or temporary work or in carrying out of this Agreement. For third party insurance policies, the contractor shall be responsible for settlement of claims with the underwriters without any liability on the purchaser / owner and will arrange replacements / rectification expeditiously without a waiting settlement by insurance claim at contractors own cost.

**23 b) ACCIDENTAL INSURANCE POLICY FOR LIFE COVER:**

Before commencing the execution of the work the CONTRACTOR shall take Accidental insurance policy for the staff engaged by him for this work to insure against any loss of life which may occur during the contract for the work of the COMPANY. The policy shall have coverage of Rs. 10 Lacs (Table C- Death + Permanent Total Disability + Partial permanent Disability due to external accidents). The Contractor shall be responsible for on the spot same day claim settlement with the victim's legal heirs without waiting for settlement by insurance claim without any liability on BYPL. The premium amount for such life cover policy shall be borne by the contractor. The contractor shall furnish copy of policy when demanded by BYPL.

**23 C) INSURANCE FOR MAN, MATERIAL & MACHINERY DEPLOYED AT SITE:**

Contractor shall be responsible for the insurance for his own man, material and machinery deployed at site for the package awarded. Contractor shall furnish the copy of this insurance policy to the purchaser, prior start of work.

**24. SECURITY**

Adequate number of trained Security Guards shall be deployed both at the storage yard and stores as well as places of work to prevent theft and pilferage of material and accessories and various other materials. All security rules and safety rules enforced at site by company shall be strictly observed.

**25. ENVIRONMENTAL, HEALTH & SAFETY PLAN:**

Contractor will make ensure that the Environment, Health & Safety (EHS) requirements are clearly understood and faithfully implemented at all levels at site as per instruction of Company. Contractors must comply with these requirements:

- a) Comply with all of the elements of the EHS Plan and any regulations applicable to the work
- b) Comply with the procedures provided in the interests of Environment, Health and Safety
- c) Ensure that all of their employees designated to work are properly trained and competent
- d) Ensure that all plant and equipment they bring on to site has been inspected and serviced in accordance with legal requirement and manufacturer's or suppliers' instructions
- e) Make arrangements to ensure that all employees designated to work on or visit the site present themselves for site induction prior to commencement of work
- f) Provide details of any hazardous substances to be brought onsite
- g) Ensure that a responsible person accompanies any of their visitors to site

All contractors staff is accountable for the following:

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1. Use the correct tools and equipment for the job and use safety equipment and protective clothing supplied, e.g. helmets, goggles, ear protection, etc. as instructed
2. Keep tools in good condition
3. Report to the Supervisor any unsafe or unhealthy condition or any defects in plant or equipment
4. Develop a concern for safety for themselves and for others
5. Prohibit horseplay
6. Not to operate any item of plant unless they have been specifically trained and are authorized to do so.

**26. TEST CERTIFICATE & QUALITY ASSURANCE:**

The Contractor shall procure all equipment from genuine sources as approved by the Company and as per Company specifications. The Contractor shall submit all the test certificates and joint inspection reports related to major equipment wherever applicable. The contractor shall ensure for the strict compliance to the specifications and Field Quality Procedures issued by company / Engineer in-charge.

**27. SUB-CONTRACTING / SUBLETTING:**

CONTRACTOR shall not assign or transfer the whole or any part of this Work Order or any other benefits accruing there from nor shall it subcontract / sublet the whole or any part of the Works without the prior written consent of COMPANY.

In the event the contractor assigns this work order, contractor's assignees shall be bound by the terms and conditions of this work order and shall, if deemed necessary by COMPANY at the time of such assignment, undertake in writing to be so bound by this Work Order.

Notwithstanding the subletting / subcontracting of any portion of the works, contractor shall remain wholly responsible for the carrying out, completion and satisfactory execution of Works in all respects in accordance with this Work Order, specification, approved drawings and data sheets.

**28. INDEMNITY:**

Contractor shall indemnify and save harmless COMPANY against and from any and all liabilities, claims, damages, losses or expenses arising due to or resulting from:

- a) any breach non-observance or non-performance by contractor or its employees or agents of any of the provisions of this Work Order.
- b) any act or omission of contractor or its employees or agents.
- c) any negligence or breach of duty on the part of contractor, its employees or agents including any wrongful use by it or them of any property or goods belonging to or by COMPANY.
- d) The vendor shall submit an Indemnity Bond against any damages / loss of free issued materials.

Contractor shall at all times indemnify COMPANY against all liabilities to other persons, including he employees or agents of COMPANY or contractor for bodily injury, damage

to property or other loss which may arise out of or in consequence of the execution or completion of Works and against all costs charges and expenses that may be occasioned to COMPANY by the claims of such person

**29. EVENTS OF DEFAULTS:**

COMPANY may, without prejudice to any of its other rights or remedies under the Work Order or in law, terminate the whole or any part of this Work Order by giving written notice to the Contractor, if in the opinion of COMPANY, contractor has neglected to proceed with the works with due diligence or commits a breach of any of the provisions of this work order including but not limited to any of the following cases:

- a) Failing to complete execution of work within the terms specified in this work order.
- b) Failing to complete works in accordance with the approved schedule of works.
- c) Failing to meet requirements of specifications, drawings, and designs as approved by COMPANY.
- d) Failing to comply with any reasonable instructions or orders issued by COMPANY in connection with the works.
- e) Failing to comply with any of the terms or conditions of this work order.

In the event COMPANY terminates this work order, in whole or in part, on the occurrence of any event of default, COMPANY reserves the right to engage any other subcontractor or agency to complete the work or any part thereof, and in addition to any other right COMPANY may have under this work order or in law including without limitation the right to penalize for delay under clause 15.0 of this work order, the contractor shall be liable to COMPANY for any additional costs that may be incurred by COMPANY for the execution of the Work.

**30. RISK & COST:**

If the Contractor fails to execute the work as per specification / as per the direction of Engineer's In-charge within the scheduled period and even after the extended period, the contract shall get cancel and company reserves the right to get the work executed from any other source at the Risk & Cost of the Contractor. The Extra Expenditure so incurred shall be debited to the Contract.

**31. ARBITRATION:**

To the best of their ability, the parties hereto shall endeavor to resolve amicably between themselves all disputes arising in connection with this LOA. If the same remain unresolved within thirty (30) days of the matter being raised by either party, either party may refer the dispute for settlement by arbitration. The arbitration to be undertaken by two arbitrators, one each to be appointed by either party. The arbitrators appointed by both the parties shall mutually nominate a person to act as presiding arbitrator before entering upon the reference in the event of a difference between the two arbitrators and the award of the said presiding arbitrator in such a contingency shall be

conducted in accordance with this provisions of the Indian Arbitration & Conciliation Act, 1996 and the venue of such arbitration shall be in the city of New Delhi only.

**32. SECURITY CLAUSE:**

The technical information, drawing and other related documents forming part of work order and the information obtained during the course of investigation under this work order shall be the Company's executive property and shall not be used for any other purpose except for the execution of the work order. The technical information drawing, records and other document shall not be copied, transferred, or divulged and/ or disclosed to third party in full/part, not misused in any form whatsoever except to the extent for the execution of this work order.

These technical information, drawing and other related documents shall be returned to the Company with all approved copies and duplicates including drawing/plans as are prepared by the Contractor during the executions of this work order, if any, immediately after they have been used for agreed purpose.

In the event of any breach of this provision, the contractor shall indemnify the Company against any loss, cost or damage or claim by any party in respect of such breach.

**33. TERMINATION DUE TO NON PERFORMANCE:**

"During the course of the execution, if at any time BSES observe and form an opinion that the work under the order is not being performed in accordance with the terms of this Agreement, BSES reserves its right to cancel this Agreement giving 15 days notice mentioning the reason for the termination of the agreement and BSES will recover all damages including losses occurred due to loss of time from Contractor.

**34. TERMINATION BY EMPLOYER CONVENIENCE:**

The owner at any time terminate the contract for any reason, by giving the contractor a notice of termination. Upon receipt of the notice of termination, the contractor shall either within 30 days of receipt of such notice, or on the date specified in the notice of termination, carry out the following : Cease all further work, except for such work as the owner may specify in the notice of termination for the sole purpose of protecting that part of the facilities already executed, or any work required to leave the site in a clean and safe condition.

- Terminate all subcontracts, except as mentioned below.
- Remove all Contractor's equipment from the site, repatriate the contractor's and its sub-contractor's personnel from the site, remove from the site any wreckage, rubbish and debris of any kind, and leave the whole of the site in a clean and safe condition.
- Deliver to the owner the parts of the facilities executed by the contractor up to date of termination.

- To the extent legally possible, assign to the owner all right , tile and benefit of the contractor to the facilities and to the plant and equipment as at the date of termination, and as may be required by the owner, in any subcontracts concluded between the contractor and its sub-contractors.

- Deliver to the owner all non-proprietary drawings, specifications and other documents prepared by the contractor or its sub-contractors as at date of termination in connection with the facilities. In the event of termination of the contract by the owner, under this clause, the owner shall pay to the contractor the following amounts after setting off the owner's claim if any under the contract:

a) The contract price, properly attributable to the parts of the facilities executed by the contractor as of the date of termination.

b) The costs reasonably incurred by the contractor in the removal of the contractor's equipment from the site and in the repatriation of the contractor's and its sub contractors personnel.

c) Pre- approved and reasonable cost of satisfying all other obligations, commitments and claims that the contractor may in good faith have undertaken with third parties in connection with the contract and that are not covered above.

**35. QUALITY:**

Contractor shall ensure that strict quality is maintained and execution of works under this Work Order and Works are executed in conformity with the Specification.

All tools, tackles, instruments and other equipments used in the execution of the Works shall be duly calibrated as required and Contractor shall maintain proper records of such tools, tackles, instruments and / or equipment.

The contractor shall submit SQP indicating Customer Holding Point for design, manufacture, inspection, testing, packing, forwarding, transportation including shop painting and final painting for Purchaser's review and approval.

The contractor shall submit Field Quality Assurance and Filed Quality Control Plan (FQP) indicating Customer Hold Point for unloading, receiving, storage at site, transportation, handling at site, erection, testing, pre-commissioning & commissioning for Purchaser's review and approval as per applicable provisions of Technical Specifications.

The Contractor shall submit a Field Erection Procedure for the scope of work under the Contract Agreement. The same shall be subject to the approval of the Purchaser and the work shall be carried out in accordance with such approved procedures.

**36. CONSTRUCTION WATER & POWER:**

Construction Water and power shall be arranged by Contractor at his own cost.

**37. PROGRESS REPORTS OF WORK EXECUTION:**

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During the various stages of manufacturing and erection of the critical equipments in the pursuance of the Contract, the Contractor shall at its own cost submit periodic progress reports as may be reasonably required by the Purchaser with such materials as charts, networks, photographs, test certificates, etc. Such progress reports shall be in the form and size as may be required by the Purchaser and shall be submitted in adequate number of copies to be notified by the Purchaser

The quantitative progress report of the works by reference to the project schedule in sufficient detail should permit the Purchaser to assess performance, plan witness dates and evaluate forecasts, including reports on key Sub-contracts (as applicable). Within 7 days of the submission of each such report and at such other times as the Purchaser may reasonably request, the Contractor and the Purchaser shall meet to discuss progress.. Weekly progress reports shall include the following sections:

- a) Executive summary
- b) Description of the work and services performed and goods and materials delivered and erected during the preceding week.
- c) Necessary photographs of work done in the manufacturer's shop and erection site which shall be taken when and where indicated by the Purchaser. Photographs shall be approximately 100 x 125 mm in size including a margin of 5 mm side for fixing. Adequate numbers of photographs shall be submitted indicating various stages of manufacture and erection of critical items. Each photograph shall contain the date, the name of the Contractor and the title of the view taken.
- d) Updated project schedule showing progress to the end of the week (as percentages completed of the Contractor's activities broken down into significant elements of the works), and the current schedule of activities and the targets for the next week.
- e) Identification of areas with foreseeable problems which in the opinion of the contractor may affect the project schedule.
- f) Such other information and supporting documentation as the Purchaser may require satisfying himself about the timely manufacture, delivery and erection of equipment as per contract.

The Purchaser shall advise the Contractor about the number of copies of progress reports and, where relevant, photographs he has to submit each week together with the names and addresses of persons to whom they are to be sent. Purchaser will also advise the contractor regarding the format of the Monthly Progress report.

**38. FREE ISSUES OF MATERIAL AND /OR EQUIPMENT:**

The Purchaser issued Free Issue Material/Equipment to Vendor in order that Vendor may fulfill its obligations under the Agreement, shall remain the property of Purchaser and shall be clearly labelled as such by Vendor until delivery of the completed Goods in accordance with the terms of the Agreement. Risk of loss in respect of all such Free Issue Items shall pass to Vendor upon receipt of such items by Vendor and remain with Vendor until delivery of the completed Goods to Purchaser in accordance with the terms of the Agreement. Vendor shall maintain all such Free Issue Items in good condition and shall use them solely in connection with the requirements of the Agreement. Disposal of

surplus items shall be in accordance with written instructions from Purchaser. The vendor shall submit an Indemnity Bond to this effect, as per the format.

**39. PROTECTION OF PROPERTY:**

The Contractor shall be responsible for any damage resulting from his operation. He shall also be responsible for protection of all persons including members of public; and employees of the PURCHASER & the PURCHASER; employees of the Contractors & Subcontractors; and all public and private property including structures, buildings, other plants and equipment and utilities either above or below the ground.

The Contractor shall ensure provision of necessary safety equipment such as barriers, sign boards, warning lights and alarms, etc to provide adequate protection to persons and property. The Contractor shall be responsible to give reasonable notice to the PURCHASER & the PURCHASER of public or private property and utilities when such property and utilities are likely to get damaged or injured during the performance of his works and shall make all necessary arrangements with such PURCHASER, related to removal and/or replacement or protection of such property and utilities.

**40. VARIATIONS / AMEDEMMENTS:**

Any additional work beyond the scope enumerated in the work order above shall be carried out as per the instructions of Engineer-In Charge. The company shall not entertain any claim or increase in the Work Order value due to execution of such additional work if the same is not approved by Engineer in Charge, in written form.

**41. ACCEPTANCE**

Acceptance of this work order implies and includes acceptance of all terms and conditions enumerated in this work order in the technical specification and drawings made available to you consisting of general conditions, detailed scope of work, detailed technical specification & detailed equipment, drawing. Complete scope of work and the Contractor's and Company's contractual obligation are strictly limited to the terms set out in the work order. No amendments to the concluded work order shall be binding unless agreed to in writing for such amendment by both the parties.

However, during the course of the execution of the work order, if at any time the Company's representative observe and form an opinion that the work under the work order is not being performed in accordance with the terms of this work order, the company reserves its right to cancel this work order forthwith without assigning any reason and the Company will recover all damages including losses occurred due to loss of time from the Contractor.

We request you to please sign the duplicate copy of this work order as a token of your acceptance and return to us.

### **Annexure - I**

The Contractor must submit the following to Engineer-In-Charge before commencement of work:

- a) An Electrical license. (If applicable)
- b) PF Code No. and all employees to have PF A/c No. under PF every Act, 1952.
- c) All employees to have a temporary or permanent ESI Card as per ESI Act.
- d) ESI Registration No. e) PAN No.
- f) Work Contract Tax/VAT Registration Number.
- g) Labor License under Contract Labor Act (R & A) Act 1970(All Engineer-in-charge responsible for execution of the job should obtain a copy of Labor License as per guidelines of HR department before start of the work by the contractor.)

The Contractor must follow:

- a) Third party Insurance Policy before start of work.
- b) To follow Minimum Wages Act prevailing in the state.
- c) Salary/ Wages to be distributed in presence of Company's representative not later than 7th of each month.
- d) To maintain Wage- cum - Attendance Register.
- e) To maintain First Aid Box at Site.
- f) Latest P.F. and E.S.I. challans pertaining to the period in which work was undertaken along with a certificate mentioning that P.F. and E.S.I. applicable to all the employees has been deducted and deposited with the Authorities within the time limits specified under the respective Acts.
- g) Workman Compensation Policy. (If applicable)
- h) Labor license before start of work. (If applicable)
- i) Group personnel accident insurance shall have coverage of Rs. 10 Lacs (Table C-Death + Permanent Total Disability + Partial permanent Disability due to external accidents).

## CONTRACT HEALTH AND SAFETY PLAN

### 1 OBJECTIVE

The objective of the Contractor Health and Safety plan is to lay down clear guidelines for all Vendors / contractors and manpower agencies (including their associates, staff and agents) which would facilitate them to observe all statutory and regulatory rules and regulations, comply with applicable standards of Central Electricity Authority (Measures relating to safety and electric supply) Regulations, 2010 & (safety requirements for construction, operation and maintenance of electrical plants and electric lines) Regulations, 2011, BYPL EHS policy, Safety Manual Guidelines, and SOPs and thus, ensure creation of safe working environment for all stakeholders of our network.

### 2 SCOPE

It is applicable to all contracts, work orders of any kind and cost will be subjected to the provisions of this document.

Small Contracts: Contracts which satisfy all the criteria listed under the head "Small Contracts".

Major Contracts: Contracts which satisfy any two or more criteria listed under the head "Major Contracts"

Criteria	Small Contracts	Major Contracts
Value of Contract	< Rs. 20,000,00/- (less than Rs. Twenty Lac)	>= Rs. 20,000,00/- (Equal or more than Rs. Twenty Lac)
Period	Period less than 1 year	Any period
Working on energized electrical equipment	No	Yes
Working on height (above 1.8 Mtrs from ground)	No	Yes
Work involving construction activity	No	Yes
Working with hazardous goods or chemicals	No	Yes
Work involving danger to general public	No	Yes

Exclusions: Exceptions for major and small contract are – in house software development, supply of material or equipment but no direct or indirect installation of the same material, administration contracts (courier, water supply, printing, security, transport, etc.). The facility management (housekeeping) contract will always be treated as a small contract.

### 3 GENERAL SAFETY CONDITIONS

For small contracts, the contractor shall assign the duties of Safety Representative to the Work Supervisor. Work Supervisor will deliver all duties and responsibilities of Safety Supervisor as detailed in this document.

For Major contracts, the contractor will appoint Safety supervisor, engineer / manager for the works in BYPL. The Contractor shall make all necessary arrangements for getting their workforce safety trained and competency checked from the safety team of BYPL before deployment in the field.

Safety Representative of Contractor will formally become the nodal point for safety concerns for BYPL. Contractor shall not frequently transfer or terminate the services of any of the safety representatives appointed for BYPL work site. Contractor will be required to provide all applicable infrastructure and power to ensure smooth working of the safety representative to maintain a sound safety management system. In the major contracts safety representative will not be assigned any other activity at site apart from the works related to safety management.

The Safety Representative of the Contractor shall be required to meet and follow the instructions of the Engineer In-charge and EHS team of BYPL. He shall be responsible for providing the MIS and/or any other relevant information, as and when desired, within the stipulated time frame as per the requirements of BYPL. Any non-conformance to safety will lead to the negative marking or issue of safety violation challan/ tokens which shall affect the monthly evaluation and performance of Contractor.

All contracts where Contractor has to depute vehicle for their staff and equipment to move from one location to other, the Contractor shall ensure that vehicle complies all required statutory clearances and requirement as per The Motor Vehicle Act, 1988 and are in good & safe state of working.

**The Contractor shall display the name of the Safety representative at all its sites including zonal and divisional office.**

#### **4 QUALIFICATION AND EXPERIENCE OF THE SAFETY PERSONAL**

Qualification and experience required for the safety and site personnel are as following:

**Safety Supervisor:** It is mandatory that educational qualification of safety supervisor be ITI (electrician trade) / Diploma (Any branch of engineering) and he has a working experience on electrical system / network of at least 5 yrs for ITI and 3 years for Diploma holder. Having formal experience of the safety systems will be an added advantage

**Safety Engineer:** It is mandatory that educational qualification of safety engineer be at least diploma (electrical) and he has working experience on electrical system of at least 3 yrs. Having the formal experience of the safety systems will be an added advantage.

**Safety Manager:** The educational qualification of safety manager should be graduate engineer with working experience on electrical system / network of at least 3 yrs. OR Diploma in Industrial Safety with working experience of 05 years including at least 02 years on electrical network.

**Site Skilled Personnel:** For all responsibility related to site activities and operations, the BA shall employ only qualified and skilled persons and shall comply the provisions of section 19 & 29 of Central Electricity Authority (Measures relating to safety and electric supply) Regulations, 2010. Persons holding valid approvals only by any Government approved agency or a competency assessment panel or a team set up by TPDDL shall be allowed to perform the High Risk / High Hazard activities (refer page 1). The skill / qualification required for the electrician and electrical supervisor are given in annexure 5. The contracts related to maintenance of Distribution Network, Distribution Projects, EHV Projects, maintenance of Sub-Transmission Network, MMG & EAG, maintenance and operation of street lights, shall preferably have at least 20 per cent of ITI qualified electricians in the first year of the contract. This figure shall preferably be incremented by 15 per cent every subsequent year.

## 5 Requirements from the Safety Representative(s)

Safety training of 4hrs/employee/month and one day of safety induction training to all new employees.

- Safety Talk / tool box talk before start of shift to all his workmen
- Ensuring the availability & proper usage of the safety equipment (PPE)
- Periodic inspection of PPE to ensure their serviceability
- Ensuring the adherence to standard operating procedures of BYPL
- Safety inspections / audits as per the process of BYPL
- Working in close coordination EHS department of BYPL
- Reporting of unsafe acts, unsafe conditions, near miss, incident or accident to Engineer In-Charge and EHS department of BYPL immediately after its occurrence.

Ensuring compliance with safety and other laws as may be applicable and providing for safety assurance.

## 6 Safety Induction Training

The Contractor shall not deploy any person at work place / site without Safety Induction Training. It is desired that Safety representative of the Contractor to impart the general safety training to each employee of duration 4 hrs per month. The training will be organized at Contractor level and the record to be sent to engineer in-charge and EHS department of BYPL every month.

## 7 List of Personal Protective Equipment (PPE) and Maintenance schedule

Contractor shall commence the project or any work only when the required PPE are made available to the team of employees involved in the work. Each PPE of Contractor shall be checked / inspected by the safety representative / supervisor at zone before the work start or as prescribed in the list. Safety representative shall regularly check the healthiness of each PPE allocated to lineman. Suitable record shall be maintained at zone. Defective PPE shall be immediately replaced or within 24 hours by the Contractor. In no case linemen or any other official of Contractor may be allowed to work with defective PPE. It is preferred that Contractor ensures minimum stock of each PPE for immediate replacement with defective one.

The PPE shall be IS / BS / CE marked and exactly as per the standard or specification mentioned in the *annexure 1*. Working without PPE / non-standard PPE shall be treated as safety violation and penalty as stated in section 12 of this document. If BYPL finds that Contractor has not provided the adequate / appropriate PPE to their staff, BYPL may provide the PPE to Contractor at the risk and actual cost of the PPE. Amount as decided by the management shall be charged to Contractor and same shall be first recovered from the current bill of Contractor or any future payment to be made to Contractor. In the event of any balance amount still left for recovery, the same shall be adjusted against retention amount or by invoking bank guarantee submitted by Contractor.

## 8 Integrated Management System & Audits

The Contractor shall work in the framework of Integrated Management System (IMS) and shall maintain documentation as prescribed in the IMS Manual of BYPL.

All contractors during their currency of contract shall strive to continuously improve and demonstrate strict compliance to ISO 9001, ISO 14001 & OHSAS 18001 standards of BYPL.

To verify compliance and to continually improve the management system, all contractors shall be subjected to both internal & external audits.

## 8.1 HIRA

The safety representative will be required to conduct the HIRA (Hazard Identification and Risk Assessment) of the process and work undertaken at least once in a year or every time if a new process / activity / machine is introduced or whenever an accident take place. The risk identified to be addressed suitably with –

Engineering Control  
Administrative Control, and  
Personal Protective Equipment.

The safety representative of Contractor shall inform and educate for the identified risk and hazard control methods to employees, supervisor and engineer as well as the engineer in-charge and EHS department of BYPL.

## 8.2 Working at Height

The Contractor shall ensure that all works carried out at a height of 2 Meter or more shall only be started after obtaining a permit to work at height, which shall be issued as per the procedure of BYPL by authorized personnel.

The contractor shall ensure that all control measures mentioned and agreed through above work permit or as deemed necessary by BYPL are enforced and complied all the time during activities carried out at height.

## 9 Safety Performance and Safety MIS

The Contractor shall maintain good practice of safety all through the contract duration. Safety shall always be of paramount importance during the contract period. Safety performance will be monitored throughout the period and no relaxation will be given for bad performance. Contractor with good track record and excellent performance will be rewarded suitably. The Contractor has to provide monthly "Performance Report – Safety" to engineer in-charge and EHS department of BYPL this shall be part of monthly bill along with training details. Performa of the report is enclosed as *annexure 2 to 5*.

## 10 Pre – Employment Medical Check-up and Fitness of employees engaged for the critical works

The contractor shall arrange a medical examination of all his employees including his sub-contractor employees like lineman, ALM, supervisor, Fitter, welders, gas cutters, drivers, workers supposed to work at height (and any other trade specified deemed necessary by BYPL at the time of deployment then annually) before employing, after illness or injury, if it appears that the illness or injury might have affected his fitness and, thereafter, once in every year as per the provisions of applicable laws or as prescribed by BYPL with proper record.

The Contractor shall submit the health fitness certificate for all those workers involved in climbing the pole or working at height for following diseases:

- Epilepsy
- Colour blindness
- Deafness

- Vertigo & height phobia

Every year Contractor will give an undertaking stating that all the employees are fit to work and have not developed aforesaid diseases.

Records of medical examination as described above shall be maintained at the contractor premises and shall be promptly produced as and when demanded by BYPL.

No person about whom the Contractor knows or has reason to believe that he is a deaf or he has a defective vision or he has a tendency to giddiness shall be required or allowed to work in any O&M operation or other construction work which is likely to involve a risk of any accident either to the worker himself or to any other person.

## 11 Suspension of Work

BYPL shall have the right at its sole discretion to suspend the work till compliance of safety norms, if in its opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and / or property, and / or equipments.

In such cases, the contractor shall be informed in writing about the nature of hazards and possible injury /accident and he shall comply to remove all shortcomings promptly. Decision of BYPL shall be conclusive and binding on the Contractor in such aspects.

The contractor shall not be entitled to damages / compensation for suspending of work due to safety reasons and the period of such stoppage of work will not be taken as an extension of time for completion of the facilities as per the work order and will not be the ground for waiver of levy of liquidated damages.

The contractor shall follow and comply with all safety Rules of BYPL, relevant provisions of applicable laws pertaining to the safety of workmen, employees plant and equipment as may be prescribed from time to time without any demur, protest or contest or reservation. In case of any inconformity between statutory requirement and safety rules of the BYPL referred above, the latter shall be binding on the contractor unless the statutory provisions are more stringent.

## 12 Penalty matrix for safety violations

Consequence Of Safety Violation Observed (Not related to incident / accident)		Violation				Subsequent violations	Action required
Sl No	Safety Violations	1st	2nd	3rd	4th		
1	Working without PPE	A	A	B	B	Will attract same penalty as applicable in 4th violation	Take risk reduction measure
2	Working without proper tools and tackles	A	B	B	C		
3	Working without creation of proper safety zone	B	B	C	D		
4	Improper supervision at worksite	B	C	D	E		
5	Working without PTW process	C	D	E			
<b>Legand</b>	<b>Action to be taken</b>	<b>Responsibility</b>			<b>Penalty Amount in Rs</b>	The number violations are to be calculated cummulative on the	Intolerable



<b>A</b>	Warning Letter	Engineer incharge	NIL	contract period or on the annual basis (which ever is less).
<b>B</b>	Levy of penalty	Engineer incharge	INR 2,000	
<b>C</b>	Memo to Contactor and levy of penalty	Circle Head	INR 4,000	
<b>D</b>	Momo to contractor and leavy of penalty	Head of Department	INR 10,000	
<b>E</b>	Memo to Contactor, levy of penalty and termination of contract	Head of Department	INR 100,000	

Fig 12(1) – Penalty Matrix for safety violation

The above figure (12 (1)) is the matrix of safety violation and the penal action to be taken against the contractor. Once the contractor reaches the "BLACK" (color – "5") category, i.e. highest level of safety violation, "Termination" notice to contractor will be issued from the office of the Head of Department (equivalent to AVP/ VP) and further, *if required*, continuation / extension of contract will only be initiated by Functional Head of the department (equivalent to VP/Sr VP level) and approved by CEO. Till the extension, the contract will remain suspended.

Safety violations resulting in incident / accident will be treated as per gravity of the injury / fatality and its impact as well as type i.e. minor or Major. Consequences of incident / accident are shown in the matrix (figure 12(2) for major and 12(3) for small) below. In case of any accident, findings and recommendations of Accident Enquiry Committee will be final and binding and will supersede the arbitration clause of GCC.

Consequence of an Incident/Accident (in case of MAJOR contract)		Incident/Accident				Action required
SI No	Safety Violations	1st	2nd	3rd	4th	
1	Slight injury (First Aid Case)	<b>F</b> (STRENGTHENING OF PROCESS)				Take risk reduction measure
2	Minor injury (No or Hospitalization less than 48 Hrs)	<b>F</b>	<b>G</b>	<b>G</b>	<b>H</b>	
3	Major injury (Bone injury or burn or Hospitalization more than 48 hrs)	<b>G</b>	<b>G</b>	<b>H</b>	<b>I</b>	
4	Single Fatality	<b>J</b>	<b>K</b>			
5	Multiple fatalities (Two or more fatalities during one event)	<b>K</b>				
<b>Legend</b>	<b>Action to be taken</b>	<b>Responsibility</b>		<b>Penalty Amount in Rs</b>		The number violations are to be calculated cumulative on the contract period or on the annual basis (which ever is less).
<b>F</b>	Issue memo and levy of penalty	Engineer incharge		INR 5,000		
<b>G</b>	Issue memo and levy of penalty	Engineer incharge		INR 20,000		
<b>H</b>	Issue memo and levy of penalty	Circle Head		INR 50,000		
<b>I</b>	Issue memo and levy of penalty	Head of Department		INR 200,000		
<b>J</b>	Issue memo and levy of penalty	Head of Department		INR 500,000		
<b>K</b>	Issue memo, levy of penalty, termination of contract and black listing of contractor	Function Head		INR 1,000,000		

Fig 12(2) – Penalty Matrix for Incident/Accident in Major Contracts

Consequence of an Incident/Accident (in case of SMALL contract)		Incident/Accident				Action required
SI No	Safety Violations	1st	2nd	3rd	4th	
1	Slight injury (First Aid Case)	<b>L</b> (STRENGTHENING OF PROCESS)				Take risk reduction measure
2	Minor injury (No or Hospitalization less than 48 Hrs)	<b>L</b>	<b>M</b>	<b>M</b>	<b>N</b>	
3	Major injury (Bone injury or burn or Hospitalization more than 48 hrs)	<b>M</b>	<b>M</b>	<b>N</b>	<b>O</b>	
4	Single Fatality	<b>P</b>	<b>Q</b>			
5	Multiple fatalities (Two or more fatalities during one event)	<b>Q</b>				
<b>Legend</b>	<b>Action to be taken</b>	<b>Responsibility</b>		<b>Penalty Amount in Rs</b>		The number violations are to be calculated cumulative on the contract period or on the annual basis
<b>L</b>	Issue memo and levy of penalty	Engineer incharge		INR 5,000		
<b>M</b>	Issue memo and levy of penalty	Engineer incharge		INR 10,000		
<b>N</b>	Issue memo and levy of penalty	Circle Head		INR 25,000		
<b>O</b>	Issue memo and levy of penalty	Head of Department		INR 100,000		

<b>P</b>	Issue memo and levy of penalty	Head of Department	INR 200,000	(whichever is less).
<b>Q</b>	Issue memo, levy of penalty, termination of contract and black listing of contractor	Function Head	INR 5,00,000	

Fig 12(3) – Penalty Matrix for Incident/Accident in small Contracts

In case of single or multiple fatalities described under legends J&K of fig 12(2) and P&Q of fig 12(3), the concerned contractor may be debarred from extension of contract or participate in new contract. In such event the approval of functional Head will be necessary for extension or award of new contract to concerned contractor.

### ANNEXURE-I

#### Specification for Personal Protective Equipment

Safety Shoes – With Composite/Fiber toes (CE approved / IS 15298) – Mandatory for all personnel working at BYPL O&M. The safety shoes shall meet the following features:

1. Electric Shock Resistant Sole
2. Impact Resistant
3. Scrap/Heat Resistant
4. Slip Resistant
5. Oil and Acid Resistant

Lead MAKE: BATA/LIBERTY/Honeywell

Safety Helmets: (IS 2925 - 1984 or DGMS) with chin strap – Mandatory for all personnel working at BYPL O&M. The specification of safety helmet shall be as given below:

HDPE Yellow With 4 Point Fast Trac Ratchet Suspension

Shell Material	UV stabilise HDPE, Non vented
Suspension	<ul style="list-style-type: none"> <li>With 4 Point Fas Trac Ratchet Suspension sewn headband</li> <li>Textile straps made from polyester Suspension</li> <li>point fixing: good positioning, ...stability, better air circulation due to ...limited contact areas with the head</li> <li>Easy clean sweatband</li> </ul>
Size	52-62 cm
Accessory slot	Standard 30 mm with removable HDPE dead plugs suitable to leak proof fitting
Approvals	ANSI/ IEC Z89.1 Class E (electrical)
Additional	Low temperature -10°C (acc. to GB2811), High temperature +50°C

Colours	Yellow
weight	360 g

Lead MAKE: 3M / KARAM/Honeywell

Full Body positioning Harness: (CE approved / IS 3521 / EN 361 / EN 355) – Shall be used while work is in progress at height more than 1.8 meter or where from a person may fall and get injured. The specification of the Full body harness shall be as given below:

Anchorage	Adjustable two chest attachment D-rings and A dorsal attachment D-ring
Adaptability	Adjustable shoulder and thigh straps
Convenience	Shoulder and thigh straps differentiated by a dual colour scheme.
Ergonomics	Idealy. Positioned sit strap for extended comfort.
Size	Standard
weight	1200GMS
ENERGY ABSORBING FORKED LANYARDS :	
Spec.	44mm wide polyamide webbing.
Length	1.5 Meter

Lead MAKE: KARAM /LIFEGEAR

#### Safety Spectacles

Shall be used to protect workers eyes from foreign materials and flying particles. Mandatory for all personnel working at BYPL O&M. Safety goggles shall meet the following feature

1. Poly carbonate/ Acetate lens for special applications requiring superior chemical resistance.
2. Industrial version of tough and popular first responder goggles.
3. SoftFlex low profile frosted frame for increased comfort.
4. Comfortable headband with length adjustment.
5. Indirect venting for comfortable, long lasting wear can be worn with safety helmets and over prescription spactacles.
6. Sightgard + premium anti-fog coating (EN 166 "N") with good anti- scratch properties.

Technical Specification:

Weight	95g.
Lens thickness	1.0mm
Overall width	173mm
Overall length	90mm
Bridge	47.6mm
Lens base	5.5 curve
Lens size	86.1mm verticle, 174mm diagonal
Headband	Adjustable length at max.440mm(long enough to fit together with helmets)
Material & colours	
Lens	Acetate clear, coating, Sightgard + anti-fog according to EN 166 "N" & anti scratch.
Body	PVC smoke
Headband holder	Nylone
Headband	Adustable grey elastic fixed on frame side parts
Marking / Approvals	
Standard number	EN 166
Frame marking	MSA EN 166 34-FT CE
Lens marking	2C-1.2 MSA 1 FT N CE
Filter class	2C (Ultra violet radiation with enhanced colour recognition)
Scale number	1.2: luminous trasmittance-89%
Optical class	1 (best class, for permanent wear)
Mechanical resistance	F (low energy impact 45m/s) T (at extreme temperature -5 to +55° C)
Resistance to	N(distorted vision due to lens fogging)
UV filter	99.9%
Ordering information	10145578-FlexiChem Sightgard + clear , 6x

Lead MAKE: MSA / UVEX/ 3M

Electrical Insulating Hand Gloves – Shall be used to prevent electric shock based upon the hazards/risks involved in a particular activity. Safety goggles shall meet the following feature

Breakthrough manufacturing process delivers exception dry grip.  
 Soft and flexible for enhanced tactility, high dexterity and wearer comfort.  
 Ergonomic design featuring tapered fingers to reduce hand fatigue.  
 Relaxed wrist for easy on/off.

Length	360mm
Class	2
Thickness	3.6mm
Proof test voltage	20000
Maximum use voltage	11000
Tensile strength	>16mpa[Mega Pascal]
Puncture resistance	>18N/mm [Newton per mili meter]
Elongation at break	>600% [Stretching length]
Tension set	<15%

It should be resist to oil, acid, ultra violet rays and very low temperature.  
 Each pair of glove should be marked with class, category, month & year of manufacturing, CE logo, batch no. and certified laboratory no.

EN certified to electrical and thermal hazards,  
EN certified to thermal & electrical hazards to confirm EN 60-903,  
EN certified to mechanical hazard to EN-388  
Lead MAKE: Honeywell / ANSELL

**CERTIFICATES REQUIRED:**

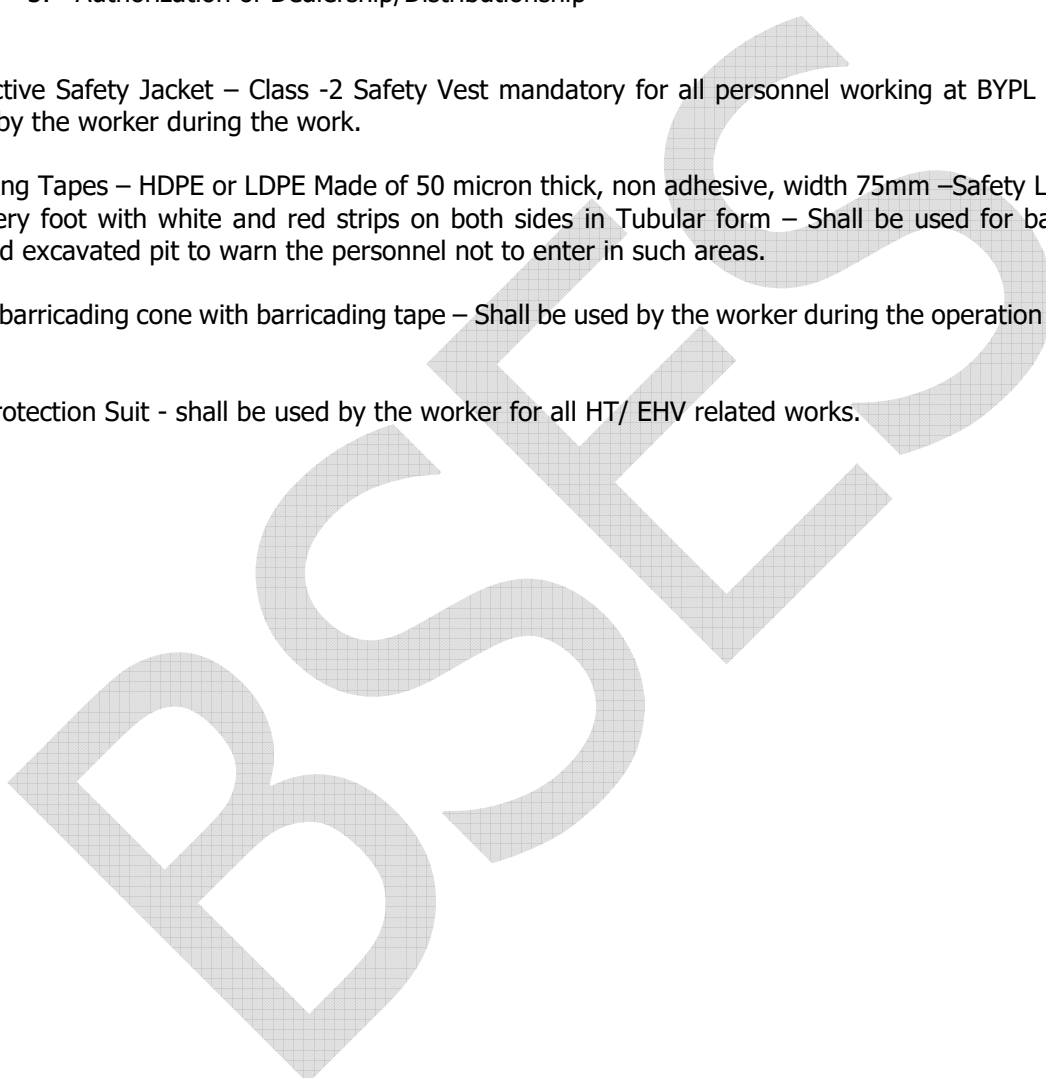
1. Manufacturer Certificate
2. Test Certificate
3. Authorization of Dealership/Distributionship

Reflective Safety Jacket – Class -2 Safety Vest mandatory for all personnel working at BYPL O&M. Shall be used by the worker during the work.

Warning Tapes – HDPE or LDPE Made of 50 micron thick, non adhesive, width 75mm –Safety Logo embossed at every foot with white and red strips on both sides in Tubular form – Shall be used for barricading area around excavated pit to warn the personnel not to enter in such areas.

Road barricading cone with barricading tape – Shall be used by the worker during the operation / maintenance work.

Arc Protection Suit - shall be used by the worker for all HT/ EHV related works.



**Annexure #2**

**BSES YAMUNA POWER LIMITED  
(Name of Site)**

**Safety Appreciation / Violation Memo**

DIVISION/Area: -----

Date & Time: -----

Name of Contractor: -----

Activity: -----

Name of Division Head: -----

Appreciation/Penalty Memo#:

S.N	Safety Violation Details	Class (A/B/C/D/E)	No. of Violations	Penalty per Violation (Rs)	Penalty Amount (Rs)	Remarks
1						
2						
3						
4						
5						

**Safety Appreciation/Violation Note:**

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Recommended By: Name: ----- Designation: -----

Sign/Date: -----

Approved By (Division Head): Name: ----- Designation: -----

Sign/Date: -----

**Annexure #3**

**BSES YAMUNA POWER LIMITED  
(Name of Site)**

**Monthly Status of PPE's / Tool Kit**

Location/Area: -----

Date & Time: -----

Name of Contractor: -----

No. AMC Employee:

Lineman:

ALM:

**Status of PPE's**

S.N	Name of PPEs / Tool	No. Of PPEs	Condition	Remarks
1	Safety Helmet			
2	Safety Goggle			
3	Electrical Insulating Hand gloves			
4	Full Body Harness			
5	Safety Shoes			
6	Reflective Jacket			

Signature / Date .....



**Annexure #4**

**BSES YAMUNA POWER LIMITED  
(Name of Site)**

**Monthly Status - Accident / Incident**

Location/Area: -----

Date & Time: -----

Name of Contractor: -----

Table – 1: Summary of Accident /Incident / Near Miss / Dangerous Occurences / First Aid:

S.N	Type of Accident /Incident / Near Miss / Dangerous Occurences / First Aid	Person Injured	Brief Discription
1			
2			
3			
4			
5			

Table – 2: Learning from Incidents:

S.N	Brief Discription	Root Cause	Recommendation
1			
2			
3			
4			
5			

Table – 3: Summary of Person Injured:

S.N	Name of Employee	Emp. ID / Designation	Type of Injury	Duration of Medical Rest	
				From	To
1					
2					
3					
4					
5					

Table -4 : Safety Inspections / Violation

S. No.	Date	Location	Discrepancies	Compliance
1				
2				
3				
4				
5				

Table - 5 : Health & Safety Complaints & Sugesstions :

S. No.	Date	Location	Complaints / Sugestion
1			
2			
3			
4			
5			

Measures to avoid recourences for all above mentioned discrepancies (Attach relevant documents if required)

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Signature / Date .....

**Annexure #5**

**BSES YAMUNA POWER LIMITED  
(Name of Site)**

**Format - PPE's Receipt by workers**

**Division:**

**Name of Contractor:**

<b>S. NO</b>	<b>NAME</b>	<b>DESI.</b>	Safety Helmet	Electrical Insulating Hand gloves	Full Body Harness	Safety Shoes	Safety Goggle	Reflective Jacket	SIGNATURE

Signature of Contractor / Date.....

**APPENDIX II**

**(To be executed on a Non-Judicial Stamp Paper of appropriate value)**

**FORMAT OF ADVANCE BANK GUARANTEE**

This Guarantee made at \_\_\_\_\_ this [\_\_\_\_] day of [\_\_\_\_] 20XX

1. WHEREAS M/s BSES Yamuna Power Limited, a Company incorporated under the provisions of Companies Act, 1956 having its Registered Office at Shaktikiran Building, Karkardooma, Delhi 110032, India hereinafter referred to as the " Owner ", (which expression shall unless repugnant to the context or meaning thereof include its successors, administrators, executors and assigns).
2. AND WHEREAS the Owner has entered into a contract for \_\_\_\_\_(Please specify the nature of contract here ) vide Contract No. \_\_\_\_\_dated \_\_\_\_\_(hereinafter referred to as the "Contract") with M/s.\_\_\_\_\_, (hereinafter referred to as "the Suppliers", which expression shall unless repugnant to the context or meaning thereof be deemed to mean and include each of their respective successors and assigns) for providing of the services on the terms and conditions as more particularly detailed therein.
3. AND WHEREAS in conformity with the provisions of clause \_\_\_\_\_ of conditions of Contract, the Suppliers has agreed to furnish a Bank Guarantee for an amount equivalent to the Advance Payment of Rs..... extended by the Owner to the Supplier for the faithful execution of the Contract.
4. AND WHEREAS the Suppliers have agreed to provide the Owner and the Owner has agreed to accept the Advance Bank Guarantee for \_\_\_\_ percent (\_\_\_\_%) of the total Contract Value from [\_\_\_\_\_] (*pl. specify the name of Bank*) having its head/registered office at [\_\_\_\_\_] through its branch in \_\_\_\_\_(*pl. specify the name of Branch through which B.G is issued*) hereinafter referred to as "the Bank", (which expression shall unless it be repugnant to the context or meaning thereof be deemed to include its successors and permitted assigns).

APPENDIX II NIT NO: CMC/BY/22-23/RS/SV/42	Page <b>1</b> of <b>12</b>	BIDDERS SEAL & SIGNATURE
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5. NOW THEREFORE, in consideration inter alia of the Owner granting the Suppliers the Contract, the Bank hereby unconditionally and irrevocably guarantees and undertakes, on a written demand, to immediately pay to the Owner any amount so demanded (by way of one or more claims) not exceeding in the aggregate [Rs. ].....)in words) without any demur, reservation, contest or protest and/or without reference to the Supplier and without the Owner needing to provide or show to the Bank ,grounds or reasons or give any justification for such demand for the sum/s demanded.
6. The decision of the Owner as to whether the Supplier has fulfilled its obligation or not towards set-off of Advance Payment extended by the Owner to the Supplier shall be final and binding on the Bank and the Supplier. The Bank acknowledges that any such demand by the Owner of the amounts payable by the Bank to the Owner shall be final, binding and conclusive evidence in respect of the amounts payable by the Supplier to the Owner. Any such demand made by the Owner on the Bank shall be conclusive and binding, notwithstanding any difference between the Owner and the Supplier or any dispute raised, invoked, threatened or pending before any court, tribunal, arbitrator or any other authority.
7. The Bank also agrees that the Owner at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor without proceeding against the Suppliers notwithstanding any other security or other guarantee that the Owner may have in relation to the Supplier's liabilities.
8. The Bank hereby waives the necessity for the Owner first demanding the aforesaid amounts or any part thereof from the Suppliers before making payment to the Owner and further also waives any right the Bank may have of first requiring the Owner to use its legal remedies against the Suppliers, before presenting any written demand to the Bank for payment under this Guarantee.
9. The Bank's obligations under this Guarantee shall not be reduced by reason of any partial performance of the Contract. The Bank's obligations shall not be reduced by any failure by the Owner to timely pay or perform any of its obligations under the Contract.

10. The Bank further unconditionally and unequivocally agrees with the Owner that the Owner shall be at liberty, without the Bank's consent and without affecting in any manner its rights and the Bank's obligation under this Guarantee, from time to time, to:

- (i) vary and/or modify any of the terms and conditions of the Contract;
- (ii) forebear or enforce any of the rights exercisable by the Owner against the Suppliers under the terms and conditions of the Contract; or

and the Bank shall not be relieved from its liability by reason of any such act or omission on the part of the Owner or any indulgence shown by the Owner to the Suppliers or any other reason whatsoever which under the law relating to sureties would, but for this provision, have the effect of relieving the Bank of its obligations under this Guarantee.

11. This Guarantee shall not be discharged by any change in the constitution or composition of the Suppliers, and this Guarantee shall not be affected or discharged by the liquidation, winding-up, bankruptcy, reorganisation, dissolution or insolvency of the Suppliers or any of them or any other circumstances whatsoever.

12. This Guarantee shall be in addition to and not in substitution or in derogation of any other security held by the Owner to secure the obligations of the Suppliers under the Contract.

13. NOTWITHSTANDING anything herein above contained, the liability of the BANK under this Guarantee shall be restricted to \_\_\_\_\_ (*insert an amount equal to ten percent (10%) of the Contract Value*) and this Guarantee shall be valid and enforceable and expire on \_\_\_\_\_ (*pl. specify date*) or unless a suit or action to enforce a claim under this Guarantee is filed against the Bank on or before the date of expiry.

14. On termination of this Guarantee, all rights under the said Guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities hereunder.

15. The Bank undertakes not to revoke this Guarantee during its validity except with the prior written consent of the Owner and agrees that any change in the constitution of the Bank or the Suppliers shall not discharge our liability hereunder.

16. This Guarantee shall be governed by the laws of India. Any suit, action, or other proceeding arising out of, connected with, or related to this Guarantee or the subject matter hereof shall be subject to the exclusive jurisdiction of the courts of **Delhi**, India.

Dated this ..... day of ..... ..20XX at .....

(Signature)

.....

(Name)

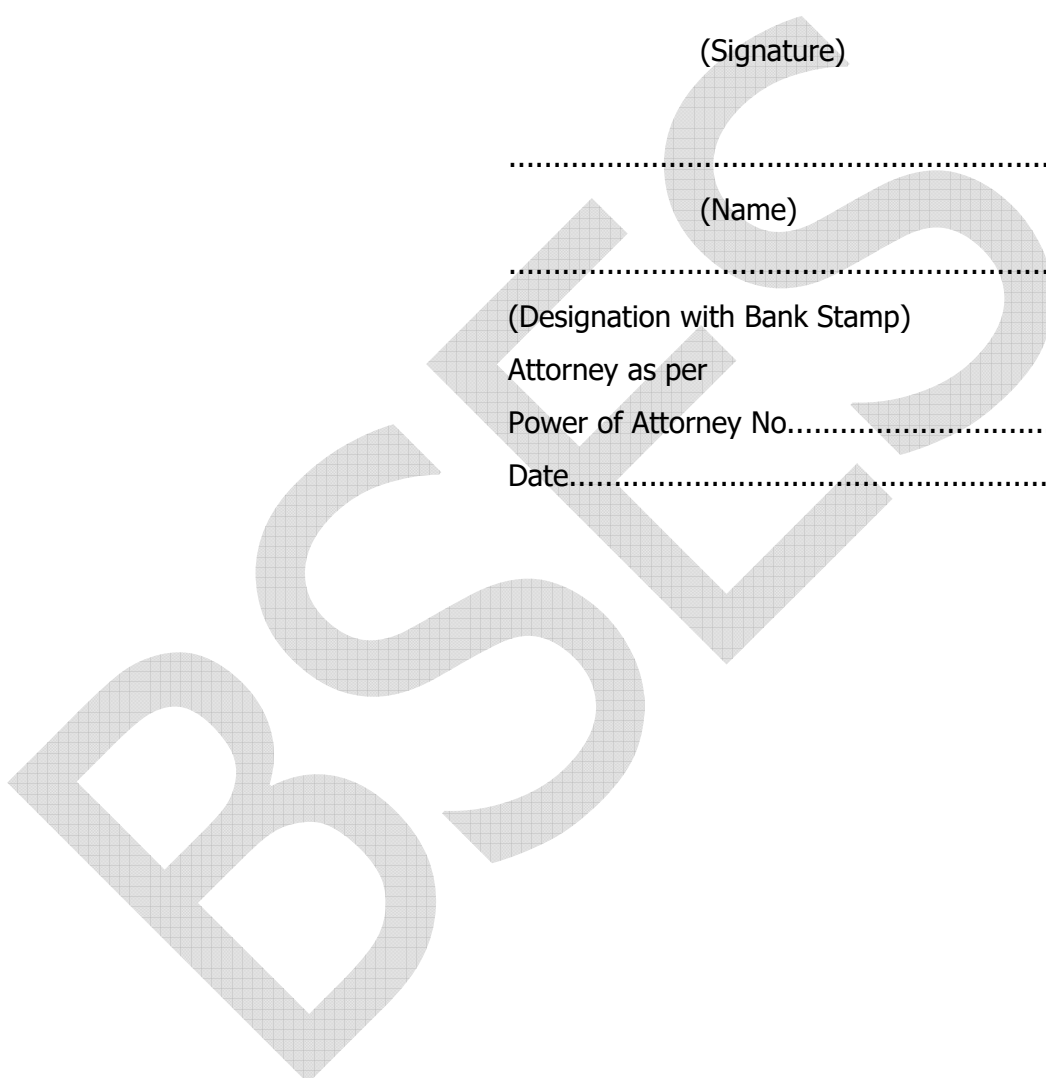
.....

(Designation with Bank Stamp)

Attorney as per

Power of Attorney No.....

Date.....



**(To be executed on a Non-Judicial Stamp Paper of appropriate value)**

**FORMAT OF PERFORMANCE BANK GUARANTEE**

This Guarantee made at \_\_\_\_\_ this [\_\_\_\_] day of [\_\_\_\_] 20XX

1. WHEREAS M/s BSES Yamuna Power Limited, a Company incorporated under the provisions of Companies Act, 1956 having its Registered Office at Shaktikiran Building, Karkardooma, Delhi 110032, India hereinafter referred to as the " Owner ", (which expression shall unless repugnant to the context or meaning thereof include its successors, administrators, executors and assigns).
  
2. AND WHEREAS the Owner has entered into a contract for \_\_\_\_\_(Please specify the nature of contract here ) vide Contract No. \_\_\_\_\_dated \_\_\_\_\_(hereinafter referred to as the "Contract") with M/s.\_\_\_\_\_, (hereinafter referred to as "the Supplier", which expression shall unless repugnant to the context or meaning thereof be deemed to mean and include each of their respective successors and assigns) for providing services on the terms and conditions as more particularly detailed therein.
  
3. AND WHEREAS as per clause \_\_\_\_of conditions of Contract, the Suppliers are obliged to provide to the Owners an unconditional bank guarantee for an amount equivalent to ten percent (10%) of the total Contract Value for the timely completion and faithful and successful execution of the Contract from [ \_\_\_\_\_ ] *pl. specify the name of Bank*) having its head/registered office at [ \_\_\_\_\_ ] through its branch in \_\_\_\_\_(*pl. specify the name of Branch through which B.G is issued*) hereinafter referred to as "the Bank", (which expression shall unless it be repugnant to the context or meaning thereof be deemed to include its successors and permitted assigns).
  
4. NOW THEREFORE, in consideration inter alia of the Owner granting the Suppliers the Contract, the Bank hereby unconditionally and irrevocably guarantees and undertakes, on a written demand, to immediately pay to the Owner any amount so demanded (by way of one or more claims) not exceeding in the aggregate [Rs. ].....(*in words*) without any demur, reservation, contest or protest and/or without reference to the Supplier and without

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the Owner needing to provide or show to the Bank ,grounds or reasons or give any justification for such demand for the sum/s demanded.

5. The decision of the Owner to invoke this Guarantee and as to whether the Supplier has not performed its obligations under the Contract shall be binding on the Bank. The Bank acknowledges that any such demand by the Owner of the amounts payable by the Bank to the Owner shall be final, binding and conclusive evidence in respect of the amounts payable by the Supplier to the Owner. Any such demand made by the Owner on the Bank shall be conclusive and binding, notwithstanding any difference between the Owner and the Supplier or any dispute raised, invoked, threatened or pending before any court, tribunal, arbitrator or any other authority.
6. The Bank also agrees that the Owner at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor without proceeding against the Suppliers notwithstanding any other security or other guarantee that the Owner may have in relation to the Supplier's liabilities.
7. The Bank hereby waives the necessity for the Owner first demanding the aforesaid amounts or any part thereof from the Suppliers before making payment to the Owner and further also waives any right the Bank may have of first requiring the Owner to use its legal remedies against the Suppliers, before presenting any written demand to the Bank for payment under this Guarantee.
8. The Bank's obligations under this Guarantee shall not be reduced by reason of any partial performance of the Contract. The Bank's obligations shall not be reduced by any failure by the Owner to timely pay or perform any of its obligations under the Contract.
9. The Bank further unconditionally and unequivocally agrees with the Owner that the Owner shall be at liberty, without the Bank's consent and without affecting in any manner its rights and the Bank's obligation under this Guarantee, from time to time, to:
  - (i) vary and/or modify any of the terms and conditions of the Contract;
  - (ii) Forebear or enforce any of the rights exercisable by the Owner against the Suppliers under the terms and conditions of the Contract; or

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(iii) Extend and/or postpone the time for performance of the obligations of the Suppliers under the Contract;

and the Bank shall not be relieved from its liability by reason of any such act or omission on the part of the Owner or any indulgence shown by the Owner to the Suppliers or any other reason whatsoever which under the law relating to sureties would, but for this provision, have the effect of relieving the Bank of its obligations under this Guarantee.

10. This Guarantee shall be a continuing bank guarantee and shall not be discharged by any change in the constitution or composition of the Suppliers, and this Guarantee shall not be affected or discharged by the liquidation, winding-up, bankruptcy, reorganisation, dissolution or insolvency of the Suppliers or any of them or any other circumstances whatsoever.
11. This Guarantee shall be in addition to and not in substitution or in derogation of any other security held by the Owner to secure the performance of the obligations of the Suppliers under the Contract.
12. NOTWITHSTANDING anything herein above contained, the liability of the BANK under this Guarantee shall be restricted to \_\_\_\_\_ (*insert an amount equal to ten percent (10%) of the Contract Value*) and this Guarantee shall be valid and enforceable and expire on \_\_\_\_\_ (*pl. specify date*) or unless a suit or action to enforce a claim under this Guarantee is filed against the Bank on or before the date of expiry.
13. On termination of this Guarantee, all rights under the said Guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities hereunder.
14. The Bank undertakes not to revoke this Guarantee during its validity except with the prior written consent of the Owner and agrees that any change in the constitution of the Bank or the Suppliers shall not discharge our liability hereunder.
15. This Guarantee shall be governed by the laws of India. Any suit, action, or other proceeding arising out of, connected with, or related to this Guarantee or the subject matter hereof shall be subject to the exclusive jurisdiction of the courts of **Delhi**, India.

Dated this ..... day of ..... 20XX at .....

APPENDIX II NIT NO: CMC/BY/22-23/RS/SV/42	Page <b>7</b> of <b>12</b>	BIDDERS SEAL & SIGNATURE
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(Signature)

.....

(Name)

.....

(Designation with Bank Stamp)

Attorney as per

Power of Attorney No.....

Date.....

BIDDERS SEAL

**BENEFICIARY'S BANK DETAIL WITH IFSC CODE:**

1. Name of the Bank: Axis Bank Limited
2. Branch Name & Full Address: C-58, Basement & Ground Floor, Preet Vihar, Main Vikas Marg,  
New Delhi 110092
3. Branch Code: 055
4. Bank Account No: 911020005246567
5. IFSC Code: UTIB0000055
6. Swift Code: AXISINBB055

BIDDER'S

**FORMAT OF WARRANTY/GUARANTEE CERTIFICATE**

BSES YAMUNA POWER LIMITED Shaktikiran Building, Karkardooma, Delhi -110032.

Ref. Purchase Order No. :

Dear Sir,

We hereby confirm that the.....dispatched to BSES YAMUNA POWER LTD vide invoice no..... DT.....is exactly of the same nature and description as per above mentioned Purchase Order.

We further confirm that we will replace/repair our.....free of cost If found any manufacturing defect during.....months from the date of dispatch of material or.....months from the data of commissioning whichever is earlier.

Vendors Name & Signature

**FORMAT OF WARRANTY / DEFECT LIABILITY PERIOD –SERVICE**

Performance requirements of the works completed is as per detailed specifications and standards specified and to be adhered to strictly. In-case of deficiency, the same is to be rectified / redone to meet the specifications by the contractor within stipulated schedule or any extension thereof. The Contractor shall be liable to rectify all defects except those arising out of normal wear and tear, in the works done by the Contractor under this contract, or from any act or omission of the contractors for a period of 24 months will depend on individual contract period package to package from the date of Handing over the works to the Employer / Owner.

Vendors Name & Signature

**FORMAT OF NO DEMAND CERTIFICATE**

NO DEMAND CERTIFICATE BY CONTRACTOR  
(To be issued on letterhead of Contractor)

To ,

BSES YAMUNA POWER LIMITED,  
Shaktikiran Building, Karkardooma,  
Delhi -110032.

Name of the Project:

Contract No.:

Date of Contract:

Name of the Contractor:

We, M/s \_\_\_\_\_ (Contractor) do hereby acknowledge and confirm that we have claimed Rs. \_\_\_\_\_ (Rs. \_\_\_\_\_) towards full and final settlement of our claims from BSES Yamuna Power Limited, in respect of the aforesaid WO/PO/Contract No.: #####. Dated. ####. including all amendments, if any, to the said Contract, to our entire satisfaction and we further confirm that we have no claim whatsoever pending with BSES Yamuna Power Limited under or in respect of the said Contract.

Notwithstanding any protest, note or objection recorded or raised by us in any correspondence, documents, measurement books and / or final bills etc.

- (a) we confirm that BSES Yamuna Power Limited stands fully discharged of all its obligations,
- (b) we shall make no claim of any nature on BSES Yamuna Power Limited or any of its affiliates or personnel, and
- (c) we waive all our rights to lodge any claim or protest in future, in respect of the said Contract.

We have paid in full all applicable duties, levies, taxes and statutory and other amounts payable by us in connection with the above-mentioned Contract and amounts payable to or in relation to third parties engaged by us including our contractors, suppliers, employees and labour. No payment in this regard is pending or unpaid and we have no (and shall have no) claim against BSES Yamuna Power Limited in this regard.

No refund has been received/ is envisaged to be received or reasonably believed to be receivable on account of taxes, duties or any other payment made by us in respect of the Contract. In case any refund corresponding to any amount paid or reimbursed by BSES Yamuna Power Limited is received in the future, the same will be passed on to BSES Yamuna Power Limited promptly and without any demand from them in this regard.

We are issuing this "NO DEMAND CERTIFICATE" in favor of BSES Yamuna Power Limited with full knowledge of its contents and with our free consent without any influence, misrepresentation, coercion etc.

Date:

Place:

Signature:

Name:

Designation:

(Company Seal)

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**FORMAT FOR LETTER OF INDEMNITY**

Format for Letter of Indemnity

(Notes: Preferably shall be obtained on Stamp paper of appropriate value as applicable at the place of execution, if not, then at least on the letterhead of the Contractor)

Place: \_\_\_\_\_

Date: \_\_\_\_\_

To,

BSES Yamuna Power Limited, Shaktikiran Building, Karkardooma, Delhi -110032.

Dear Sirs,

WO/PO/Contract No. \_\_\_\_\_ Dated \_\_\_/\_\_\_/\_\_\_

For \_\_\_\_\_

**Settlement of Dues**

In consideration of your awarding the subject Work Order/Purchase Order/Contract to us and in further consideration of your having agreed to pay our final bill towards settlement of the dues in respect of the subject Work Order/Purchase Order/Contract, inter alia, on our assurances and representations that :

(a) We have paid in full all amounts payable by us including but not limited to duties, levies, taxes, cess, octroi, royalties, statutory payments, amounts payable to or in relation to third parties engaged by us including our contractors, suppliers, employees and labour, and

(b) we have fully complied with all requirements under applicable laws in connection with the subject Purchase Order/Work Order/Contract,

We \_\_\_\_\_,

unconditionally and irrevocably agree and undertake, to pay and/or settle entirely at our own cost and indemnify, defend and hold harmless you, your affiliates and your/your affiliates' personnel, directors and representatives, (hereinafter collectively referred to as "Indemnified Parties") from and against any and all liabilities, judgments, damages, losses, claims, costs and expenses, claimed, suffered or incurred or, likely to be claimed, suffered or incurred at any time by or against the Indemnified Parties or any of them as a result of, or arising out of, or in any way related to any failure or delay in payment of any of the amounts or compliances by us as aforesaid for any reason whatsoever.

Any notice(s) or communication(s) by you shall be sufficient proof that the Indemnified Parties have suffered or incurred loss, damages, liabilities etc. as aforesaid and we shall upon receipt of such notice(s) or communication(s) immediately, without any delay or demur or contest, make payment to you of the entire amount demanded under the said notice(s) or communication(s).

This letter of indemnity shall be in addition to and not in derogation of any other indemnity/ guarantee and/or security which we may have executed in your favor or your rights and entitlements under the contract.

This letter shall be governed by and construed and interpreted to accordance with the laws of India, and shall be subject to the exclusive jurisdiction of the courts of law at Mumbai.

Yours faithfully,

For M/s \_\_\_\_\_

Authorized Signatory

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# **PRICE BID FORMATS (SUPPLY & SERVICES)**

BIDDERS

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## GRAND SUMMARY OF THE QUOTED PACKAGE(S)

**ALL PRICES IN INR (₹)**

Package Name/Description	Supply Prices-Landed (A)	Erection, Testing and commissioning prices - Landed (B)
TURNKEY PACKAGE FOR DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 33/11KV INDOOR GIS SUBSTATION ALONG WITH ALLIED EQUIPMENTS AND WORKS AT OMAXE SUB-STATION, CHANDNI CHOWK, DELHI		
<b>Grand Total [A+B+C]</b>		
<b>Grand Total (In words)</b> .....		

We declare that the following are our quoted prices in INR for the entire packages.

Date:

Bidders Name:

Place:

Bidders Address:

Signature: .....

Designation: .....

Printed Name: .....

Common Seal: .....

**Note:**

- 1) All prices for the packages quoted are inclusive of taxes and duties, GST and freight etc. Bidder shall include & indicate any others taxes under the applicable law(s) for supply and services to be performed in the purchaser's country.
- 2) Bidder shall include & indicate any others taxes under the applicable law(s) for supply and services to be performed in the purchaser's country.
- 3) The bidder shall, at its own, handle all imported equipment's and handle all formalities for custom clearances, port charges, etc if any

- 4) All prices for the packages quoted are against the scope of work under the contract shall be executed strictly as per the NIT conditions and the technical specification.
- 5) Quoted prices shall be as per the Bill of quantities (BOQ) as attached. However Any items/material/machinery, not specifically mentioned In BOQ as well as in the technical specifications but required for successful completeness, Erection, Testing and Commissioning of the package awarded shall be deemed to be in the scope of the bidder.
- 6) Insurance as per the clause defined in SCC and other contract conditions, is included in the quoted prices. However Bidder shall indicate the value of the insurance taken, separately.
- 7) Kindly refer the relevant layout drawing of existing foundations in Annexure of tender document. Site visit is advisable prior to submission of quotation.

BIDDERS

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**PRICE FORMAT – SUPPLY (A) (Kindly refer detailed package wise SCOPE OF SUPPLY attached as Volume II for Indicative Description of Goods/BOM, BOQ)**

S. No.	DESCRIPTION OF GOODS	HSN CODE (8 Digit Mandatory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)	UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
						% AMT		
	<b>33 kV GIS with Double Bus Bar Arrangement</b>							
1	Incomer Feeder Panel with Line PT		Nos	3				
2	Outgoing Feeder Panel with Line PT		Nos	2				
3	Bus Coupler		Nos	1				
4	Bus PT		Nos	2				
	<b>End Termination Kits</b>							
5	GIS termination kit for 33kV, 3C X 400sqmm cable		Nos	8				
6	GIS termination kit for 33kV, 3C X 300sqmm cable		Nos	4				
7	End Termination kit for 0.415 kV 4C X 150 sqmm cable		Nos	4				
	<b>Cable and Associated Items</b>							
8	0.415 kV 2R X 4C X 150 sqmm XLPE Insulated stranded conductor, PVC outer Sheath Power Cable		Lot	1				
9	Control Cables with proper ferruling and tagging along with glands and lugs		Lot	1				
10	Cable Tray including bends etc with 50% spare capacity in each		Lot	1				
11	Cable Tray Support Structure		Lot	1				
12	Fire Resistant Coating		Lot	1				
13	Cable Support Structure along with Clamping Arrangement		Lot	1				
	<b>Auxiliary Equipment</b>							
14	AC Distribution Board		Nos	1				
15	DC Distribution Board		Nos	1				
16	SMPS Battery Charger		Nos	1				
17	220 V Li Ion Battery Bank		Nos	1				
18	Earthing		Lot	1				
19	Angle and Channel		Lot	1				
20	Line Interface Unit (LIU)		Lot	1				
21	Patch Cord		Lot	1				
22	Grid Energy Meter		Nos	3				
23	Fire Protection System		Lot	1				

PRICE BID  
NIT NO: CMC/BY/22-23/RS/SV/42

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BIDDERS SEAL & SIGNATURE

S. No.	DESCRIPTION OF GOODS	HSN CODE (8 Digit Mandatory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)		UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
						%	AMT		
24	Conduits		Lot	1					
25	Insulated Floor Coating		Lot	1					
26	SF6 Gas Handling Kit		No	1					
27	SCADA Works		Lot	1					
28	IT Works		Lot	1					
29	Painting of Feeder names (SCADA code, Asset Code, etc)		Lot	1					
30	Illumination and Lighting		Lot	1					
31	Licensed programming software		No	1					
32	Communication Cord		Lot	1					
33	Stepped trolley cum platform		No	2					
34	Recommended & Mandatory Spares		Lot	1					
35	Accessories		Lot	1					
36	SLD of Grid		No	1					
37	Emergency Exit Floor Marking		Lot	1					
<b>GRAND TOTAL LANDED COST (₹)</b>									
In words .....									
Note: All quantities mentioned above are estimated quantities. Actual quantities may vary as per actual site requirement. All the lot items are required to be quantities for ordering and billing purpose.									

**PRICE FORMAT – E/T/C (B) (Kindly refer detailed package wise SCOPE OF WORK attached as Volume II for Indicative Description of Services/BOM, BOQ)**

S. No.	DESCRIPTION OF SERVICES	SAC CODE (8 Digit Mandatory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)	UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
						% AMT		
	Erection, Testing and Commissioning of all items specified in "Scope of Supply"							
	<b>33 kV GIS with Double Bus Bar Arrangement</b>							
1	Incomer Feeder Panel with Line PT		Nos	3				
2	Outgoing Feeder Panel with Line PT		Nos	2				
3	Bus Coupler		Nos	1				
4	Bus PT		Nos	2				
	<b>End Termination Kits</b>							
5	GIS termination kit for 33kV, 3C X 400sqmm cable		Nos	8				
6	GIS termination kit for 33kV, 3C X 300sqmm cable		Nos	4				
7	End Termination kit for 0.415 kV 4C X 150 sqmm cable		Nos	4				
	<b>Cable and Associated Items</b>							
8	0.415 kV 2R X 4C X 150 sqmm XLPE Insulated stranded conductor, PVC outer Sheath Power Cable		Lot	1				
9	Control Cables with proper ferruling and tagging along with glands and lugs		Lot	1				
10	Cable Tray including bends etc with 50% spare capacity in each		Lot	1				
11	Cable Tray Support Structure		Lot	1				
12	Fire Resistant Coating		Lot	1				
13	Cable Support Structure along with Clamping Arrangement		Lot	1				
	<b>Auxiliary Equipment</b>							
14	AC Distribution Board		Nos	1				
15	DC Distribution Board		Nos	1				
16	SMPS Battery Charger		Nos	1				
17	220 V Li Ion Battery Bank		Nos	1				
18	Earthing		Lot	1				

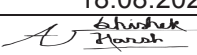


S. No.	DESCRIPTION OF SERVICES	SAC CODE (8 Digit Mandatory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)		UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
						%	AMT		
19	Angle and Channel		Lot	1					
20	Line Interface Unit (LIU)		Lot	1					
21	Patch Cord		Lot	1					
22	Grid Energy Meter		Nos	3					
23	Fire Protection System		Lot	1					
24	Conduits		Lot	1					
25	Insulated Floor Coating		Lot	1					
26	SF6 Gas Handling Kit		No	1					
27	SCADA Works		Lot	1					
28	IT Works		Lot	1					
29	Painting of Feeder names (SCADA code, Asset Code, etc)		Lot	1					
30	Illumination and Lighting		Lot	1					
31	Licensed programming software		No	1					
32	Communication Cord		Lot	1					
33	Stepped trolley cum platform		No	2					
34	Recommended & Mandatory Spares		Lot	1					
35	Accessories		Lot	1					
36	SLD of Grid		No	1					
37	Emergency Exit Floor Marking		Lot	1					
38	Termination of Incomer and Outgoing 33 kV Power Cables		Set	5					
39	Retrofitting Work of Line Differential Relay at remote end		Lot	1					
40	Training on O&M of 33 KV GIS		Days	2					
41	Training on application, programming, testing and commissioning of Numerical Relays		Days	2					
42	Training on IEC 61850		Days	2					
43	Grouting Work for any Supplied Equipment		Lot	1					
GRAND TOTAL LANDED COST (₹)									
In words .....									
Note: All quantities mentioned above are estimated quantities. Actual quantities may vary as per actual site requirement.									

**VOLUME – II: SCOPE OF TURNKEY EXECUTION &  
TECHNICAL SPECIFICATIONS**

**SCOPE OF TURNKEY EXECUTION**

**FOR**

**OMAXE SUB-STATION**

<b>Revision</b>			0
<b>Date</b>			18.08.2022
<b>Prepared by</b>	Abhishek Harsh	<b>CES</b>	 <small>326767c3-82b5-464b-b5a6-8676e7820a34</small>
<b>Reviewed by</b>	Srinivas Gopu	<b>CES</b>	 <small>5d32525e-e03a-4641-91c7-88a5e7761519</small>
	Brij Singh	<b>EHV O&amp;M</b>	<i>Brij p Singh</i> <small>05f86352-8089-49ba-9a6a-71d7ad0c59</small>
	Ashok Somavat	<b>P&amp;E</b>	<b>Ashok Somavat</b> <small>72682ae-ba2a-4642-9640-5d890047374</small>
<b>Approved by</b>	Gaurav Sharma	<b>CES</b>	 <small>23626a2-950e-4472-99a7-dca873a4726a</small>
	Prem Gomber	<b>EHV O&amp;M</b>	<i>Prem Gomber</i> <small>12662471-2a24-499a-9677-56ac1f15aac</small>
	Pramod Kumar	<b>P&amp;E</b>	<i>Pramod J Kumar</i> <small>8b6c64b3-v9d3-4fce-a14e-5276f460034f</small>



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**SCOPE OF TURNKEY EXECUTION FOR GT ROAD GRID SUBSTATION****1 INTENT**

- a. This document defines the scope for turnkey execution of Omaxe Substation.
- b. This document shall be read in conjunction with all technical documents enclosed in tender. In event of any contradiction between tender documents, the most stringent one shall govern.

**2 SITE DETAILS**

- a. Omaxe S/S is situated near Chandni Chowk Metro Station, Delhi 110006.
- b. Longitude and Latitude of Omaxe Substation is 28°39'27.4"N 77°13'51.2"E
- c. Note that Switchgear room shall be located at -1 floor and Cable cellar room shall be located at -2 floor.

**3 BIDDER'S SCOPE**

- a. Bidder's Scope includes design, engineering, manufacture, shop testing, inspection, packing, dispatch, supply, loading, unloading, storage at site, assembly, erection, complete pre-commissioning checks, testing & commissioning at site, obtaining statutory clearance & certification from Electrical Inspector and handing over of complete substation covered under scope of this document to BSES Yamuna Power Ltd.
- b. Any supply/work details not explicitly mentioned in this scope but mandatory for successful commercial operation of the substation shall be deemed to be included in bidder's scope.
- c. Bidder shall depute its representative at site to assess the condition of existing infrastructure in detail prior to submission of bid.

**3.1 DESIGN & ENGINEERING**

- a. Detailed design and engineering of complete project as per tender requirements shall be in bidder's scope.
- b. General guidelines for design are given below

**3.1.1 CODES AND STANDARDS**

- a. The bidder shall comply with latest Indian/International standard and CEA regulations.
- b. Refer respective equipment specification for applicable standards.

**3.1.2 SERVICE CONDITIONS**

3.1.2.1	Average grade atmosphere	Heavily polluted, Dry
3.1.2.2	Maximum altitude above sea level	1000M

**SCOPE OF TURNKEY EXECUTION FOR GT ROAD GRID SUBSTATION**

3.1.2.3	Ambient air temperature	Highest 50Deg C,Average 40Deg C
3.1.2.4	Minimum ambient air temperature	0 Deg C
3.1.2.5	Relative Humidity	100%
3.1.2.6	Rainfall	750mm concentrated in four months
3.1.2.7	Seismic Condition	Zone IV
3.1.2.8	Max. Relative Humidity	100%

**3.1.3 SYSTEM PARAMETERS**

3.1.3.1	Nominal Voltage kV	33
3.1.3.2	Rated voltage kV	36
3.1.3.3	Power Frequency (kV rms) with stand voltage	70
3.1.3.4	Basic Insulation Level KVp	170
3.1.3.5	Rated Frequency Hz	50±5%
3.1.3.6	System Neutral Earthing	Solidly Grounded

**3.2 SCOPE OF SUPPLY**

S. No	Items	UOM	Qty	Remarks
3.2.1	33 kV GIS with Double Bus Bar Arrangement			
3.2.1.1	Incomer Feeder Panel with Line PT	Nos	3	Line Differential Protection Relay for both Local and Remote End are included in scope of supply.
3.2.1.2	Outgoing Feeder Panel with Line PT	Nos	2	Configuration of Outgoing feeder shall be same as Incomer feeder
3.2.1.3	Bus Coupler	Nos	1	
3.2.1.4	Bus PT	Nos	2	
3.2.2	End Termination Kits			
3.2.2.1	GIS termination kit for 33kV, 3C X 400sqmm cable	Nos	8	a) 6 Kits shall be used at 33kV GIS Incomer Feeder b) 2 Kits shall be in spare
3.2.2.2	GIS termination kit for 33kV, 3C X 300sqmm cable	Nos	4	4 Kits shall be used at 33kV GIS Outgoing Feeder
3.2.2.3	End Termination kit for 0.415 kV 4C X 150 sqmm cable	Nos	4	For Terminating 0.415 kV Cables at ACDB Incomer and Outgoing of Omaxe Panel

**SCOPE OF TURNKEY EXECUTION FOR GT ROAD GRID SUBSTATION**

3.2.3	Cable and Associated Items			
3.2.3.1	0.415 kV 2R X 4C X 150 sqmm XLPE Insulated stranded conductor, PVC outer Sheath Power Cable	Lot	1	For AC Supply
3.2.3.2	Control Cables and Auxiliary Power Cable with proper ferruling and tagging along with glands and lugs	Lot	1	For Items specified in "Scope of Supply"
3.2.3.3	Cable Tray including bends etc with 50% spare capacity in each	Lot	1	a) For routing Power and Control Cables b) For items specified in "Scope of Supply" c) 50% spare capacity in each is tray is required
3.2.3.4	Cable Tray Support Structure	Lot	1	
3.2.3.5	Fire Resistant Coating	Lot	1	a) On all cable specified in "Scope of Supply" b) Fire Rating- 2 Hours
3.2.3.6	Cable Support Structure along with Clamping Arrangement	Lot	1	a) For all Power Cable Terminations b) For Control Cable Termination wherever Required
3.2.4	Auxiliary Equipment			
3.2.4.1	AC Distribution Board	Nos	1	Type-2 as per specification
3.2.4.2	DC Distribution Board	Nos	1	Type-2 as per specification
3.2.4.3	SMPS Battery Charger	Nos	1	Type-2 as per specification
3.2.4.4	220 V Li Ion Battery Bank	Nos	1	Type-2 as per specification
3.2.5	Earthing	Lot	1	a) Earthing of items specified in "Scope of Supply" with GI flat of 75 X 6 sqmm on two sides of equipment b) Joining of these flats with existing mesh shall be in bidder's scope
3.2.6	Angle Channel Arrangement	Lot	1	For Supplied equipment
3.2.7	Line Interface Unit (LIU)	Lot	1	It also includes LIUs for remote end optical fibre cable
3.2.8	Patch Cord	Lot	1	It also includes Patch Cord for remote end Line Differential relay
3.2.9	Grid Energy Meter	Nos	3	
3.2.10	Fire Protection System	Lot	1	As per Specification
3.2.11	Conduits	Lot	1	
3.2.12	Insulated Floor Coating	Lot	1	For Items specified in "Scope of Supply"
3.2.13	SF6 Gas Handling Kit	No	1	

**SCOPE OF TURNKEY EXECUTION FOR GT ROAD GRID SUBSTATION**

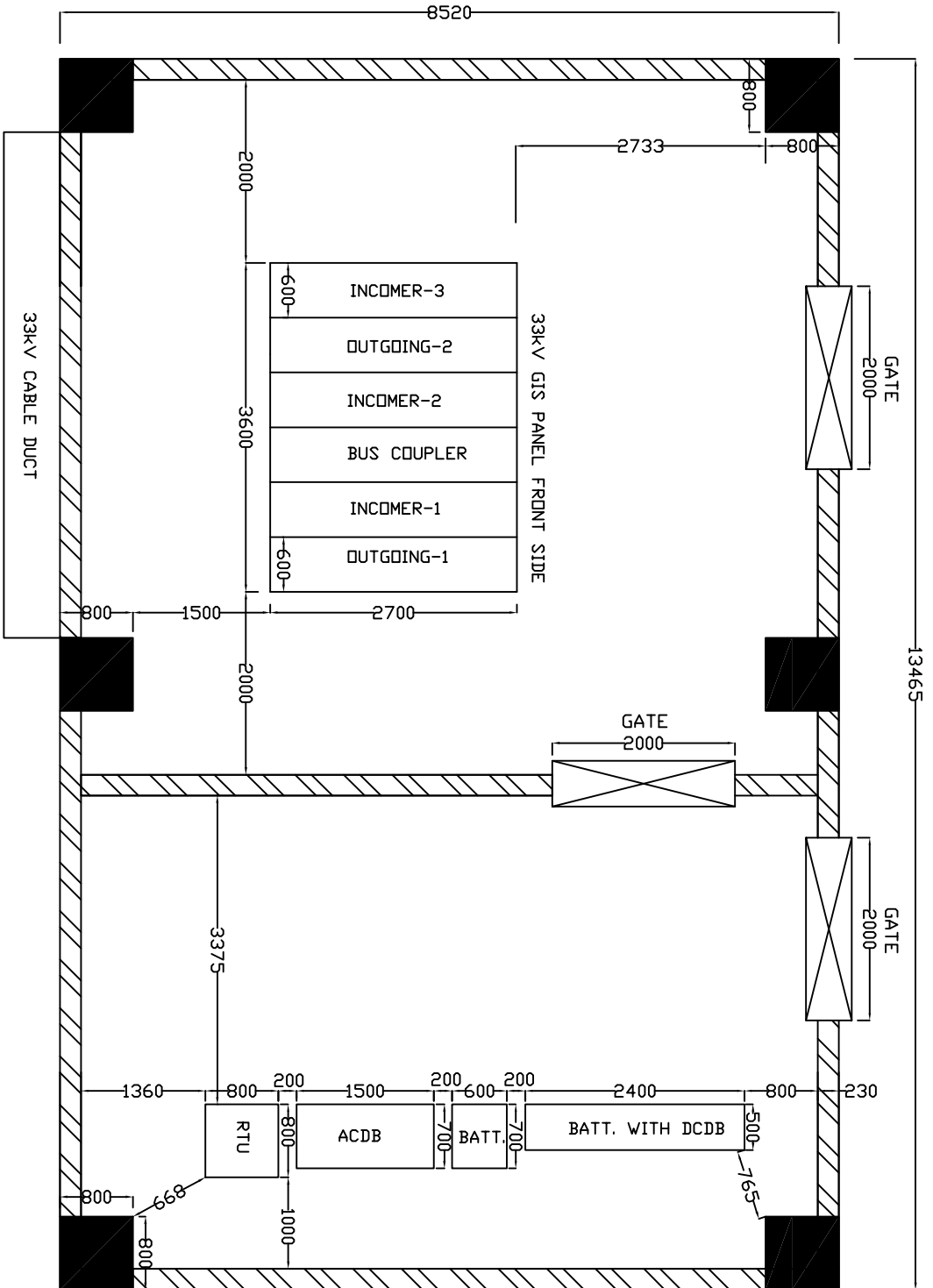
3.2.14	SCADA Works	Lot	1	As per Specification
3.2.15	IT Works	Lot	1	As per Specification
3.2.16	Painting of Feeder names (SCADA code, Asset Code, etc)	Lot	1	As per Engineer Incharge Guidance
3.2.17	Illumination and Lighting	Lot	1	
3.2.18	Licensed programming software	No	1	
3.2.19	Communication Cord	Lot	1	
3.2.20	Stepped trolley cum platform	No	2	To Access Relays of Switchgears
3.2.21	Recommended & Mandatory Spares	Lot	1	For Items specified in "Scope of Supply" as per Respective Sepcifications
3.2.22	Accessories	Lot	1	For Items specified in "Scope of Supply"
3.2.23	SLD of Grid	No	1	Covered in Acrylic Sheet
3.2.24	Emergency Exit Floor Marking	Lot	1	For Items specified in "Scope of Supply"

**3.3 SCOPE OF WORK**

Broad scope of work is specified below. Refer respective equipment/work specifications for detailed scope of work.

S. No	Items	Unit	Qty	Remarks
3.3.1	Erection, Testing and Commissioning of all items specified in "Scope of Supply"	Lot	1	
3.3.2	Termination of Incomer and Outgoing 33 kV Power Cables	Set	5	For three incoming and two outgoing Panels
3.3.3	Retrofitting Work of Line Differential Relay at remote end	Lot	1	a) Installation, testing and commissioning including cut out works on remote end panels b) Control cable works
3.3.4	Training on O&M of 33 KV GIS	Days	2	One-day classroom training at BYPL Training Centre and one-day onsite training. Training shall be provided by Domain experts only
3.3.5	Training on application, programming, testing and commissioning of Numerical Relays	Days	2	One-day classroom training at BYPL Training Centre and one-day onsite training. Training shall be provided by Domain experts only
3.3.6	Training on IEC 61850	Days	2	Two - Day Classroom Training
3.3.7	Grouting Work for any Supplied Equipment	Lot	1	If Required

**3.4 REFERENCE LAYOUT**



- NOTE -
1. ALL DIMENTIONS ARE IN MM.
  2. ROOM HIGHT 4100MM
  3. CABLE CELLAR ROOM BELOW GIS PANEL ROOM WITH TWO EXITS

DRAWN	RAJESH	TITLE:-
CHECKED	A/H/SG	TENTATIVE LAYOUT FOR
APPD.	G.S	OMAXE 33KV GIS ROOM AT
DATE	09.06.22	BASEMENT



**SCOPE OF TURNKEY EXECUTION FOR GT ROAD GRID SUBSTATION**
**3.5 SCOPE DEMARCATION**

S. No	Head	BYPL	Bidder's Scope	Remarks
3.5.1	Permissions from Various External and Internal Agencies other than Tree Cutting permission	x	✓	Statutory fees will be borne by BYPL if applicable
3.5.2	Permit to work request to BYPL authority	x	✓	Permit Should be applied to Engineer Incharge prior to work through proper procedure
3.5.3	Permit to work issuance from BYPL authority	x	✓	
3.5.4	Testing Equipment	x	✓	
3.5.5	Lighting Arrangement	x	✓	
3.5.6	Construction Power and Construction Water	x	✓	For construction power, bidder may take temporary connection from BYPL on chargeable basis.
3.5.7	Safety and Security of Manpower( Labor, Engineers, Supervisors etc)	x	✓	
3.5.8	Various Tools and Tackles related to Job	x	✓	
3.5.9	Loading, Unloading and Transportation of Material	x	✓	It includes transportation of dismantled equipment to BYPL store in stacked manner.
3.5.10	Cleanliness around work premises	x	✓	
3.5.11	Document/Drawing Submission	x	✓	
3.5.12	Document/Drawing Approval	✓	x	
3.5.13	Security and Safety of material until handover	x	✓	
3.5.14	Various Machines e.g. Crane, Hydra, JCB etc to complete the Job	x	✓	
3.5.15	Maintenance of Equipment Until Handover to Engineer Incharge and EHV O&M	x	✓	
3.5.16	Electrical Inspector Clearance	x	✓	Only statutory fees will be borne by BYPL if applicable
3.5.17	Permit issuing agency for Works inside BYPL Premises	✓	x	

## SCOPE OF TURNKEY EXECUTION FOR GT ROAD GRID SUBSTATION

3.5.18	Permit requesting Agency	x	✓	Permit Should be applied to Engineer In charge prior to start of work. Isolation & permit of only one Feeder at a time, shall be given at a time, during final hook up. All necessary preparation works to be made, in order to minimize the Shutdown Time.
3.5.19	Temporary office near work premises	x	✓	After handing over the equipment, contractor has to evacuate the premises within one week otherwise deemed fit action will be taken
3.5.20	Temporary store at work premises	x	✓	
3.5.21	Yard aesthetics at work place should be maintained at the time and after the completion of Work	x	✓	Disposal of Scrap/Debris etc from site and complete cleaning of working area till handover
3.5.22	Any damages done to the existing system, shall be repaired/ rectified/ replaced	x	✓	
3.5.23	Clearance certificate	x	✓	Clearance Certificate shall be taken from BYPL Departments (Quality, Safety, Protection, O&M, SCADA, EHV, Civil, etc ) before Final Charging of the Systems. Any Site Observations/ Punch points, observed during execution, shall be attended.
3.5.24	External Agency Clearance	x	✓	Statutory fee shall be borne by BYPL
3.5.25	Various compliances pertaining to Job	x	✓	IE rules, CEA Regulation 2010



**SCOPE OF TURNKEY EXECUTION FOR GT ROAD GRID SUBSTATION**
**3.6 DOCUMENTATION**

Document/Drawing submission shall be as per the matrix given below:

- a. All documents/drawings shall be provided in soft copy only.
- b. Language of the documents shall be English only.
- c. Incomplete submission shall be liable for rejection.
- d. Document check sheet compliance shall be the first sheet for each submission stage i.e. Technical bid, Drawing Approval, Pre Dispatch, Pre closure
- e. No submission is acceptable without check list compliance.
- f. Deficient/ improper document/ drawing submission shall be liable for rejection.
- g. Order of documents shall be strictly as per the check list.
- h. Any drawing not included in the below table but necessary for detailed engineering shall be deemed to be included in bidder's scope.

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
3.6.1	Tender No.	Required			
3.6.2	Communication Details				
3.6.2.1	Name of the Bidder	Required			
3.6.2.2	Name of Authorized contact person	Required			
3.6.2.3	Contact No. of Authorized contact person	Required			
3.6.2.4	E-mail id of Authorized contact person	Required			
3.6.3	Document Submission Format				
3.6.3.1	Documents shall be submitted in Box file/spiral binding. Any other format is not acceptable	Required			
3.6.3.2	Index of documents with page numbers for each document	Required			
3.6.3.3	Separator with document description shall be provided before each document	Required			
3.6.4	Qualifying Requirement Compliance				
3.6.4.1	Summary of compliance of qualifying criteria in tabular form along with summary of documentary proof provided	Required			
3.6.4.2	Detailed Documents supporting compliance of qualifying criteria	Required			
3.6.5	Drawings/ Documents as per Technical Specification.				
3.6.5.1	Signed copy of technical	Required			

**SCOPE OF TURNKEY EXECUTION FOR GT ROAD GRID SUBSTATION**

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
	specification				
3.6.5.2	Type Test reports of offered model/ type/ rating	Required	Required		
3.6.5.3	Deviation Sheet	Required	Required		
3.6.5.4	Detailed Drawings	Required	Required		
3.6.5.5	Other drawing/ documents mentioned in technical specification	Required	Required		
3.6.5.6	Soft copy of complete technical bid in pen drive	Required			
3.6.5.7	Samples as per technical specification.	Required			
3.6.5.8	Design Calculation		Required		
3.6.5.9	Manufacturer's quality assurance plan		Required		
3.6.5.10	GTP		Required		
3.6.5.11	Inspection Reports			Required	
3.6.5.12	As manufacturing Drawings			Required	
3.6.5.13	Operation and Maintenance Manual			Required	
3.6.5.14	As built Drawings				Required
3.6.6	Soft Copy				
3.6.6.1	In Pen drive	Required			
3.6.6.2	Through Mail		Required	Required	Required

#### 4 APPROVED MAKE LIST

Following table contains Approved Make List. Although, any make other than specified in table shall be subject to BSES Yamuna Power Limited Approval.

S. No	Equipment	MAKE
4.1.1	33 kV GIS	Schneider/ABB/Siemens
4.1.2	33kV GIS Termination kit	Raychem/3M
4.1.3	Control cable	Universal/KEI/GEMSCAB/Polycab/ Cords Cable
4.1.4	Numerical relays	Siemens (Siprotec series), Siemens (7SR5 Series), Schneider / GE (Micom Series) , Schneider (P5) Series,
4.1.5	Ethernet Switch	Ruggedcom, Hirschman
4.1.6	Grid Energy Meter	Secure/HPL/Schneider (L&T)

**SCOPE OF TURNKEY EXECUTION FOR GT ROAD GRID SUBSTATION**

4.1.7	Fire retardant coating for cables	3M/Demech/Stanvac
4.1.8	SF6 Gas Handling Kit	Dilo/Wika
4.1.9	Floor coating	3M/Demech/Stanvac



## Technical Specification

For

33 kV Gas Insulated Switchgear

Specification no – BSES-TS-65-33GIS-R0

Rev.	0	
Page	1 of 47	
Date	28 Apr 2022	
Prepared by	Abhishek Harsh	<i>Abhishek Harsh</i> 28/4/22
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Approved by	Gaurav Sharma	<i>Gaurav Sharma</i>
	Gopal Nariya	

*for*

*Abhinav Srivastava*

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**1.0 SCOPE**

- a. This specification covers the design, manufacture, testing, supply, erection & commissioning of 33kV, Gas Insulated (GIS), metal-enclosed and factory assembled switchgear.
- b. This specification shall be used in conjunction with all specifications, switchgear data sheets, 33kV switchgear single line diagrams, and other drawings attached to the specification / purchase requisition.

**2.0 CODES & STANDARDS**

Materials, equipment and methods used in the manufacture of switchboards shall conform to the latest edition of following –

2.1	Indian Electricity Rules 1956	Latest edition
2.2	Indian Electricity act 1910	Latest edition
2.3	Switchgear and control gear	IEC : 60694, IEC: 60298, IEC : 62271-200, IEC : 60529, IS: 3427, IS: 12729, IS: 12063, IS: 13947, IS: 9046
2.4	Circuit breaker	IEC 62271 - 100, IS 13118, IS 2516
2.5	Isolators & earthing switches	IEC 62271 - 102
2.6	Current transformers	IS:2705, IEC:60185
2.7	Voltage transformer	IS:3156, IEC:60186,
2.8	Indicating Instruments	IS:1248
2.9	Energy meters	IS 13010
2.10	Relays	IS:8686, IS:3231, IS:3842
2.11	Control switches and push buttons	IS 6875
2.12	HV fuses	IS 9385
2.13	Arrangement of Switchgear bus bars, main connections and auxiliary wiring	IS:375
2.14	Code of practice for phosphating iron & steel	IS 6005
2.15	Colours for ready mixed paints	IS 5
2.16	Code of practice for installation and maintenance of switchgear	IS 3072

**3.0 SERVICE CONDITIONS**

3.1	Location	Indoor
3.2	Average grade atmosphere	Heavily polluted, Dry
3.3	Maximum altitude above sea level	1000M
3.4	Ambient air temperature	Highest 50 <sup>0</sup> C Average 40 <sup>0</sup> C
3.5	Minimum ambient air temperature	0 <sup>0</sup> C
3.6	Relative Humidity	100%
3.7	Rainfall	750mm concentrated in four months
3.8	Seismic Zone	IV

**4.0 ELECTRICAL SYSTEM**

4.1	Type	Switchgear shall be 33kV, 3 phase, 3 wire, 50Hz,
4.2	Earthing type	Solidly Earth
4.3	Fault Current	31.5 kA for 3 sec
4.4	Rating	As per Annexure –B (Technical Particulars) and Annexure-F (SLD)

**5.0 PANEL CONSTRUCTION**

5.1	Structural Requirements	<p>a. Switchgear shall be an indoor gas insulated and metal-clad cubicle design with single/double bus bar system in accordance with tender requirement. Refer technical particulars given in Annexure-B and SLDs given in annexure-F for details.</p> <p>b. Each Panel shall be metal enclosed, free standing, floor mounting, flush fronted and arranged to form a single structure with a common bus bar assembly. Construction, including cable entry, shall be vermin proof.</p>
5.2	Compartments	<p>Switchgear should be completely partitioned from panel to panel. Also, each panel should have separate compartments for the following-</p> <p>a. Busbars b. Circuit breakers c. Incoming/Outgoing power cables d. LV compartment</p>
5.3	High Voltage Compartments for Busbar and CB	<p>a. All high voltage parts (Including bus bars, core module with built in circuit breaker etc.) shall be located in a metal enclosure filled with an insulating inert gas. Gas leakage rate for all gas filled compartments should be less than 0.5 % per annum.</p> <p>b. Bidder shall specify the type, quantity and operating pressure for all gas filled compartments or equipment. Degree of protection for HV compartment should be IP65.</p>
5.3.1	Pressure Indicators	<p>a. A pressure indicator shall be provided for each gas filled compartment and include a set of changeover contacts with two stage alert i.e alarm and lockout.</p> <p>b. Alarm stage shall be set appropriately to alert the operator of the reduction in gas pressure.</p> <p>c. Lockout stage shall be set to avoid any mal-operation in absence of gas pressure.</p>
5.4	HV Cable compartment	<p>a. Each panel shall have an air-insulated cable connection compartment. Cable connection compartment shall contain the cable sockets</p>

**TECHNICAL SPECIFICATION FOR 33KV GAS INSULATED SWITCHGEAR**

		<p>accessible for fitting of the power cable plugs and the test cable sockets.</p> <p>b. Cable compartment shall also include provisions for conventional VT plug in connections. Cable compartment should be IP4X compliant.</p>
5.5	Low voltage compartment	<p>a. It should contain the switch operating mechanisms and all secondary equipment including the protection and control system. All operating mechanisms shall be motorized.</p> <p>b. Manual operation switches and mechanical position indicators shall also be provided. Degree of protection for LV compartment should be IP4X.</p>
5.6	Safety from Internal faults	<p>a. The structure, including doors and panels, shall be capable of withstanding the internal pressures created by faults within the structure (equal to the maximum fault-current rating) without danger to the operating personnel.</p> <p>b. Type test reports regarding internal arc withstand performance shall be available with bids.</p>
5.6.1	Passive Protection from internal faults	<p>a. A passive safety section shall ensure that hot gases shall be guided via pressure relief disks from each compartment.</p> <p>b. The pressure relief duct ends shall be guided to open air or fitted with absorbers to cool the hot gases.</p> <p>c. Relief into a cable basement or cavity below a false floor is not acceptable.</p> <p>d. Hazards to persons or risk of fire shall be reliably prevented. An arcing fault in one compartment should not cause major damage to other compartments.</p> <p>e. Structure shall be provided with barriers to prevent the transfer of ionized gases between two adjacent compartments except bus chamber.</p> <p>f. Separate pressure relief vents shall be provided in bus bar, cable and circuit breaker compartments to release arc fault pressure quickly and safely.</p> <p>g. The orientation of pressure relief vents and gas exhaust ducts as necessary shall be coordinated with BUYER at the bid stage.</p>
5.6.2	Internal arc classification	As per Annexure-B (Technical Particulars)



5.7	Workability	<ul style="list-style-type: none"><li>a. Switchgear shall be designed and constructed to facilitate inspection, cleaning, repair and maintenance and to ensure absolute safety during such work.</li><li>b. Interlocks, busbar shutters and covers shall be provided to prevent incorrect or unsafe operation and to prevent access to live parts.</li><li>c. It shall be possible to work safely within individual panels, such as equipping and commissioning of spare panels as well as connecting main, control and auxiliary cabling, while the remainder of the switchgear is energized.</li></ul>
5.8	Service continuity	<ul style="list-style-type: none"><li>a. Arc faults caused by external reasons shall be positively confined to the originating compartment and shall not spread to other parts of the switchgear.</li><li>b. In case of any internal arc fault in a busbar, busbar disconnecter or circuit breaker, of double bus system, repair works must be possible without shutting down complete substation and at least one busbar and the undisturbed bays must remain in operation.</li><li>c. For Bus Coupler / sectionaliser - In case of any internal arc fault in a busbar, busbar disconnecter or sectionaliser, repair work must be possible without shutting down the complete substation and at least one half of the substation must remain in operation.</li><li>d. To achieve service continuity, gas tight buffers shall be used at suitable place.</li><li>e. Documents indicating sequence of repair work steps and description of necessary restrictions during work shall be submitted with the technical bid. Each bay module should be equipped with suitable arrangement for easy dismantling and refitting during maintenance without disturbing other units.</li></ul>
5.9	Interchange-ability	<ul style="list-style-type: none"><li>a. Similar parts and components shall be interchangeable wherever practical. An interlock system shall be provided to prevent the interchange of modules with higher current rating with modules of lower current rating.</li><li>b. Replacement of circuit breaker module shall be without interfering busbar operation and without gas work.</li></ul>

**TECHNICAL SPECIFICATION FOR 33KV GAS INSULATED SWITCHGEAR**

5.10	Doors and Covers	<p>a. All doors, hinged covers, and hinged panels larger than 0.36 m<sup>2</sup> in area shall open at least 95 degrees and be equipped with doorstops to hold them in the open position. Door swing must allow withdrawable equipment to be withdrawn. All such doors and hinged covers shall be equipped with handles and secured by captive bolts, lockable with a key or pad-lockable.</p> <p>b. Breaker compartment door shall open and close without obstruction with and without rubber mats laid in front of the switchgear. Door of one panel should not cause hindrance for opening of adjacent panel.</p>
5.11	Cover Plates	All cover plates that exceed 0.7 m <sup>2</sup> that require removal for installation or maintenance of the equipment shall be equipped with lifting handles and self-supporting lips. With the exception of the backs of panels cover plates shall not exceed 1.1 m <sup>2</sup> in area or 27 kg in weight, unless they are hinged and bolted or locked. Cover plates shall be secured using captive bolt fixings.
5.12	Test Facilities	<p>Each panel shall be provided with test facilities to allow for:</p> <p>a. Voltage testing of the primary circuit at rated voltage with all parts connected to the facility</p> <p>b. Current testing of primary circuit (primary injection test)</p> <p>c. Protection testing suitable for continuous operation at maximum current</p> <p>d. Access for test devices shall be clearly identified and covers shall be secured using captive fixings that require the use of a tool for access. Provision shall be included to secure the test devices in the test position.</p>
5.13	Panel Dimension	Maximum 2700mm, Operating height maximum 1600mm, Width-600 mm, Depth- 1800 mm
5.14	Extensibility	Switchgear shall be arranged to permit future extension at both ends. Bidder shall confirm the minimum safe operational clearances around the switchgear.
5.15	Panel Base Frame	Steel Base frame as per manufacturer's standard. Bidder shall provide facilities for bolting the switchgear to its foundation. Such facilities shall be suitable for the specified seismic service.
5.16	Non- tiered construction	Incoming and bus-section units shall be located in non-tiered separate panels.

**6.0 CIRCUIT BREAKER & THREE POSITION DISCONNECTOR**

6.1	Circuit Breaker	
6.1.1	Interrupting medium	Vacuum in SF6 filled compartment
6.1.2	Breaker operation	Three separate identical single pole units operated through a common shaft
6.1.3	Operating Mechanism	Re-strike free, Trip free, with electrical anti-pumping feature
6.1.4	Type	Motor wound, spring charged, stored energy type with manual charging facility
6.1.5	Operation on supply failure	One O-C-O operation possible after failure of power supply to the spring charging motor
6.1.6	Shunt Release	For closing and tripping
6.1.7	Number of Trip coils	Two
6.1.8	Push buttons	<ul style="list-style-type: none"> <li>a. Manual / mechanical ON/ OFF / Emergency trip push button</li> <li>b. Emergency Off push button should be provided with a protective flap.</li> <li>c. Mechanical ON shall have padlocking facility</li> <li>d. Labels giving clear instructions for manual operation should be provided wherever appropriate</li> </ul>
6.1.9	Mechanical Indications	<ul style="list-style-type: none"> <li>a. On-Off</li> <li>b. Operation counter</li> <li>c. Mechanism charge/discharge</li> </ul>
6.1.10	Position detection	Through proximity sensors/Aux Switches
6.1.11	Breaker Control	On panel front only
6.1.12	Technical particulars	As per Annexure-B
6.2	Three position disconnecter	
6.2.1	Functions	<p>Three phase, three position suitable for-</p> <ul style="list-style-type: none"> <li>a. Connecting</li> <li>b. Disconnecting</li> <li>c. Earthing</li> </ul>
6.2.2	Type	Motorized with provision for local and remote operation. Operation of earth switch should be through local only. Provision for Manual operation shall also be there.
6.2.3	Position detection	Through proximity sensors/Aux Switches
6.2.4	Mechanical indications	Earthing switch close/open.
6.2.5	Padlocking facility	For locking the earthing device in the open and close position.
6.2.6	Rating	Continuous and Short circuit rating should be same as specified for switchgear.

**7.0 FUNCTIONAL REQUIREMENTS**

7.1	Mechanical and electrical interlock	<ul style="list-style-type: none"> <li>a. To prevent earthing of an incoming supply which has not been isolated</li> <li>b. To prevent switching on an incoming supply which is earthed</li> <li>c. To prevent earthing of feeder circuit when the circuit breaker is in the closed position</li> <li>d. To prevent switching on a circuit breaker when the feeder is earthed</li> </ul>
7.2	Breaker Operation	
7.2.1	Closing from local	Only when local/remote selector switch is in local position
7.2.2	Closing from remote	Only when local/remote selector switch is in remote position
7.2.3	Tripping from local	Only when local/remote selector switch is in local position
7.2.4	Tripping from remote	Only when local/remote selector switch is in remote position
7.2.5	Tripping from protective relays	Irrespective of position of local/remote switch
7.2.6	Trip circuit supervision relay contact	For indication, alarm & to inhibit closing of breaker
7.2.7	Tripping or opening of breaker through relay but not routed through Lockout (Example- SCADA Opening, Under voltage, Overvoltage)	Wired to Contact multiplication Relay and then from CMR to tripping of breaker
7.2.8	Closing of breaker through relay	Wired to Contact multiplication Relay and then from CMR to closing of breaker
7.2.9	Emergency trip push button contact	Wired directly to trip coil (wired to Master trip relay if second trip coil provided)
7.2.10	Emergency trip push button contact	Wired to inhibit closing of breaker
7.2.11	Master trip relay contact (if given)	Wired to inhibit closing of breaker
7.3	DC control supply bus in all panels	Fed by two DC incoming sources in Bus coupler panel with auto changeover facility
7.4	PT supply bus in all panels	Fed normally by bus PT with automatic changeover facility to incomer line PT

**8.0 BUSBARS**

8.1	Material	Hard drawn electrolytic copper
8.2	Cross section	Uniform throughout length of switchgear

8.3	Phase busbars	The phase busbars shall be enclosed in individual or a combined gas filled compartment. Busbars shall be silver or tin-plated at joints. Provision shall be made at the bolted connections to enable accessibility for maintenance and extension where appropriate.
8.4	Marking	All busbars and cable connections shall be marked to indicate the phase colouring, which shall be red, yellow and blue unless otherwise specified or explicitly precluded by relevant national standards.
8.5	Earth busbar	An earth busbar, sized for the earth fault rating of the electrical system and switchgear, shall be provided along the full length of the switchgear structure. The earth busbar shall have provision for earth cable connections at each end.
8.6	Supports	All phase and earth busbars and connections shall be sized, braced and supported to withstand the dynamic, dielectric stresses and thermal affects resulting from the switchgear rated short circuit current over the full length of the switchgear and carry certification from a recognized testing authority.
8.7	Rating	As per Annexure – B (Technical particulars) and Annexure-F (Single line diagram).

**9.0 EARTHING**

9.1	Earthing of enclosure & non-current carrying parts	All metallic non-current carrying parts of the switchgear shall be bonded together and connected to the switchgear earth busbar. The frame of each functional unit and each device requiring earthing shall be connected directly to the earth busbar. For direct connection to the station earthing grid, earthing bolts of at least 10mm shall be provided at both ends of the main earth bar.
9.2	Busbar and Feeder Earthing	Through three position switch
9.3	Circuit breaker frame earthing	Integral earthing shall be provided on feeder/incoming circuit breakers for cable earthing, and on incoming or bus coupler circuit breakers for busbar earthing.
9.4	Earthing of withdrawable parts	Withdrawable parts shall be effectively earthed until they are completely withdrawn with all power and control connections disconnected.
9.5	Cable armour Earthing	Provision shall be made, adjacent to the cable termination, for connecting earthing cable armouring to the earth busbar.
9.6	Hinged doors	Earthed through flexible copper braid

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9.7	Metallic cases of relays, instruments and other LT panel mounted equipment	Connected to the earth bus by independent copper wires of size not less than 2.5 sq. mm with green colour insulation. For this purpose LT compartment should have a clear designated earth bus to which earth connections from all components are to be connected.
9.8	CT and PT neutral	Earthed at one place at the terminal blocks through links.
9.9	Instructions	Clear instructions, preferably pictorial, shall be provided showing methods of earthing wherever appropriate.

**10.0 SURGE SUPPRESSOR**

10.1	Provision	To be provided in all panels except bus coupler and BPT.
10.2	Type	Gapless, metal oxide type
10.3	Technical particulars	As per Annexure –B (Technical particulars)

**11.0 CURRENT TRANSFORMER**

11.1	Type	Solid insulation with class of E or better.
11.2	Location	Shall be located outside the gas compartment. Location shall be suitable for easy access to secondary terminals, testing and replacement.
11.3	Rating plate	Should be located at position so that the details can be easily read.
11.4	Rating	As per Annexure – B (Technical particulars) and Annexure-F (SLD)

**12.0 VOLTAGE TRANSFORMERS**

12.1	Type	Shall be cast resin type with insulation class of E or better.
12.2	Disconnection provision for Both Bus and Line PT	Motorised Disconnecting switch with provision for Manual operation.
12.3	Rating	As per Annexure – B (Technical particulars) and Annexure-F (SLD)

**13.0 CABLE TERMINATION**

13.1	Power Cable termination	
13.1.1	Cable entry	Front / rear entry only. Socket and plug assembly shall be provided for the field power cables. Facilities shall be provided for cable testing including current and voltage injection.

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13.1.2	Bushing Extender	Bushing extender has to be provided for connecting rear cable directly on panel bushing in absence of front cable. This will enable easy energization of panel with rear cable in event the front cable is faulty. Needs to be removed for energizing the panel to bushing incomer panel in absence of front cable.
13.1.3	Cable size and nos. of runs	2 runs x 3C x 400sqmm XLPE insulated stranded aluminium cable
13.1.4	Cable supports	Cable supports shall be provided (where practicable) by bidder to avoid undue strain on the cable termination.
13.1.5	Gland plates	Termination of single core cables shall be through a non-magnetic metal panel or gland plate. Minimum air clearances shall be maintained over and above cable lugs and fixing bolts.
13.1.6	Armour Earthing	Provision should be made for bonding and earthing any armour and/or concentric earth conductors.
13.2	Control Cable termination	
13.2.1	Cable entry	Bottom and front entry
13.2.2	Gland plate	Undrilled 3mm CRCA

**14.0 METERS**

14.1	Mounting	Flush mounted
14.2	Multifunction Meter	
14.2.1	SCADA Interfacing	RS485 rear port suitable for integration on Modbus Protocol
14.2.2	Size	96x96 mm <sup>2</sup>
14.2.3	Panels where to be provided	All panels except Bus PT Panel
14.2.4	Accuracy Class	1
14.2.5	Signal List	R-Ph Current, Y-Ph Current, B-Ph Current, Neutral Current, R-Y Ph Voltage, Y-B Ph Voltage, B-R Ph Voltage, Active Power, Active Energy, Reactive Power, Power Factor, Max Demand, Phase angle 1, Phase angle 2, Phase angle 3, THD Mean Current, THD Mean Voltage
14.2.6	Data Type	MFI
14.2.7	Compatibility with RTU	ABB 560
14.2.8	Programmability	CT secondary shall be programmable i.e for both 1 A and 5 A
14.2.9	Auxiliary Supply	a. 48 – 240VDC and AC i.e universal type. b. Although in Scheme, MFM must be wired up with DC only
14.3	Voltmeter	Digital type with programmable ratio
14.3.1	Size	96x96 mm <sup>2</sup>

14.3.2	Panels where to be provided	Incomer and bus PT panel
14.3.3	Voltmeter switch	Inbuilt in meter
14.3.4	Accuracy Class	1.0
14.4	Energy meter provision	Energy meter is not in supplier's scope. Only space and CT/PT wiring is to be provided in all panels except bus coupler and bus PT. Space for Energy meter shall be 200(w) X 350(h) mm <sup>2</sup>

**15.0 INDICATIONS & ALARMS**

15.1	Indications	Flush mounted, High intensity, clustered LED type
15.1.1	Breaker ON	Red
15.1.2	Breaker Off	Green
15.1.3	Isolator On	Red
15.1.4	Isolator Off	Green
15.1.5	Earth switch On	Red
15.1.6	Earth switch Off	Green
15.1.7	Spring Charged	Blue
15.1.8	DC control supply fail	Amber
15.1.9	AC control supply fail	Amber
15.1.10	Auto trip	Amber
15.1.11	Heater circuit healthy	Yellow (Indication with integrated push button for checking)
15.1.12	Trip circuit healthy	White
15.1.13	PT supply as applicable	R, Y B
15.2	Alarm scheme with isolation switch	a. For DC fail, TC fail and CB auto trip b. For all signals wired to annunciator in 33kV panels

**16.0 SELECTOR SWITCHES & PUSH BUTTONS**

16.1	Selector switches	Flush mounted on LV compartment door, with shrouded terminals
16.1.1	TNC switch with pistol grip	Lockable, spring return to normal position for CB, Isolator and earth switch control
16.1.2	Local / SCADA selector switch	2 pole Lockable Switch
16.1.3	Rotary ON/OFF switches	For heater / illumination circuit
16.1.4	Rating	16 A



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16.2	Push Button	Flush mounted on LV compartment door, with shrouded terminals
16.2.1	Emergency trip push button	Red color with stay put
16.2.2	Accept push buttons	Black color – Trip alarm / DC fail alarm
16.2.3	Reset push buttons	Yellow color – Trip alarm / DC fail alarm
16.2.4	Rating	10 A

**17.0 INTERNAL WIRING**

17.1	Grade and type	1100 V, PVC insulated, FRLS type stranded flexible copper wire.
17.2	Size	2.5 sq mm for CT circuit, 1.5 sq mm for PT & control circuits
17.3	Colour code	
17.3.1	CT & PT	R Ph – Red Y Ph – Yellow B Ph – Blue Neutral – Black
17.3.2	Others	DC– grey, AC-black, Earth – green
17.4	Ferrules	At both ends of wire
17.5	Ferrule type	Interlocked type (one additional red colour ferrule for all wires in trip circuit)
17.6	Lugs	Tinned copper, pre-insulated, ring type, fork type and pin type as applicable. CT circuits should use ring type lugs only.
17.7	Spare contacts	Spare contacts of relays and contactors etc. should be wired upto the terminal block.
17.8	Panel wiring	Panel wiring shall be on one side of the terminal block only. No more than two wires shall be connected to a terminal.
17.9	Inter-panel wiring	Inter-panel wiring for AC and DC supplies, voltage transformer circuits, annunciation circuits and other common services shall be provided on the same set of terminals in all the panels with proper segregation. Wires with ferrule to be terminated in the adjacent shipping section should be supplied with one end terminated and the other end bunched and coiled.
17.10	Wiring enclosure	Plastic channels for panel wiring, PVC sleeves for Inter panel wiring. Where wiring enters or passes through compartments containing high voltage apparatus, it shall be run in earthed continuous metallic conduit/trunking without gaps, holes or joints.

**18.0 TERMINAL BLOCKS**

18.1	Rating and Type	1100 V grade, moulded piece, stud type screw driver operated terminals complete with insulated barriers, washers, nuts and lock nuts.
18.2	Suitability	For termination of minimum 6sqmm flexible copper conductor.
18.3	Marking and covers	White fibre markings strip with clear plastic, slip-on / clip-on terminal covers to be provided.
18.4	Disconnecting Facility	To be provided in CT and PT terminals
18.5	Shorting & Earthing Facility	To be provided in CT Terminals
18.6	Spare Terminals	20% in each TB row
18.7	TB shrouds & separators	Moulded non- inflammable plastic material
18.8	Clearance between 2 sets of TB	100 mm min
18.9	Clearance with cable gland plate	250 mm min
18.10	Clearance between AC / DC set of TB	100 mm min
18.11	Test terminal blocks	Screw driver operated stud type for metering circuit

**19.0 PROTECTION AND CONTROL**

19.1	Protection Relays – General Features	
19.1.1	Technology and Functionality	Numerical , microprocessor based with provision for multifunction protection, control, metering and monitoring
19.1.2	Mounting	Flush Mounting, IP5X
19.1.3	Architecture	Hardware and software architecture shall be modular and disconnectable to adapt the protection and control unit to the required level of complexity as per the application.
19.1.4	Programming and configuration	Relay shall utilize a user friendly setting and operating multi-lingual software in windows environment with menus and icons for fast access to the data required. Programming software and communication cord for offered relays should be included in scope of supply.
19.1.5	Conformal Coating	a. Required on all cards and Components to protect against moisture, dust, chemicals, temperature extremes etc b. Testing shall be as per IEC 60068-2-60
19.1.6	Communication module	Communication Card of Relay shall have galvanic Isolation from all other cards to prevent damage during power system transients/Faults

19.1.7	SCADA Interface port	LC Type Dual fibre optic port for interfacing with SCADA on IEC 61850 with PRP compatible. Through these ports relays shall be connected to Ethernet switches.
19.1.8	Indications Processing	SCADA functions for monitoring shall be executed on SPI (Single Point Input) and DPI (Double Point Input). DPI shall only be used in case of Isolator and Circuit breaker "close" and "open" indication.
19.1.9	Command Processing	Functionality of command processing offered for SCADA interface shall include the processing of single and double commands i.e SCO (Single Command Output) and DCO (Double object command Output). DCO shall only be used in case of Isolator and Circuit Breaker close" and "open" command.
19.1.10	GOOSE messaging	Relays shall communicate all status signals, commands and events on GOOSE messaging.
19.1.11	PC Interface port	Front port (preferably serial) for configuration/data download using PC. Licensed software and communication cord, required for programming of offered protection relays shall be provided with the switchgear.
19.1.12	User Interface	An alphanumeric key pad and graphical LCD display with backlight indicating measurement values and operating messages. It should be possible to access and change all settings and parameters without the use of PC.
19.1.13	SCADA Interface	Relay shall communicate all measured & monitored parameters, analog signals, event record, fault record, DIs , DOs etc to SCADA
19.1.14	Relay Characteristics	Relay shall integrate all necessary protections for different applications in accordance with IS and IEC. Relay shall provide wide setting ranges and choice of all IEC, IEEE and other tripping curves through a minimum of two setting groups.
19.1.15	Event and Fault records	Relay shall have the facility of recording of various parameters during event/fault with option to set the duration of record through settable pre fault and post fault time. Relay shall store records for last 10 events and 10 faults (minimum). It should be possible to download and access all records locally from PC and remotely from SCADA.
19.1.16	Self diagnosis	Relay shall be able to detect internal failures. A

		watchdog relay with changeover contact shall provide information about the failure.
19.1.17	Time synchronization	All relays shall be capable of being synchronized with the system clock using SCADA interface and PC.
19.1.18	Operation Indicators	LEDs with push button for resetting.
19.1.19	Test Facility	Inbuilt with necessary test plugs.
19.1.20	Auxiliary supply	50/220 VDC. Relays should be suitable for continuous operation at 15% overvoltage
19.2	Protection Relays for 33KV Incomer	
19.2.1	Relay 1	Line differential protection (Dual channel, Compatible for Single Mode Fibre having wavelength 1310 nm) Distance protection Power swing blocking Software based CT ratio correction Dual Channel ST port for communication with remote end relay through optical fibre. This port should be in addition to PC interface and SCADA interface ports.
	Selection of Relay 1	Selection of Relay-1 (primary protection) will depend on site requirements. In case of Line differential as primary protection, Relays at both ends shall be provided.
19.2.2	Relay 2	Bay control unit having MIMIC with 3-phase Directional Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Trip Circuit Supervision
		Sync check function
		Circuit Breaker failure protection
		Reverse blocking function
		Under Frequency, Over Frequency and Rate of Change of frequency
		PT supervision
Relay shall communicate all measured and monitored parameters like current, voltage, active power, reactive power, apparent power, power factor, phase angle, event record, fault record, DIs , DOs etc to SCADA		
19.2.3	DIs and DOs	<p>a. Relay-1 should have DIs and DOs as per scheme requirement. Same shall be finalized during detailed engineering. 2 DIs and 2 DO shall be spare for future use.</p> <p>b. Relay-2 should have minimum of 32 DIs and 16 DOs exclusively for SCADA interfacing. DIs and DOs for tripping and interlocking shall be additional as per scheme requirement. If DIs and DOs for tripping and interlocking are integrated with DIs and DOs meant for SCADA (may be done to optimize DI/DO configuration), atleast 4 DIs and 4 DOs should be spare for future use.</p>

19.2.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
19.2.5	SLD	Refer annexure – F1/F5
19.3	Protection Relays for 33KV Transformer Feeder Panel	
19.3.1	Relay 1	Biased differential protection
		REF protection
		Software based ratio and vector correction feature (without ICT)
		H2 and H5 harmonic restraint
19.3.2	Relay 2	Bay control unit having MIMIC with 3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Trip Circuit Supervision
		Reverse blocking function
		Under Frequency, Over Frequency and Rate of Change of frequency
		Circuit Breaker failure protection
		Relay shall communicate all measured and monitored parameters like current, voltage, active power, reactive power, apparent power, power factor, phase angle, event record, fault record, DIs , DOs etc to SCADA
19.3.3	DIs and DOs	<p>a. Relay-1 should have DIs and DOs as per scheme requirement. Same shall be finalized during detailed engineering. 2 DIs and 2 DO shall be spare for future use.</p> <p>b. Relay-2 should have minimum of 32 DIs and 16 DOs exclusively for SCADA interfacing. DIs and DOs for tripping and interlocking shall be additional as per scheme requirement. If DIs and DOs for tripping and interlocking are integrated with DIs and DOs meant for SCADA (may be done to optimize DI/DO configuration), atleast 4 DIs and 4 DOs should be spare for future use.</p>
19.3.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
19.3.5	SLD	Refer annexure – F2/F6
19.4	Protection Relays for 33KV Bus-coupler/Bus-sectionalizer Panel	
19.4.1	Relay 1	Bay control unit having MIMIC with 3-phase Overcurrent and earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Trip Circuit Supervision
		Sync check function
		Reverse blocking function
		Circuit Breaker failure protection
		Under Frequency, Over Frequency and Rate of Change of frequency
		PT supervision (fuse failure monitoring) for Bus PT-1

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		<p>Relay should have a total of 40 DIs and 20 DOs exclusively for SCADA interfacing. DIs and DOs for tripping and interlocking shall be additional as per scheme requirement. If DIs and DOs for tripping and interlocking are integrated with DIs and DOs meant for SCADA (may be done to optimize DI/DO configuration), atleast 4 DIs and 4 Dos should be spare for future use.</p> <p>Relay shall communicate all measured and monitored parameters like current, voltage, active power, reactive power, apparent power, power factor, phase angle, event record, fault record, DIs , DOs etc to SCADA</p>
19.4.2	Relay 2	PT supervision (fuse failure monitoring) for Bus PT-2
19.4.3	SLD	Refer annexure – F3/F4
19.4.4	Note	One Bus PT should be provided for each bus section
19.5	Protection Relays – SCADA Interfacing Philosophy for all panels	
19.5.1	Configuration and wiring of DIs in Protection Relays for routing status and alarm signals to SCADA through SCADA interface port	<p>DI-1 – TC-1 Healthy  DI-2 – TC-2 Healthy  DI-3 – CB Autotrip (contact from lockout relay)  DI-4 – CB Open  DI-5 – CB Close  DI-6 – Spring Charged  DI-7 – L/R switch in Remote  DI-8 – L/R switch in Local  DI-9 - DC fail  DI-10 - AC Fail  DI-11 – Gas pressure low in CB Compartment  DI-12 –Gas pressure low in busbar compartment  DI-13 – PT MCB trip (metering and protection, for incomer and bus coupler panel only)  DI-14 – Isolator-1 Open  DI-15 – Isolator-1 Close  DI-16 – Earth Switch-1 Open  DI-17 – Earth Switch-1 Close  DI-18 – Isolator-2 Open  DI-19 – Isolator -2 Close  DI-20 – Earth switch -2 Open(bus coupler panel only)  DI-21 – Earth switch -2 Close(bus coupler panel only)  Sequence of DIs should be strictly as mentioned above.</p>
19.5.2	Configuration and wiring of DOs in Protection relays for execution of SCADA commands through SCADA interface port	DOs should be wired for operation of CB and three position disconnectors. Sequence of DO assignment should be same in all panels.
19.5.3	Looping of protection relays	All relays in the switchboard have to be looped to form a common bus for interfacing with SCADA.

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19.5.4	Spare DIs and DOs	Should be wired upto terminal block for future use.
19.6	Transformer Monitoring cum AVR Relay	
19.6.1	Features	As per annexure –A
19.6.2	Requirement	To be provided in 33KV Transformer feeder panel
19.7	Auxiliary Relays – General Features	
19.7.1	Relays for auxiliary, supervision, trip and timer relays	Static or electromechanical type.
19.7.2	Reset mechanism for auxiliary relays	Self reset contacts except for lock-out relays.
19.7.3	Reset mechanism for lockout relays	Hand reset type.
19.7.4	Operation indicators	With hand-reset operation indicators (flags) or LEDs with pushbuttons for resetting.
19.7.5	Auxiliary supply	50/220VDC. Relays should be suitable for continuous operation at 15% overvoltage
19.8	Auxiliary relays – Requirement	
19.8.1	Anti pumping (94), lockout (86) relays	For each breaker
19.8.2	PT selection relays	To be provided for selection between Bus PT and Line PT of respective sections.
19.8.3	Switchgear with two incomer & bus coupler	Lockout relay (86) contact of each incoming breakers to be wired in series in closing circuit of other incoming breakers & bus coupler.
19.8.4	Contact Multiplication Relay for Tripping and closing of Breaker	<ul style="list-style-type: none"> <li>a. One for Tripping and one for closing with each breaker</li> <li>b. Current Rating shall be 30 percent more than closing and tripping coil current rating</li> <li>c. Shall be of closed type i.e. direct unauthorised access shall not be provided.</li> </ul>
19.8.5	Auxiliary Relays, contact multiplication relays etc.	To effect interlocks and to exchange signals of status & control
19.8.6	Transformer trouble relays (For Transformer feeder panel only)	<p>Auxiliary relays with indicating flags should be provided for the following trip and alarm commands –</p> <ul style="list-style-type: none"> <li>a. Buchholz trip</li> <li>b. OSR trip</li> <li>c. PRV trip</li> <li>d. SPR trip</li> <li>e. WTI Trip</li> <li>f. OTI Trip</li> <li>g. Buchholz Alarm</li> <li>h. Low oil level alarm</li> <li>i. OTI Alarm</li> <li>j. WTI Alarm.</li> </ul>
19.9	MCBs	
19.9.1	Incoming auxiliary supplies	Shall be protected by MCB at the point of entry to the switchboard

19.9.2	Panel auxiliary supplies	<p>a. All auxiliary supplies (DC, AC, PT supply etc.) shall be protected by MCB of appropriate rating.</p> <p>b. Separate MCBs shall be provided for control, indication and protection circuits of each breaker. For shunt trip circuits the protection shall be rated atleast 300 % of the load.</p>
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**20.0 ETHERNET SWITCHES & FIBRE OPTICS**

20.1	Ethernet Switch	
20.1.1	Numbers	Two at each site
20.1.2	FO Port	16 Nos
20.1.3	RJ 45 Port	4 Nos
20.1.4	Communication Protocol	IEC 61850
20.1.5	Network Protocol	PRP
20.1.6	Downlink Rate	100 MBPS
20.1.7	Uplink Rate	1 GBPS
20.1.8	Coating	Conformal
20.1.9	Power Supply Voltage	220 / 50 VDC as per site condition
20.1.10	Grade	Industrial
20.1.11	Certification required	KEMA,CE & FCC for IEC 61850 compliance
20.1.12	Operating Temperature	
20.1.13	Mounting	In Switchgear Panel
20.1.14	Blinking LED Indicators	On each RJ45 ports
20.1.15	Separate Maintenance/console Part	Required
20.1.16	Latency	Less than or equal to 10 ms
20.1.17	Fibre Optic Compatibility	Multimode, 1310 nm
20.1.18	Placement	Din Rail Arrangement inside Switchgear
20.2	Fibre Optics (Patch Cord) and Ethernet cable	
20.2.1	Connection	From Relays, Meters to Ethernet Switch
20.2.2	Mode of Fibre Optics	Multimode
20.2.3	Wavelength	1310 nm
20.2.4	Ethernet Cable Type	CAT VI
20.2.5	Associated Connectors and Accessories	Required

**21.0 SPACE HEATERS, SOCKETS & ILLUMINATION LAMPS**

21.1	Space Heaters	
21.1.1	Type	Thermostat controlled with switch for isolation



21.1.2	Location	In Breaker & HV cable compartment, mounted on an insulator. Heater position in cable compartment should be easily accessible after cable termination.
21.2	Illumination lamp with switch	For LV & cable chamber
21.3	Universal type (5/15 A) Socket with Switch	In LV chamber

**22.0 NAMEPLATES AND MARKING**

22.1	Nameplates	To be provided as per the following description
22.1.1	Equipment Nameplates	<p>a. All equipment mounted on front as well as inside the panels shall be provided with individual name plates with equipment designation/description engraved.</p> <p>b. All front mounted equipment shall be also provided at the rear with individual name plates engraved with tag numbers corresponding to the one shown in the panel internal wiring to facilitate easy tracing of the wiring.</p>
22.1.2	Feeder Nameplates	Large and bold name plate carrying feeder identification/ feeder number shall be provided on the top of each panel on front as well as rear side. On rear side, nameplate should be provided on frame.
22.1.3	Panel Rating Plate	<p>Following details are to be provided on Panel rating plate:</p> <p>a. Manufacturers name or trade mark</p> <p>b. Switchgear designation</p> <p>c. Rated system voltage, phases, wires and frequency</p> <p>d. Rated fault current</p> <p>e. Busbar rating</p> <p>f. Insulation Gas Type and rated filling pressure for insulation</p> <p>g. Alarm pressure for insulation</p> <p>h. Minimum functional pressure for insulation</p> <p>i. Minimum functional pressure for operation</p> <p>j. Design pressure of gas filled compartment</p> <p>k. Year of manufacture</p> <p>l. Warranty Period</p> <p>m. Purchasers name</p> <p>n. Serial no</p> <p>o. Customer – BSES</p> <p>p. PO No. &amp; Date – As per respective PO.</p> <p>q. CT rating details</p> <p>r. PT rating details</p>
22.1.4	CB Rating Plate	<p>a. Type / Model No.</p> <p>b. Month /Year of Manufacturing</p>

		c. Current and voltage rating. d. Rated fault making and breaking current.
22.1.5	Material	Non-rusting metal or 3 ply lamicaid. Nameplates shall be black with white engraved lettering. Stickers are not allowed.
22.1.6	Fixing of rating plates and external nameplates	Shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.
22.1.7	Fixing of internal nameplates	Internal labels may make use of a durable proprietary labeling system unless specifically indicated otherwise.
22.2	Markings	Each switch shall bear clear inscription identifying its function. Similar inscription shall also be provided on each device whose function is not otherwise identified. If any switch or device does not bear this inscription separate nameplate giving its function shall be provided for it. Switch shall also have clear inscription for each position indicating e.g. Trip-Neutral close, ON-OFF etc.

**23.0 FINISH**

23.1	Finish	The colour and finish may be in accordance with the Manufacturer standards for the service conditions specified, subject to BUYER's approval. The switchgear shall be fully tropicalized.
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**24.0 APPROVED MAKES OF COMPONENTS**

24.1	Numerical Relays	Siprotec series of Siemens, Micom series of Schneider/Alstom. Numerical relays used in complete switchboard should be of same make. Use of two different makes of relays in a switchboard is not acceptable.
24.2	Transformer monitoring cum AVR relay	A-eberle
24.3	Electromechanical Relays	Alstom/Schneider/Siemens/ABB
24.4	Contact Multiplication Relays	Alstom/Schneider/Siemens/ABB
24.5	Contactors	ABB/Siemens/Schneider/ Telemechanique
24.6	MCBs	Siemens/Schneider/Legrand/ABB
24.7	Control switches	Switron/Kaycee
24.8	Test terminal blocks	IMP/Schneider/Alstom
24.9	Terminal blocks	Elmex/Connectwell
24.10	Indicating lamps	Siemens/Teknic/ Binay
24.11	Surge Suppressors	Oblum/Tyco/NKT/Nexans
24.12	Cable termination	Pfisterer/Sudkabel/ NKT/ Euromold

<b>BSES</b>	<b>BSES-TS-65-33GIS-R0</b>
<b>TECHNICAL SPECIFICATION FOR 33KV GAS INSULATED SWITCHGEAR</b>	

24.13	Multifunction Meter	Rishabh
24.14	Ethernet Switches	Ruggedcom/Hirschmann

## 25.0 INSPECTION AND TESTING

25.1	Type Tests	The product must be of type tested quality as per applicable Indian standards / IEC
25.2	Type test report validity period	Last five years from date of bid submission. Bidder with type test report more than 5 years old needs to re-conduct the tests without any commercial implication to BSES
25.3	Pressure relief device operation	Test certificate for panel to be submitted
25.4	Acceptance & Routine tests	To be done as per this specification and relevant standards. Charges for all these tests shall be deemed to be included in the equipment price. In addition to these tests, following tests have to be carried out as acceptance tests -
25.5	Primary injection test	To be carried out on panels selected for testing
25.6	Temperature rise test	One panel per Purchase order (PO with minimum 10 panels) without any commercial implication to BSES. In-house testing is acceptable.
25.7	Paint Thickness/ Peel off	To be carried out on panels selected for testing
25.8	Inspection	The purchaser/owner reserves the right to witness all the acceptance/routine tests during inspection.
25.9	Notice to purchaser for conducting type tests	At least three weeks in advance
25.10	Test reports before dispatch for approval	Six (6) copies of acceptance and routine test reports
25.11	Vendor quality plan	To be submitted for purchaser approval
25.12	Inspection points	To be mutually identified & agreed in quality plan

## 26.0 PACKING

26.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, panels may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
26.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification

**TECHNICAL SPECIFICATION FOR 33KV GAS INSULATED SWITCHGEAR**

26.3	Details of Packing Identification Label on each packing case	<ul style="list-style-type: none"> <li>a. Individual serial number</li> <li>b. Purchaser's name</li> <li>c. PO number (along with SAP item code, if any) &amp; date</li> <li>d. Equipment Tag no. (if any)</li> <li>e. Destination</li> <li>f. Project Details</li> <li>g. Manufacturer / Supplier's name</li> <li>h. Address of Manufacturer / Supplier / it's agent</li> <li>i. Description and Quantity</li> <li>j. Country of origin</li> <li>k. Month &amp; year of Manufacturing</li> <li>l. Case measurements</li> <li>m. Gross and net weights in kilograms</li> <li>n. All necessary slinging and stacking instructions</li> </ul>
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**27.0 SHIPPING**

27.1	Shipping	<p>The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, Overhead lines, free access etc. from the Manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed Packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.</p> <p>The Bidder shall be responsible for all transit damage due to improper packing.</p>
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**28.0 HANDLING AND STORAGE**

28.1	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.
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**29.0 DEVIATION**

29.1	Deviation	Deviations from this Specification shall be provided in excel sheet with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.
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**30.0 ACCESSORIES & SPARES**

30.1	Accessories	Should be supplied alongwith the switchgear in accordance with annexure-C
30.2	Spares	Should be supplied alongwith the switchgear in accordance with annexure- D

**31.0 DRAWINGS & DATA SUBMISSION MATRIX**

Document/Drawing submission shall be as per the matrix given below:

- All documents/drawings shall be provided in soft copy only in returnable Pen drives
- Language of the documents shall be English only.
- Incomplete submission shall be liable for rejection.
- Document check sheet compliance shall be the first sheet for each submission stage i.e. Technical bid, Drawing Approval, Pre Dispatch, Pre closure
- No submission is acceptable without check list compliance.
- Deficient/ improper document/ drawing submission shall be liable for rejection.
- Order of documents shall be strictly as per the check list.
- Any drawing not included in the below table but necessary for detailed engineering shall be deemed to be included in bidder's scope.

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
31.1	Contact Person Name, Email ID and Mobile Number	Required	Required		
31.2	Consolidated Deviation Sheet	Required	Required		
31.3	GTP	Required	Required		
31.4	Relevant Type Test as per IS/IEC (including internal arc withstand performance)	Required			
31.5	Power Cable and control cable Philosophy and Schedule		Required		
31.6	Manufacturer's quality assurance plan and certification for quality standards		Required		
31.7	Sizing Calculation of Associated Equipment		Required		
31.8	Recommended Spares Apart from spares stated in Spec(for five years of operation)		Required		
31.9	<b>33 kV Switchgear drawing</b>				

31.9.1	General Arrangement	Required	Required		
31.9.2	Sectional Layout				
31.9.3	Door Layout		Required		
31.9.4	LV Box Internal Layout		Required		
31.9.5	Gas Pressure Diagram		Required		
31.9.6	SLD	Required	Required		
31.9.7	Gas SLD	Required	Required		
31.9.8	Schematic Circuit diagram and Scheme of Each type of Panel		Required		
31.9.9	Communication Architecture		Required		
31.9.10	Bus Bar Arrangement		Required		
31.9.11	QAP		Required		
31.9.12	Panel wise BOQ		Required		
31.9.13	Logic Operation Diagram		Required		
31.9.14	Plan		Required		
31.9.15	Synch Logic Diagram		Required		
31.9.16	Foundation Diagram		Required		
31.9.17	DI sheet		Required		
31.9.18	DO Sheet		Required		
31.9.19	TB Details		Required		
31.9.20	Make of all Component as per specification		Required		
31.10	Drawing of Substation Room		Required		
31.11	Ventilation detail requirement of GIS Room		Required		
31.12	Installation, erection and commissioning manual for switchgear		Required		
31.13	Inspection Reports			Required	
31.14	As manufacturing Drawings			Required	
31.15	Operation and Maintenance Manual			Required	
31.16	Trouble shooting manual			Required	
31.17	As built Drawings				Required
31.18	Test Report				Required

**ANNEXURE – A – TRANSFORMER MONITORING CUM AVR RELAY**

1	General features	
1.1	Technology and Functionality	Microprocessor based with provision for multifunction control and monitoring.
1.2	Mounting	Flush Mounting
1.3	Conformal Coating	a. Required on all cards and Components to protect against moisture, dust, chemicals, temperature extremes etc b. Testing shall be as per IEC 60068-2-60
1.4	Architecture	Hardware and software architecture shall be modular and disconnectable to adapt the control unit to the required level of complexity as per the application.
1.5	Programming and configuration	AVR shall utilize a user friendly setting and operating multi-lingual software in windows environment with menus and icons for fast access to the data required.
1.6	User Machine Interface	UMI with an alphanumeric key pad and graphical LCD display with backlight indicating measurement values and operating messages. Capability to access and change all settings and parameters.
1.7	PC Interface port	Front port (preferably serial) for configuration using PC. Cost of licensed software and communication cord, required for programming of offered protection relays using PC, shall be mentioned separately in the bid.
1.8	SCADA Interface port	LC Type Dual fibre optic port for interfacing with SCADA on IEC 61850 with PRP compatibility. Through these ports relays shall be connected to switches. Ethernet switches at switchgear end shall be suitably mounted in an auxiliary compartment in switchgear panel.
1.9	Self diagnosis	Shall be able to detect internal failures. A watchdog relay with changeover contact shall provide information about the failure.
1.10	Cable Termination	Termination of cable shall be at rear side.
1.11	Auxiliary supply	220VDC or 48VDC
2	Inputs and Outputs	
2.1	CT Input	1/5A selectable through programming
2.2	PT Input	110VAC
2.3	Binary Inputs	Sixteen programmable binary inputs should be provided
2.4	Analog Inputs (4-20mA)	One input to be provided
2.5	PT-100 direct input	Two inputs to be provided
2.6	Direct Resistance Input	For tap position indication (18 steps)

**TECHNICAL SPECIFICATION FOR 33KV GAS INSULATED SWITCHGEAR**

2.7	Binary Outputs	Ten programmable binary outputs should be provided
3	Control	
3.1	Control Tasks	Ability to implement control functions through programmable logics
3.2	Voltage setting	Programmable Voltage set point
3.3	Voltage Regulation	Raise/Lower tap position to maintain the preset value of voltage.
3.4	Voltage Regulation modes	Automatic and Manual
3.5	Operation Modes	Local and Remote
3.6	Fan and Pump control	To be provided
3.7	Transformer Paralleling	Capability to parallel transformers whose AVR's are interconnected via a communication network.
4	SCADA Interfacing	
4.1	Configuration of DIs for routing alarm/trip signals to SCADA.	DI-1 – Buchholz trip DI-2 – OSR Trip DI-3 – PRV trip DI-4 – SPR trip DI-5 – OTI trip DI-6 – WTI trip DI-7 – Buchholz alarm DI-8 – Oil Level low larm (MOG alarm) DI-9 – WTI alarm DI-10 – OTI alarm DI-11 – Tap changer trouble/stuck/out of step DI-12 – Tap changer motor supply fail DI-13 – Tap changer in local control All signals from DI-1 to DI-10 are to be wired up from transformer trouble auxiliary relays.
4.2	Configuration of Dos for executing commands from SCADA through interface port/CRP	DO-1 – Tap raise DO-2 – Tap lower DO-3 – Fan group 1 control DO-4 – Fan group 2 control
4.3	Spare Dis and Dos	To be wired upto the terminal block.
5	Measurement, Event Recording and Monitoring	
5.1	Measured Quantities (optional)	Voltage, Current, Active Power, Reactive Power, Apparent Power, Power factor, frequency
5.2	Event Recording	Facility for recording parameters during various events such as tap change, change in binary input status etc.
5.3	Monitoring	Capability to monitor important transformer parameters such as Oil temperature, Winding Temperature etc and give indication/alarm when the value of a particular parameter exceeds the preset value.



**ANNEXURE – B – TECHNICAL PARTICULARS (DATA BY PURCHASER)**

<b>1.0</b>	<b>SWITCHGEAR</b>		
1.1	Type	Metal clad, SF6 gas insulated with VCB type circuit breaker	
1.2	Service	Indoor	
1.3	Mounting	Free standing, floor mounted	
1.4	System Voltage	33kV	
1.5	Voltage variation	+/- 10%	
1.6	Frequency	50 Hz +/- 5%	
1.7	Phase	3	
1.8	Rated voltage	36 kV	
1.9	Rated current	As per Single line diagram	
1.10	Short time rating for 3 sec.	25kA	
1.11	Internal arc classification and rating		
1.11.1	Classification	IAC – A – FLR	
1.11.2	Rating	25kA for 1 second.	
1.12	Insulation level (PF rms / Impulse peak)	70 kV/ 170 kV	
1.13	System ground	Effectively earthed	Effectively earthed
1.14	Enclosure degree of protection	IP – 65 for gas filled compartments IP – 4X for Cable and LV compartment	
1.15	Bus bar – Main	Rating as per SLD, Short time rating as per clause 1.10.	
1.15.1	Material	Copper	
1.15.2	Bus bar joint plating	As per manufacturer's standard. Tape on joints is not acceptable.	
1.15.3	Bus identification	Colour coded	
1.15.4	Temperature rise	40 deg. C for conventional joints. 55 deg. C for silver plated joints	
1.16	Auxiliary bus bar	Electrolytic grade tinned copper	
1.17	Auxiliary DC Supply	220 V DC / 50 V DC	
1.18	Auxiliary AC supply	240 V AC 50 Hz	
1.19	Hardware	Stainless steel.	
1.20	Earth bus	Aluminium	
1.21	Power cable entry	From bottom and rear	
1.22	Control cable entry	From bottom and front (i.e breaker compartment)	
1.23	Gas leakage rate	Less than 0.5% per annum	
<b>2.0</b>	<b>CIRCUIT BREAKER</b>		
2.1	Voltage class, insulation level, short time rating	As specified for switchgear	
2.2	Rated current	As per SLD.	

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2.3	Duty cycle	O – 0.3 sec – CO – 3min – CO
2.4	Short circuit rating	
2.4.1	A.C sym. Breaking current	25kA
2.4.2	Short circuit making current	62.5kA
2.5	Operation time	
2.5.1	Break time	Not more than 4 cycles
2.5.2	Make time	Not more than 5 cycles
2.6	Range of Auxiliary Voltage	
2.6.1	Closing	85% - 110%
2.6.2	Tripping	70% - 110%
2.6.3	Spring Charging	85% - 110%
2.7	No. of spare aux. Contacts of Breaker, for Owner's use.	Minimum 4 NO + 4 NC
2.8	Nos. of spare auxiliary contacts of disconnecter	Minimum 2 NO + 2 NC
2.9	Nos. of spare auxiliary contacts of earth switch	Minimum 2 NO + 2 NC
<b>3.0</b>	<b>CURRENT TRANSFORMERS</b>	
3.1	Voltage class, insulation level and short time rating	As specified for switchgear
3.2	Type	Solid Insulation
3.3	Class of insulation	Class E or better
3.4	Ratio	As per SLD
3.5	Number of secondaries	As per SLD
3.6	Accuracy class	
3.6.1	Protection core	5P20
3.6.2	Protection (Diff. / REF)	PS
3.6.3	Metering	0.2s
3.7	Burden (VA)	Adequate for the protection & instruments offered i.e atleast 1.5 times the connected burden.
3.8	Excitation current of PS Class CTs	30 mA at $V_k/4$
<b>4.0</b>	<b>VOLTAGE TRANSFORMERS</b>	
4.1	Type	Cast resin, single phase unit
4.2	Rated Voltage	
4.2.1	Primary	33000/sq.rt.3
4.2.2	Secondary	110V/sq.rt.3
4.3	No. of phases	3
4.4	No. of secondary windings	2
4.5	Method of connection	Star/Star

4.6	Rated voltage factor	1.2 continuous, 1.9 for 30 seconds
4.7	Class of insulation	Class E or better
4.8	Accuracy class	
4.8.1	Protection	3P
4.8.2	Metering	0.2
<b>5.0</b>	<b>SURGE ARRESTORS</b>	
5.1	Rated Voltage	30kV
5.2	Maximum continuous operating voltage (MCOV)	25kV
5.3	Discharge current	10kA
5.4	Discharge class	3

**ANNEXURE – C – MANDATORY ACCESSORIES FOR EACH SWITCHBOARD SET**

<b>S No.</b>	<b>Description</b>	<b>Qty</b>
1	Current test plug/ adapter	2
2	Voltage test plug/ adapter	2
3	Operating Handles	2 sets
4	Adaptor Plug (For Testing of Cable)	2 sets
5	Bushing Extender	2 sets
6	Gas leak detector – DILO make	1
7	Cable dummy plugs (if required, depending on type of cable termination)	2 sets
8	Special tools and tackles required for erection, testing, commissioning and maintenance of the switchboard should be supplied with the switchboard.	1 set
9	Other accessories required for trouble free operation of switchgear as per manufacturer recommendation.	1 set

**ANNEXURE – D – SPARES REQUIREMENT**

<b>S No.</b>	<b>Description</b>	<b>Qty</b>
1	Numerical relay of each type	1
2	Auxiliary Relay of each type	5
3	Contactors of each type	5
4	Contact Multiplication Relay of each type	5
5	Line voltage transformer	3 (1 set)
6	Bus voltage transformer	3 (1 set)
7	GIS End Termination Kit	2
8	Ethernet Switch	1 No (Each Site)
9	Optical Fibre	20% of Supplied Items
10	CAT VI Ethernet cable for Communication	20% of Supplied Items
11	Current transformers suitable for incomer panel	3 (1 set)
12	Current transformers suitable for transformer panel	3 (1 set)
13	Current transformers suitable for bus coupler panel	3 (1 set)
14	Trip Coil	4
15	Closing Coil	4
16	CB Spring charging motor	2
17	Auxiliary switch	2 sets (2 Nos. each type)
18	Disconnecter motor for isolator	1
19	Disconnecter motor for earthswitch	1
20	Gas density switch	2
21	Bursting disc / pressure relief plate complete	2
22	Capacitive voltage indicator	6 (2 sets)
23	Mobile gas filling and evacuation device -DILO make	1
24	SF6 Gas cylinders	4
25	SCADA Spares	20% of Supplied Items
26	Other spares recommended by manufacturer may be added to this list	

Unit price for all the spares should be indicated in price bid.

**ANNEXURE – E– GUARANTEED TECHNICAL PARTICULARS (DATA BY BIDDER)**

Vendor must submit clause wise compliance in Excel sheet against specification at the time of drawing approval clearly highlighting the deviations from specification against each clause.

<b>S No.</b>	<b>DESCRIPTION</b>	<b>UNITS</b>	<b>DATA SPECIFIED BY PURCHASER</b>	<b>DATA PROVIDED BY BIDDER</b>
<b>1.00</b>	<b>SITE CONDITIONS</b>			
1.01	Altitude	meters	1 -50	
1.02	Maximum Ambient Temperature	°C	45	
1.03	Minimum Ambient Temperature	°C	0	
1.04	Design Ambient Temperature	°C	50	
1.05	Relative Humidity	%	100	
<b>2.00</b>	<b>PARAMETERS</b>			
2.01	Voltage	kV	33	
2.02	Phases	-	3	
2.03	Frequency	Hz	50	
2.04	Short Time Rating for 3 Sec	kA	31.5	
2.05	Voltage Class	kV	36	
2.06	Insulation level (PF rms / Impulse peak)	kVrms / kVpeak	70/170	
2.07	Internal arc test			
a	Rated current and duration	kA, sec		
b	Classification			
<b>3.00</b>	<b>ENCLOSURE TYPE</b>		IP65 / IP4X	
3.01	Rear Doors	-	Manufacturers Standard	
3.02	Indoor / Outdoor	-	Indoor	
3.03	Arc Resistant	-	YES	
3.04	Tamperproof Category	-	YES	
3.05	Dust resistant (gasketed)	-	YES	
<b>4.00</b>	<b>PANEL CONSTRUCTION</b>			
4.01	Gas pressure – busbar compartment		Bar / MPa	
a	Normal gas pressure		Bar / MPa	
b	Permitted range of Gas pressure for safe operation		Bar / MPa	
c	Alarm level		Bar / MPa	
d	Gas pressure for operation of PRD		Bar / MPa	
e	Withstand gas pressure of enclosure		Bar / MPa	
f	Number of aux.contacts /stages provided for the gas density meter			
4.02	Gas pressure – breaker		Bar / MPa	

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<b>S No.</b>	<b>DESCRIPTION</b>	<b>UNITS</b>	<b>DATA SPECIFIED BY PURCHASER</b>	<b>DATA PROVIDED BY BIDDER</b>
	compartment			
a	Normal gas pressure		Bar / MPa	
b	Permitted range of Gas pressure for safe operation		Bar / MPa	
c	Alarm level		Bar / MPa	
d	Gas pressure for operation of PRD		Bar / MPa	
e	Withstand gas pressure of enclosure		Bar / MPa	
f	Number of aux. contacts /stages provided for the gas density meter			
4.03	Material and thickness of gas enclosure			
4.04	Total no. of Gas compartments per panel		No.	
4.05	Number of Gas Density meters provided per panel		No.	
4.06	Rating of Isolator (A)		Same as CB rating	
4.07	Rating of earthing switch (A)		Same as CB rating	
4.07	Guaranteed Gas leakage Rate		< 0.5 %	
4.08	Rodent damage protection		YES	
4.09	Ground and test device		YES	
4.10	Equipment Labeling		Anodized aluminium	
4.11	Lift truck		If required	
4.12	Testing facility			
a	For Cable		Required	
b	For CT		Required	
c	For PT		Required	
<b>5.00</b>	<b>BUS INFORMATION</b>			
5.01	Material		Copper	
5.02	Bus Joint Plating		Manufacturers Standard	
5.03	Rated Continuous Current	A rms	2000 A	
5.04	Short time Withstand Current	A rms	31.5kA for 3 Sec	
<b>6.00</b>	<b>BUS SUPPORTS AND INSULATION</b>			
6.01	Manufacturer's Standard & Type		Manufacturers Standard	
6.02	Material		Manufacturers Standard	
<b>7.00</b>	<b>POWER CABLE ACCOMMODATION</b>			

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<b>S No.</b>	<b>DESCRIPTION</b>	<b>UNITS</b>	<b>DATA SPECIFIED BY PURCHASER</b>	<b>DATA PROVIDED BY BIDDER</b>
7.01	Power Cable entry		Bottom	
7.02	Terminal lug type		Socket & Plug for SF6	
7.03	Qty of power cables per phase per compartment	qty	As per specification and SLD	
7.04	Make of termination			
<b>8.00</b>	<b>CIRCUIT BREAKER INFORMATION</b>			
8.01	Manufacturer / Model No.			
8.02	Type (SF6/Vacuum)		Manufacturers Standard	
8.03	Rated Short-Circuit Current	kA	31.5 kA	
8.04	Short circuit-Current Withstand Time	sec	3	
8.05	Rated Maximum Voltage	kV rms	36	
8.06	Rated Voltage Range Factor, K		1.1	
8.07	Power Frequency Withstand Voltage	kV rms	70	
8.08	Lightning Impulse Withstand Voltage	kV crest	170	
8.09	Rated Continuous Current	A rms	As per single line drawing.	
8.10	Rated Transient Recovery Voltage Time to Peak (T2)	microsec	Manufacturers Standard	
8.11	Switching duty/capability			
a	Power Transformers (oil filled)	Capacity		
b	Cables	Length		
c	Over head lines	Length		
8.12	Rated Interrupting Time	ms	60	
8.13	Time for Opening Operation	cycles	3	
8.14	Time for Closing Operation	cycles	4	
8.15	Closing and latching capability (peak)	kA	Manufacturers Standard	
8.16	Control Power Voltage Range, Trip Coil	V dc	220/50	
8.17	Control Power Voltage Range, Closing Coil	V dc	220/50	
8.18	Auxiliary Contacts Total	qty	12	
8.19	Min. Auxiliary Contacts for Customer use	qty	6	
8.20	Auxiliary Contact voltage rating	V dc	220 / 50	
8.21	Auxiliary Contact current	Amps	10	



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<b>S No.</b>	<b>DESCRIPTION</b>	<b>UNITS</b>	<b>DATA SPECIFIED BY PURCHASER</b>	<b>DATA PROVIDED BY BIDDER</b>
	rating			
8.22	Stored Energy System Minimum Voltage	V dc	187	
8.23	Stored Energy Spring Charging Motor Current	Amps	MS	
8.24	Stored Energy Spring Charging Motor Inrush	Amps	MS	
8.25	Stored Energy Time to Fully Recharge Spring:	seconds	MS	
8.26	Rated Operating duty cycle		O – 0.3Sec – CO - 3min -CO	
8.27	Rated out of phase switching capability to IEC 56			
8.28	Operating Power Consumption			
a	Trip Coil	Watt		
b	Closing Coil	Watt		
c	Operating Motor	Watt		
8.29	Number of trip coils	Nos.	2	
8.30	Quantity of Gas in CB			
a	Mass			
b	Volume at Normal Pressure	CuM		
8.31	Interrupting Gas Pressure Maximum / Normal / Minimum	Bar (Absolute)		
8.32	Number of Close / Open Operation possible without re-charging	No.		
8.33	Number of operations possible before interrupter maintenance required			
a	At rated S.C. current	Nos.		
b	At full load current	Nos.		
c	At no load	Nos.		
8.34	Method used to relieve internal overpressure due to short circuit (Bursting disc / relief valve / none. Etc.)			
8.35	Operating pressure of pressure relief device			
<b>9.00</b>	<b>PROTECTIVE RELAYS</b>			
9.01	Manufacturer		By Seller	
9.02	Model no. of each relay			
9.03	Relay functions		As per specification	

<b>S No.</b>	<b>DESCRIPTION</b>	<b>UNITS</b>	<b>DATA SPECIFIED BY PURCHASER</b>	<b>DATA PROVIDED BY BIDDER</b>
9.04	Relay Communication		IEC 61850	
<b>10.00</b>	<b>MULTI FUNCTION METER</b>			
10.01	Model		Rish Delta Energy	
10.02	Make		Rishabh	
10.03	SCADA Interfacing		RS485 rear port suitable for integration on Modbus Protocol	
10.04	Size	mm <sup>2</sup>	96x96	
10.05	Panels where to be provided		All panels	
10.06	Accuracy Class		1	
10.07	Auxiliary Supply		48 – 240VDC and AC i.e universal type.	
<b>11.00</b>	<b>CONTROL WIRING</b>		See Specification	
11.01	Type		XLPE or PVC	
11.02	Control wire Size minimum:		1.5 mm	
11.03	Voltage Rating:	Vac	600/1000V	
11.04	FRLS type		Yes	
<b>12.00</b>	<b>CURRENT TRANSFORMERS</b>		As per SLD	
	(Details to be furnished for each type of CT)			
12.01	Manufacturer/Model Number:			
12.02	Accuracy Class		As per SLD	
12.03	Ratio		As per SLD	
12.04	Burden		As per SLD	
12.05	Knee point voltage		As per SLD	
12.06	Rct			
12.07	Excitation current		As per SLD	
<b>13.00</b>	<b>VOLTAGE TRANSFORMERS</b>			
13.01	Manufacturer			
13.02	Model Number			
13.03	Accuracy		As per SLD	
13.04	Secondary MCB		Required	
13.05	Burden		As per SLD	
13.06	Disconnecting switch for VT		Required	
<b>14.00</b>	<b>PANEL ACCESSORIES</b>			
14.01	Indications		LED type	
14.02	Control switches			
a	Make			
b	Type			
c	Rating			
14.03	L/R switch			

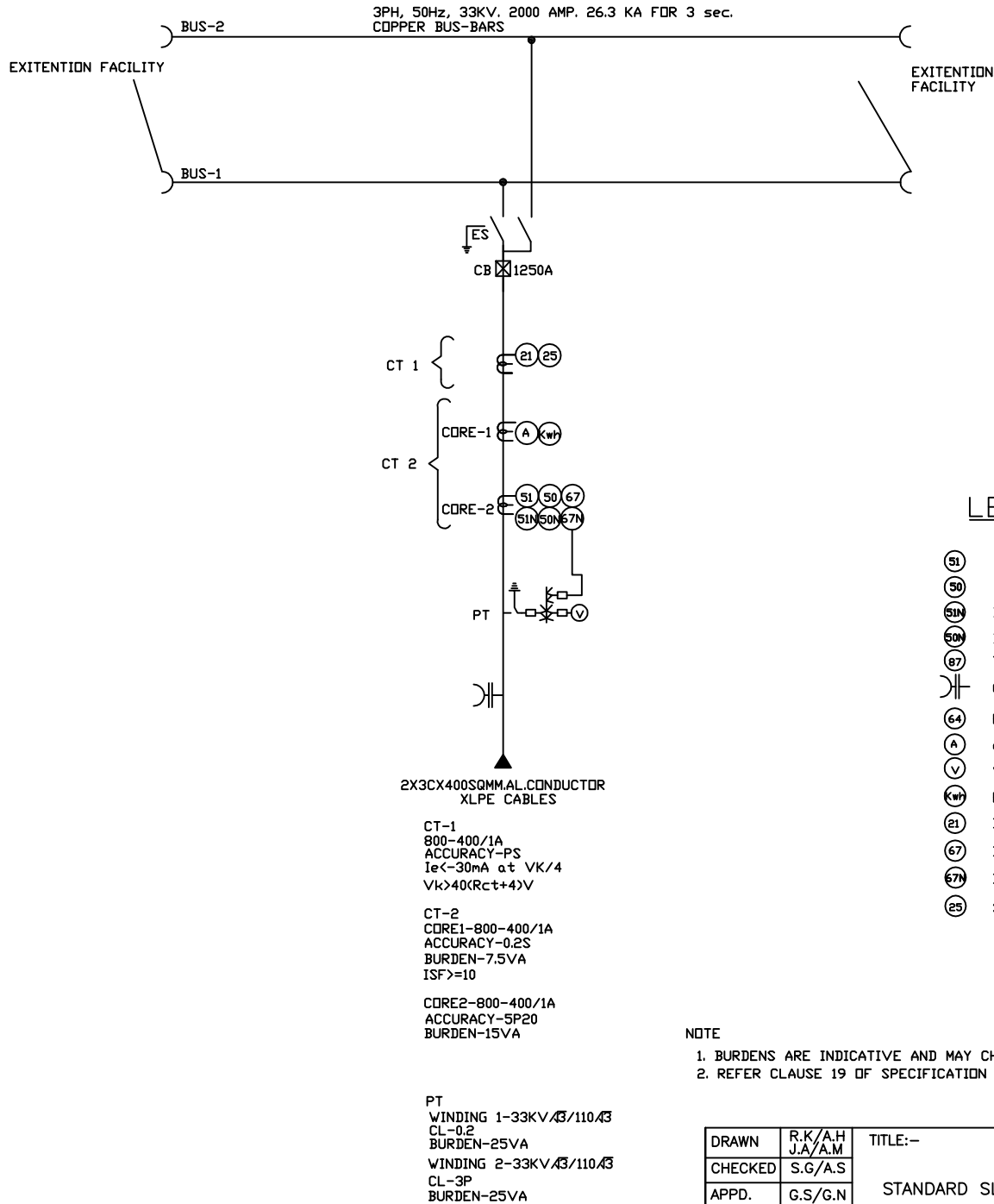
<b>S No.</b>	<b>DESCRIPTION</b>	<b>UNITS</b>	<b>DATA SPECIFIED BY PURCHASER</b>	<b>DATA PROVIDED BY BIDDER</b>
a	Make			
b	Type			
c	Rating			
14.04	CT & PT Terminal blocks			
a	Make			
b	Type		Disconnecting	
c	Size			
d	Rating			
14.05	Terminal blocks			
a	Make			
b	Type		Non-Disconnecting	
c	Size			
d	Rating			
<b>15.00</b>	<b>HEAT LOSS</b>			
15.01	Bus Losses	Watts		
15.02	Heat loss at rated breaker current –2000 A	W/bkr		
15.03	Heat loss of space heater per vertical section	W/vrtl		
<b>16.00</b>	<b>INSTALLATION INFORMATION</b>			
16.01	Mass of heaviest piece to be shipped as a unit	kg		
16.02	Largest section to be shipped a unit -Length:	mm		
16.03	Largest section to be shipped a unit -Width:	mm		
16.04	Largest section to be shipped a unit -Height:	mm		
16.05	Total Mass of assembly to be shipped	kg		
16.06	Total assembly (breaker line-up only) -Length	mm		
16.07	Total assembly (breaker line-up only) -Width	mm		
16.08	Total assembly (breaker line-up only) -Height	mm		
16.09	Transition section (breaker line-up only) -Mass	kg		
16.10	Transition section (breaker line-up only) -Length	mm		
16.11	Transition section (breaker line-up only) -Width	mm		
16.12	Transition section (breaker	mm		

**TECHNICAL SPECIFICATION FOR 33KV GAS INSULATED SWITCHGEAR**

<b>S No.</b>	<b>DESCRIPTION</b>	<b>UNITS</b>	<b>DATA SPECIFIED BY PURCHASER</b>	<b>DATA PROVIDED BY BIDDER</b>
	line-up only) -Height			
16.13	Total Number of shipping sections per line up:	qty		
<b>17.00</b>	<b>PANEL DIMENSIONS</b>			
17.01	Incomer (Width x Depth x Height)	mm		
17.02	Bus-coupler (Width x Depth x Height)	mm		
17.03	Outgoing (Width x Depth x Height)	mm		
17.04	Overall length of Complete board	mm		
<b>18.00</b>	<b>CONTROL AND AUXILIARY SUPPLY</b>			
18.01	Buyer Control power supply (Volts)		220 V / 50V , +15% & -15%V DC	
18.02	Buyer Control power current rating (A)		15 A	
18.03	Buyer control power supply short circuit level		30 kA	
18.04	Buyer AC power supply (Volts)		240 V + 10%	
18.05	Buyer AC power supply current rating (A)		20A	
18.06	Buyer AC power supply short circuit rating (kA)		50 kA	
<b>19.00</b>	<b>PAINTING / FINISHING</b>			
19.01	Manufacturer's Standard		Manufacturer's Paint Spec doc. No.	
19.02	Color		RAL7032	
<b>20.00</b>	<b>MODULE REPLACEMENT</b>			
20.01	Complete panel replacement duration (at site)	Hours		
20.02	CB Module replacement duration (at site)	Hours		
20.03	Bushing Replacement duration (at site)	Hours		

**ANNEXURE – F – SINGLE LINE DIAGRAMS**

# ANNEXURE-F1



## LEGEND:

- (51) IDMT PHASE OVER CURRENT RELAY
- (50) INSTANTANEOUS PHASE OVER CURRENT RELAY
- (51N) IDMT EARTH FAULT RELAY
- (50N) INSTANTANEOUS EARTH FAULT RELAY
- (67) TRANSFORMER DIFFERENTIAL RELAY
- (64) RESTRICTED EARTH FAULT RELAY (33 KV OF TRANSFORMER)
- (A) AMMETER WITH SELECTOR SWITCH
- (V) VOLTMETER WITH SELECTOR SWITCH
- (Kw) ENERGY METER
- (21) DISTANCE RELAY
- (67) DIRECTIONAL OVER CURRENT RELAY
- (67N) DIRECTIONAL EARTH FAULT RELAY
- (25) SYNCHRO CHECK RELAY

### NOTE

1. BURDENS ARE INDICATIVE AND MAY CHANGE SUBJECT TO CALCULATIONS DURING DETAILED ENGINEERING.
2. REFER CLAUSE 19 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENT OF RELAYS.

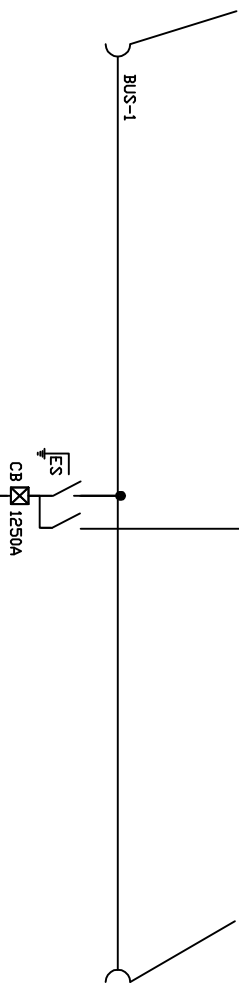
DRAWN	R.K/A.H J.A/A.M	TITLE:--	<div style="font-size: 2em; font-weight: bold; color: red; margin-bottom: 10px;">BSES</div> STANDARD SLD FOR 33KV INCOMER
CHECKED	S.G/A.S		
APPD.	G.S/G.N		
DATE	28.04.22		
SCALE	NTS		
SPECIFICATION NO. BSES-TS-65-33GIS-R0			
SLD-GIS-33KV-01			

# ANNEXURE -F2

EXTENTION FACILITY  
BUS-2

EXTENTION FACILITY  
BUS-1

3PH, 50Hz, 33KV, 2000 AMP, 26.3 KA FDR 3 sec.  
COPPER BUS-BARS



## LEGEND:

- Ⓐ IDMT PHASE OVER CURRENT RELAY
- Ⓑ IDMT INSTANTANEOUS PHASE OVER CURRENT RELAY
- Ⓒ INSTANTANEOUS EARTH FAULT RELAY
- Ⓓ TRANSFORMER DIFFERENTIAL RELAY
- Ⓔ CAPACITIVE VOLTAGE INDICATOR
- Ⓕ RESTRICTED EARTH FAULT RELAY (33 KV OF TRANSFORMER)
- Ⓖ AMMETER WITH SELECTOR SWITCH
- Ⓢ VOLTMETER WITH SELECTOR SWITCH
- Ⓣ ENERGY METER
- Ⓛ DISTANCE RELAY
- Ⓜ DIRECTIONAL OVER CURRENT RELAY
- Ⓝ DIRECTIONAL EARTH FAULT RELAY
- Ⓟ SYNCHRO CHECK RELAY

CT-2  
CORE-2-800-400/1A  
ACCURACY-0.2S  
BURDEN-7.5VA  
ISF=10

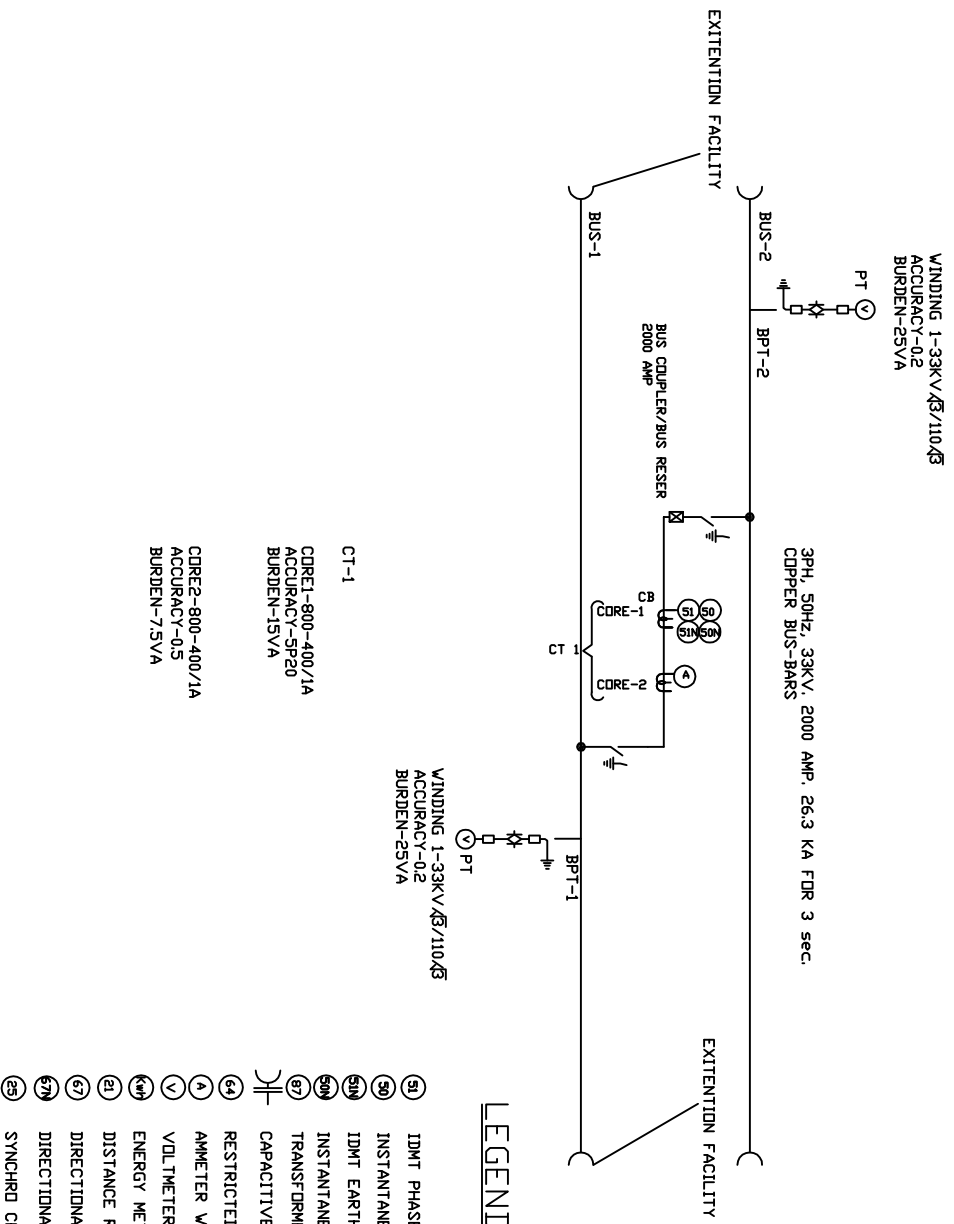
CT-1  
800-400/1A  
ACCURACY-PS  
Ie<-30mA at VK/4  
Vk>40(Rct++4)V

### NOTE

1. BURDENS ARE INDICATIVE AND MAY CHANGE SUBJECT TO CALCULATIONS DURING DETAILED ENGINEERING.
2. REFER CLAUSE 19 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENT OF RELAYS.

DRAWN	R/K/AH	TITLE:-	STANDARD SLD FOR 33KV TRANSFORMER FEEDER
CHECKED	J/A/AM		
APPD.	G/S/GN		
DATE	28.04.22		
SCALE	NTS		
<b>BSES</b>			SPECIFICATION NO. BSES-TS-65-33GIS-RO
			SLD-GIS-33KV-02

# ANNEXURE-F3



### LEGEND:

- (51) IDMT PHASE OVER CURRENT RELAY
- (50) INSTANTANEOUS PHASE OVER CURRENT RELAY
- (51M) IDMT EARTH FAULT RELAY
- (50M) INSTANTANEOUS EARTH FAULT RELAY
- (67) TRANSFORMER DIFFERENTIAL RELAY
- (59) CAPACITIVE VOLTAGE INDICATOR
- (64) RESTRICTED EARTH FAULT RELAY (33 KV OF TRANSFORMER)
- (A) AMMETER WITH SELECTOR SWITCH
- (V) VOLTMETER WITH SELECTOR SWITCH
- (W) ENERGY METER
- (21) DISTANCE RELAY
- (67) DIRECTIONAL OVER CURRENT RELAY
- (67N) DIRECTIONAL EARTH FAULT RELAY
- (25) SYNCHRO CHECK RELAY

CT-1  
 COREL-800-400/1A  
 ACCURACY-SP20  
 BURDEN-15VA

CORE2-800-400/1A  
 ACCURACY-0.5  
 BURDEN-7.5VA

### NOTE

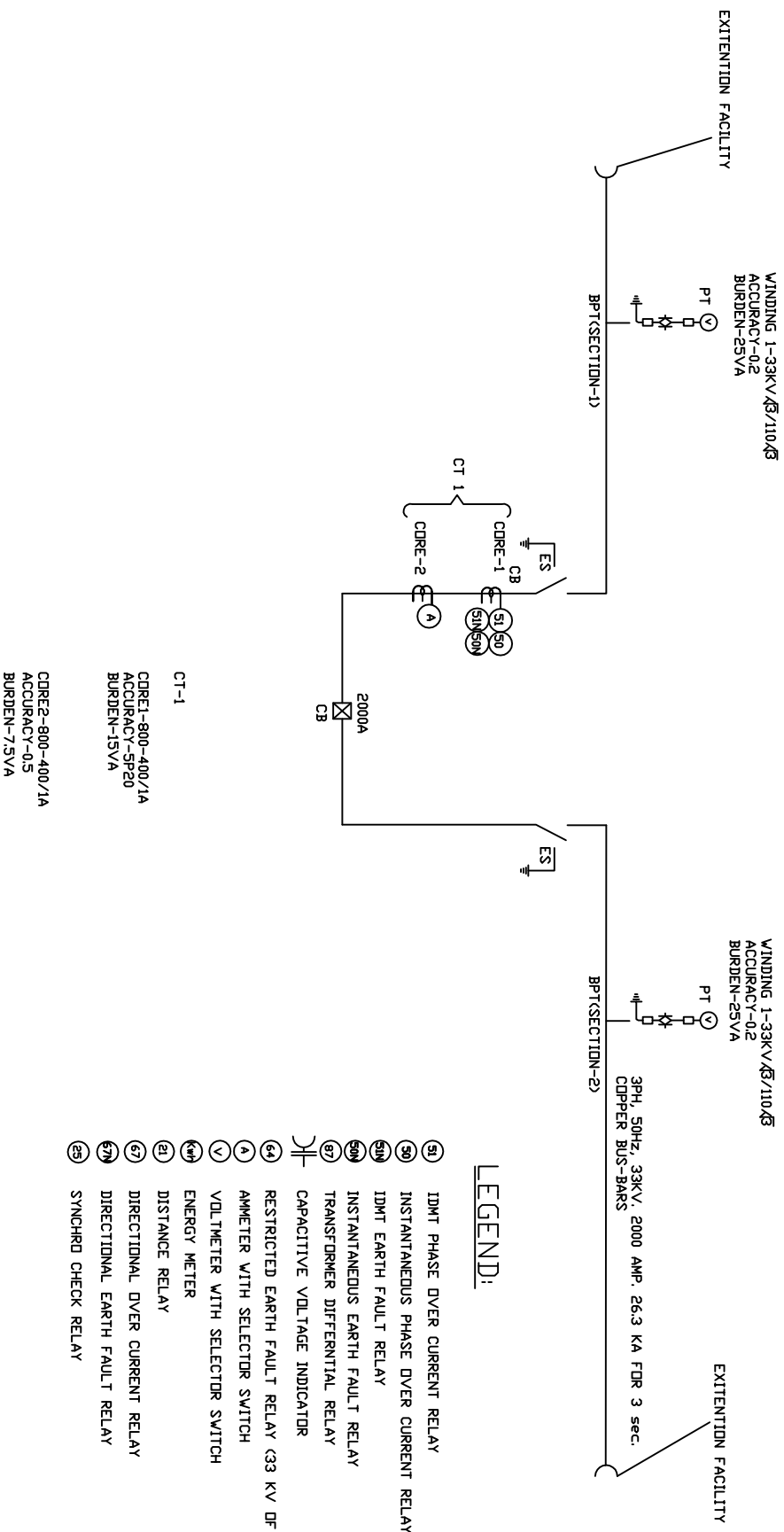
1. BURDENS ARE INDICATIVE AND MAY CHANGE SUBJECT TO CALCULATIONS DURING DETAILED ENGINEERING.
2. REFER CLAUSE 19 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENT OF RELAYS.
3. ONE BPT TO BE PROVIDED FOR EACH BUS SECTION.

DRAWN	R.K/A.H	TITLE:-	STANDARD SLD FOR 33KV BUS COUPLER CUM BUS PT
CHECKED	J.A/A.M		
APPD.	S.G/A.S		
DATE	G.S/G.N		
SCALE	28.04.22		
	NTS		

SPECIFICATION NO. BSES-TS-65-33GIS-R0

SLD-GIS-33KV-03

# ANNEXURE-F 4



**NOTE**

1. BURDENS ARE INDICATIVE AND MAY CHANGE SUBJECT TO CALCULATIONS DURING DETAILED ENGINEERING.
2. REFER CLAUSE 19 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENT OF RELAYS.
3. ONE BPT TO BE PROVIDED FOR EACH BUS SECTION.

DRAWN	R.K/AH	TITLE:-	STANDARD SLD FOR 33KV BUS SECTIONALIZER CUM RISER CUM BUS PT
CHECKED	J.A/AM		
APPD.	S.G/AS		
DATE	G.S/G.N		
SCALE	28.04.22		
	NTS		
SPECIFICATION NO. BSES-TS-65-33GIS-RO			
SLD-GIS-33KV-04			

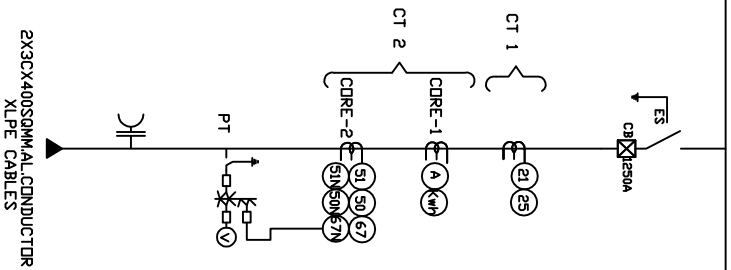




# ANNEXURE-F5

EXTENSION FACILITY

EXTENSION FACILITY



## LEGEND:

- 51 IDMT PHASE OVER CURRENT RELAY
- 50 INSTANTANEOUS PHASE OVER CURRENT RELAY
- 50N IDMT EARTH FAULT RELAY
- 50N INSTANTANEOUS EARTH FAULT RELAY
- 67 TRANSFORMER DIFFERENTIAL RELAY
- 67N CAPACITIVE VOLTAGE INDICATOR
- RESTRICTED EARTH FAULT RELAY (33 KV OF TRANSFORMER)
- 4 AMMETER WITH SELECTOR SWITCH
- 4 VOLTMETER WITH SELECTOR SWITCH
- 4 ENERGY METER
- 21 DISTANCE RELAY
- 67 DIRECTIONAL OVER CURRENT RELAY
- 67N DIRECTIONAL EARTH FAULT RELAY
- 25 SYNCHRO CHECK RELAY

CT-1  
800-400/1A  
ACCURACY-SPS  
Ie<-30mA at VK/4  
VK>40(Rct+4)V

CT-2  
CORE1-800-400/1A  
ACCURACY-0.2S  
BURDEN-75VA  
ISF>=10

CORE2-800-400/1A  
ACCURACY-SP20  
BURDEN-15VA

PT  
WINDING 1-33KV/43/110/43  
CL-02  
BURDEN-25VA  
WINDING 2-33KV/43/110/43  
CL-3P  
BURDEN-25VA

NOTE  
1. BURDENS ARE INDICATIVE AND MAY CHANGE SUBJECT TO CALCULATIONS DURING DETAILED ENGINEERING.  
2. REFER CLAUSE 19 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENT OF RELAYS.

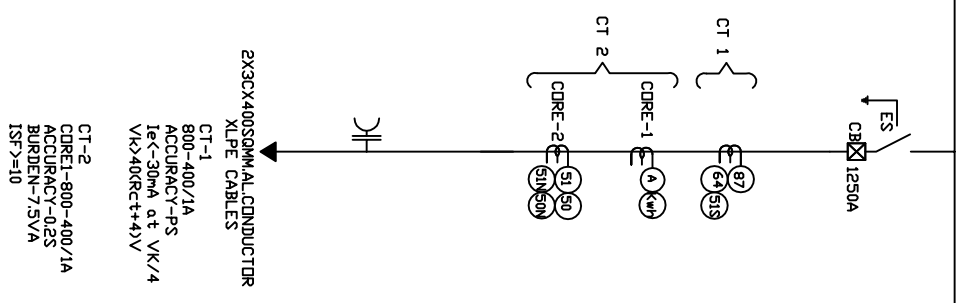
DRAWN	R.K/A.H	TITLE:-	STANDARD SLD FOR 33KV INCOMER
CHECKED	J.A/A.M		
APPD.	S.G/A.S		
DATE	G.S/G.N		
SCALE	28.04.22		
	NTS		
SPECIFICATION NO. BSES-TS-65-33GIS-R0			
SLD-GIS-33KV-05			



# ANNEXURE -F6

EXTENTION FACILITY

EXTENTION FACILITY



CORE2-800-400/1A  
ACCURACY-SP20  
BURDEN-15VA

### LEGEND:

- 89 IDMT PHASE OVER CURRENT RELAY
- 90 INSTANTANEOUS PHASE OVER CURRENT RELAY
- 91N IDMT EARTH FAULT RELAY
- 90N INSTANTANEOUS EARTH FAULT RELAY
- 92N TRANSFORMER DIFFERENTIAL RELAY
- 97 CAPACITIVE VOLTAGE INDICATOR
- 64 RESTRICTED EARTH FAULT RELAY (33 KV OF TRANSFORMER)
- 4 AMMETER WITH SELECTOR SWITCH
- 7 VOLTMETER WITH SELECTOR SWITCH
- 4M ENERGY METER
- 81 DISTANCE RELAY
- 67 DIRECTIONAL OVER CURRENT RELAY
- 67N DIRECTIONAL EARTH FAULT RELAY
- 25 SYNCHRO CHECK RELAY

### NOTE


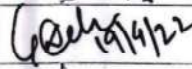

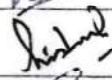
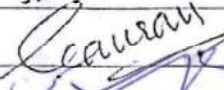

1. BURDENS ARE INDICATIVE AND MAY CHANGE SUBJECT TO CALCULATIONS DURING DETAILED ENGINEERING.
2. REFER CLAUSE 19 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENT OF RELAYS.

DRAWN	R.K/A.H	TITLE:-	
CHECKED	S.G/AS	STANDARD SLD FOR	<b>BSES</b>
APPD.	G.S/G.N	33KV TRANSFORMER	
DATE	28.04.22	FEEDER	
SCALE	NTS	SPECIFICATION NO. BSES-TS-65-33GIS-R0	SLD-GIS-33KV-06

# BSES

## Technical Specification For Heat Shrinkable & GIS Cable Termination Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

Specification no – BSES-TS-45-TERM-R0

Rev:		0
Pages		22
Date:		19 Apr 2022
Prepared by	Abhishek Vashistha	
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Reviewed by	Puneet Duggal	
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	Gopal Nariya	

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BSES-TS-45-TERM-R0

**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**

**Record of Revision**

Item/Clause No.	Change in Specification	Approved By	Rev

**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)****1.0.0 Scope of work**

Heat Shrinkable & GIS Termination Kits, suitable for 11 kV & 33 kV, 66 kV XLPE / PILC cables, shall be designed, manufactured, tested, packed and delivered by the Vendor, as per Purchaser's requirements.

**2.0.0 Codes & standards**

## 2.1.0 National Standards:

SL	Standard Number	Title
2.1.1	IS – 13573: 2011	Joints & Terminations of Polymeric Cables for working voltages from 6.6 kV up to and including 33 kV Performance Requirements and Type Tests
2.1.2	IS – 7098 Part 2 : 2011	Cross-linked Polyethylene (XLPE) Insulated PVC sheathed cables : Part 2 : For working voltages from 3.3 kV up to and including 33 kV
2.1.3	IS – 692: 1994	Paper insulated lead-sheathed cables (PILC) for rated voltages up to and including 33 kV specification
2.1.3	IS – 10810: 1984	Methods of test for cables
2.1.4	IS – 7098 Part 3 : 2019	Cross-linked polyethylene insulated thermoplastic sheathed Cables specification: Part 3 - For working voltages from 66 kV up to and including 220 KV

## 2.1.1 International Standards:

S No.	Standard Number	Title
2.2.1	EA TS – 09 – 13	Electricity Association – Technical Specification -09-13 Material component for use in Electric Power Cable Termination & Joints for System voltage above 1000 V up to 36 kV
2.2.2	IEEE – 48	Standards Test Procedures and requirements for high voltage alternating current cable termination
2.2.3	IEC – 60183	Guide to the selection of high voltage cables
2.2.4	IEC – 885 Part 1-3	Electric test methods for electric cables
2.2.5	IEC – 60840	Power cable with extruded insulation and their accessories for rated voltage above 30 Kv ( $U_m=36$ kV) up to 150 KV ( $U_m=170$ kV) – test methods and requirements.

**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)****3.0.0 Cable Construction**

Normal sizes of XLPE cables used in BSES system and the construction features of these cables are indicated below:

- a. 11 kV, 3-core x 150 sq mm AL
- b. 11 kV, 3-core x 300 sq mm AL
- c. 11 kV, 3-core x 400 sq mm AL
- d. 11 kV, 3-core x 400 sq mm AL(OFC Embedded)
- e. 11 kV, 1-core x 1000 sq mm AL
- f. 11 kV, 1-core x 150 sq mm AL HTAB with copper metallic screen
- g. 11 kV, 1-core x 150 sq mm AL HTAB with Aluminium wire metallic screen
- h. 11 kV, 1-core x 95 sq mm AL HTAB with copper metallic screen
- i. 11 kV, 1-core x 95 sq mm AL HTAB with Aluminium wire metallic screen
- j. 33 kV, 3-core x 400 sq mm AL
- k. 33 kV, 3-core x 400 sq mm AL (OFC Embedded)
- l. 33 kV, 1-core x 1000 sq mm AL
- m. 66 kV, 1-core x 630 sq mm AL
- n. 66 kV, 1 core x 1000 sq mm AL
- o. 66 kV, 3-core x 300 sq mm AL
- p. 66 kV, 3-core x 300 sq mm AL(OFC Embedded)

PILC type Cables:

3-core 240 or 300 sq. Mm. Al

3.1.0	Conductor	For XLPE : a) Electrolytic Grade stranded Aluminium Conductor / Annealed Copper Conductor b) Grade: H2/ H4 as per IS: 8130/84 (For Al) c) Shape: Compacted Circular d) Class 2 For PILC : a) 11 kV : sector-shaped b) 33Kv: oval-shaped
3.2.0	Conductor Screen	For XLPE : Extruded Semi Conducting material For PILC : 11 kV : no conductor screen 33 kV : carbon paper
3.3.0	Insulation	For XLPE: Extruded TR XLPE For PILC: Layers of impregnated papers

**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**

3.4.0	Insulation Screen	<p><b>Non Metallic Screen:</b> For XLPE Insulated cable: a) For 11, 33 U/G cable and HTAB cable - Freely strippable Semi Conducting ( without application of heat) b) For 66kV cable - Firmly bonded semi conducting</p> <p><b>Metallic Screen:</b> a) For For 11, 33 &amp; 66 Kv U/G cable – Copper Tape b) For HTAB – option 1 – Copper Tape (old installations) and option 2 – Aluminium wire (new installations) For PILC : a) 11 kV : absent (Belted) b) 33kV: metallised paper tape</p>
3.5.0	Water Swellable Tape	<p>For XLPE: Semi-conducting Water Swellable Tape shall be provided under the copper tape on each core. For PILC : not applicable</p>
3.6.0	Filler	<p>For XLPE: All interstices, including centre interstices filled by PP filler. Note- In special cases, for 66kV 3CX300 sqmm, 33kV, 3CX400 and 11kV 3CX400 cable are with-36 nos. Single mode and 12 nos. Multi modes OFC are also inbuilt as filler.Requirement of cable joint kit with OFC shall be fulfilled as per tender requirement For PILC : a) 11 kV : Crushed paper filler b) 33kV: Jute twine</p>
3.7.0	Over all three cores	<p>XLPE : Binder tape PILCA : 11 kV : belt paper 33kV: Copper Woven Fabric tape</p>
3.8.0	Inner Sheath	<p>For XLPE: Extruded Inner Sheath of Black PVC type ST-2. For PILC : Lead alloy sheath</p>
3.9.0	Bedding Tape	<p>For XLPE: not applicable For PILC: two layers of paper, followed by compounded (bituminized) cotton tape.</p>
3.10.0	Copper Woven Fabric Tape (CWF tape)	<p>For XLPE : not applicable For PILC : a) 11 kV : absent (Belted cable) b) 33 kV : applicable for screened cable</p>
3.11.0	Armour	<p>For XLPE : a) Galvanised Steel round Wires/ Galvanised steel flat strip armour (For 3 core cables) b) Hard drawn Aluminium Wire (For 1 core cables) c) Aluminium or lead sheathed for 1Core 66kV cables For PILC : a) 11 kV double steel tape armour</p>
3.12.0	Binder Tape	<p>For XLPE: Rubberised cotton tape</p>



**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**

3.13.0	Outer Sheath	For XLPE: Extruded outer sheath of PVC (ST-2) for 11 kV/ 33 KV and HDPE for 66kV Cable with termite- repellent. For 66kV Cable- HDPE extruded semicon layer or HDPE with graphite layer. For PILC : compounded (bituminised) Jute/PVC
3.14.0	HTAB Cable (1CX150 and 1CX95) core construction	Aluminium conductor-conductor semicon screen- TR XPLE insulation- insulation semicon screen–Water Swell-able tape –Round wire armour installation) / Copper Tape (old installation) ) Water Swell-able tape-outer sheath

**4.0.0 Cable Termination Kits**

General Technical Requirements for Cable Termination Kits are as follows:

4.1.0	Scope	Design, manufacture, testing and supply of Cable Termination Kits for H. T. Power Cables.																																																														
4.2.0	Functional Requirements																																																															
4.2.1	Conductor Connection	<table border="1"> <thead> <tr> <th>Voltage Grade</th> <th>Cable Size</th> <th>Application</th> <th>Material of Lug</th> <th>Connection Method</th> </tr> </thead> <tbody> <tr> <td rowspan="4">11 kV</td> <td rowspan="2">3Cx150, 3Cx300 and 3Cx400 sq mm</td> <td>Indoor</td> <td>Bi-Metal</td> <td>Crimping</td> </tr> <tr> <td>Outdoor</td> <td>Bi-Metal/ Aluminium as per tender requirement</td> <td>Crimping</td> </tr> <tr> <td rowspan="2">1Cx1000 sq mm</td> <td>Indoor</td> <td>Aluminium</td> <td>Crimping</td> </tr> <tr> <td>Outdoor</td> <td>Aluminium</td> <td>Crimping</td> </tr> <tr> <td rowspan="2">HTAB (indoor not required)</td> <td>1Cx95</td> <td>Outdoor</td> <td>Aluminium</td> <td>Crimping</td> </tr> <tr> <td>1Cx150</td> <td>Outdoor</td> <td>Aluminium</td> <td>Crimping</td> </tr> <tr> <td rowspan="4">33 kV</td> <td rowspan="2">3Cx400 sq mm</td> <td>Indoor</td> <td>Aluminium</td> <td>Crimping</td> </tr> <tr> <td>Outdoor</td> <td>Aluminium</td> <td>Crimping</td> </tr> <tr> <td rowspan="2">1Cx1000 sq mm</td> <td>Indoor</td> <td>Aluminium</td> <td>Crimping</td> </tr> <tr> <td>Outdoor</td> <td>Aluminium</td> <td>Crimping</td> </tr> <tr> <td rowspan="4">66 kV</td> <td rowspan="2">3Cx300</td> <td>Indoor</td> <td>Aluminium</td> <td>Crimping</td> </tr> <tr> <td>Outdoor</td> <td>Aluminium</td> <td>Crimping</td> </tr> <tr> <td rowspan="2">1Cx630, 1Cx1000 sq mm</td> <td>Indoor</td> <td>Aluminium</td> <td>Crimping</td> </tr> <tr> <td>Outdoor</td> <td>Aluminium</td> <td>Crimping</td> </tr> </tbody> </table>	Voltage Grade	Cable Size	Application	Material of Lug	Connection Method	11 kV	3Cx150, 3Cx300 and 3Cx400 sq mm	Indoor	Bi-Metal	Crimping	Outdoor	Bi-Metal/ Aluminium as per tender requirement	Crimping	1Cx1000 sq mm	Indoor	Aluminium	Crimping	Outdoor	Aluminium	Crimping	HTAB (indoor not required)	1Cx95	Outdoor	Aluminium	Crimping	1Cx150	Outdoor	Aluminium	Crimping	33 kV	3Cx400 sq mm	Indoor	Aluminium	Crimping	Outdoor	Aluminium	Crimping	1Cx1000 sq mm	Indoor	Aluminium	Crimping	Outdoor	Aluminium	Crimping	66 kV	3Cx300	Indoor	Aluminium	Crimping	Outdoor	Aluminium	Crimping	1Cx630, 1Cx1000 sq mm	Indoor	Aluminium	Crimping	Outdoor	Aluminium	Crimping	<p>* For Bimetallic Lug Copper portion shall be tinned</p>		
Voltage Grade	Cable Size	Application	Material of Lug	Connection Method																																																												
11 kV	3Cx150, 3Cx300 and 3Cx400 sq mm	Indoor	Bi-Metal	Crimping																																																												
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HTAB (indoor not required)	1Cx95	Outdoor	Aluminium	Crimping																																																												
	1Cx150	Outdoor	Aluminium	Crimping																																																												
33 kV	3Cx400 sq mm	Indoor	Aluminium	Crimping																																																												
		Outdoor	Aluminium	Crimping																																																												
	1Cx1000 sq mm	Indoor	Aluminium	Crimping																																																												
		Outdoor	Aluminium	Crimping																																																												
66 kV	3Cx300	Indoor	Aluminium	Crimping																																																												
		Outdoor	Aluminium	Crimping																																																												
	1Cx630, 1Cx1000 sq mm	Indoor	Aluminium	Crimping																																																												
		Outdoor	Aluminium	Crimping																																																												

**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**

		<p>a) For GIS cable termination kits: Plug in type, Conductor connection assembly shall be by standard method of split, silver-plated copper cone and pressure-fit contact assembly or as per manufacturer's standard.</p> <p>b) Top corners of all lugs shall be circular shape not rectangular. Refer Annexure F for details.(Except GIS kit)</p>			
4.2.2	Stress Control System	<p>a) The earthed insulation screen of an XLPE cable is terminated at a suitable distance from the conductor.</p> <p>b) The tube is in electrical contact with insulation screen.</p> <p>c) Impedance of the tube shall be constant up to an operating temperature and shall be within the range <math>1 \times 10^{08}</math> ohm-cm to <math>8 \times 10^{08}</math> ohm-cm.</p> <p>d) Length of stress control tube for 11 kV and 33 kV shall be 130 mm and 260 mm respectively or according to insulation tube length. For 66kV termination kits, stress control tube shall be as per type tested design.</p> <p>e) The physical and electrical properties shall conform to ESI 09: 13.</p> <p>f) For GIS cable termination kits Stress control shall be by means of a polymeric stress cone. External profile of the cone shall match inner profile of GIS epoxy bushing. Vendor shall specify the material (EPDM / Silicone) of the cone.</p>			
4.2.3	Insulation Protection	<p>a) XLPE insulation shall be protected by means of an outer tube, resistant to tracking and weathering.</p> <p>b) One end of the tube shall be coated internally with red sealant mastic for a length of 50 mm.</p> <p>c) Physical and Electrical properties shall conform to ESI 09: 13.</p> <p>d) Insulation Tube length for termination- shall be 650 mm for both Indoor and Outdoor Termination kits of 11kV, 3CX150, 3CX300 and 3CX400 sqmm cable. All other accessories related to termination shall be according to 650mm insulation tube length.</p>			
4.2.3.1	Outer Anti-tracking Tube	<p>Outer length of the tube shall be controlled by providing creepage Extension Shed having the same material composition as the tube. These lengths are given in the table below: Creepage distance shall be 31mm/kV minimum.</p>			
4.2.3.2	OFC (66kV, 3CX300 sqmm , 33kV, 3Cx400 sqmm and 11kV, 3Cx400 sqmm cable)	<p>Termination kit for OFC (36 single mode and 12 nos. Multi mode ) shall be supplied along with termination kit.</p>			
Cable System		Length of tube (mm)		Creepage Extension Shed (No.)	
Voltage	Cores	Indoor	Outdoor	Indoor	Outdoor
11 kV	3 – core	650	650	Nil	2

**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**

	1 – core	340	340	NIL	2
33 kV	3 – core	800	1200	2	5
	1 – core	600	600	2	5

4.2.3.3	Oil Barrier Tube (applicable for PILC cable termination)	<p>a) Transparent tube is used for restoring the insulation provided by belt paper, which is terminated at the crotch.</p> <p>b) 33 kV PILC Termination: The oil barrier tube provides an oil-resistant layer to contain impregnating compound within, thus preventing anti-tracking tube coming in contact with the impregnating compound.</p>
4.2.4	Environmental Sealing System	<p>a) Red Sealant Mastic Tape: This tape, used for sealing at ends, shall be synthetic rubber-based and resistant to tracking and weathering. Sufficient quantity of this tape shall be provided.</p> <p>b) Lug-sealing Sleeve: It shall have the same material composition as outer anti-tracking tube. The sleeve shall be fully coated internally with red sealant mastic tape. Length of the sleeve shall be so as to cover half length of the lug barrel and an equal length of track-resistant tube.</p> <p>c) Conductive Break-out: It shall be provided over the crotch for 3-core cables. The break-out base shall overlap PVC outer sheath by a 50 mm. Minimum.</p> <p>d) For GIS termination kits : Environmental sealing of cores below the switchgear shall be by means of a trifurcation kit, consisting of heat shrinkable conductive break-out and heat-shrinkable conductive tube of total length of 6 metres supplied in one roll.</p>

**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**

4.2.5	Earth Bond System	<p>Minimum Armour Fault Current Carrying capacity of cables is as following: 11 kV U/G Cable – 11 kA for 1 sec 33 kV Cable – 31.5 kA for 1 sec 66 kV Cable – 31.5 kA for 1 sec 11 kV HTAB Cable – 11 kA for 1 sec</p> <p>Fault current requirement shall be met by Tinned copper braid as per following: 11 kV U/G cables – Three No's 25 sq mm each 33 kV Cable – Four No's of 50 sq mm each 66 kV Cable – Four No's of 50 sq mm each HTAB Cable with copper tape metallic screen – Three No's of 25 sq mm each</p> <p>Length of the copper braided conductor shall be 750 mm.</p> <p>Each copper braided conductor shall be supplied with copper lug, crimped at one end</p> <p>For HTAB Cable with Aluminium wire metallic screen – Tinned copper braid is not required. 1 No's of Aluminium crimping lug of 120 sq mm cross section area shall be provided instead</p>
4.2.6	Suppression of electrical discharges	<p>Following materials are required for use during cable termination :</p> <p>a) Silicone-based compound Required for filling-in minute services/ surface cracks over XLPE insulation.</p> <p>b) Polymeric mastic Required for application over semicon screen, for, eliminating any air-entrapment at any cut point on the surface. It should have sufficient elongation and electrical properties compatible with stress control tube.</p>
4.2.7	Installation. Instruction Sheet	It shall be in English and Hindi language and shall be provided inside every kit.
4.2.8	Paper Measuring Tap	Required for use during cable preparation / terminations.
4.2.9	Identification Tag (for traceability)	<p>a) An aluminum pouch with paper tag &amp; sealing arrangement at one end shall be provided.</p> <p>b) This tag is required to be tied over the cable at one side of the joint.</p> <p>c) The paper tag shall give following information</p> <ol style="list-style-type: none"><li>1) Vendor kit designation</li><li>2) Division</li><li>3) Breakdown ID/Shutdown ID/Scheme No.</li><li>4) Cable section</li><li>5) Type of joint</li><li>6) Size of Joint</li><li>7) Make of joint</li><li>8) Voltage class</li></ol>

**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**

		<p>9) Serial no. of kit  10) Vendor lot &amp; batch no  11) Month &amp; year of manufacturing  12) Date of installation  13) Name of joiner  14) Name of vendor supervisor  15) Name of BSES supervisor  16) Remarks  In addition to above Stainless Steel Tag shall be provided with following details for straight through joint</p> <p>a. Manufacturing month and year (MM/YY format)  b. Manufacturer name i.e Comp  c. Manufacturer own sl no for future tracing</p>
4.3.0	Technical Particulars	Vendor shall submit Guaranteed Technical Particulars (GTP) as per Annexure A.
4.4.0	Type Tests	<p>i. Termination Kit shall be of type-tested quality from CPRI/ERDA/KEMA/CESI as per the BIS/IEC/IEEE within last 5 years.</p> <p>ii. In case of type test is more than 5 years old but less than 10 years old, bidder has to give undertaking that there is no changes in design.</p> <p>iii. In case of type test report is more than 10 years old, bidder has to conduct type test from CPRI/ERDA/KEMA/CESI as per the BIS/IEC/IEEE without any cost implications to BSES</p>
4.5.0	Testing & Inspection	
	a) Tests	All the routine and acceptance tests shall be carried out as per ESI guidelines. (Also refer Annexure -C)
	b) Inspection	<p>1) Buyer reserves the right to witness all tests specified on individual H. S. components, Moulded components or completed Cable Termination Kit.</p> <p>2) Buyer reserves the right to inspect Cable Termination Kit at the Seller's works at any time, prior to dispatch, to verify compliance with the specification.</p> <p>3) In-process and final inspection call intimation shall be given in 10 days advance to purchaser.</p>
	c) Test Certificates	Three sets of complete Test Certificates (Routine & Acceptance tests) shall be submitted along with the delivery of Cable Termination Kits.
4.6.0	Documents	"Documents" refer to Documents, Data, Manuals, etc. (Scanned copy of signed documents also shall be part of entire soft file (e-file) or CD.)

**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**

4.6.1	Along with the Bid	Vendor shall submit signed 3 sets (plus 1 set of soft copy) of following documents: a) GTP (duly filled-in) (as per Annexure - A). b) Cross-sectional drawings for components Assembly c) Type Test Certificates d) Complete Catalogue and Instructions. e) Any other document.
4.6.2	After Award of Contract	Vendor shall submit signed 2 sets (plus 1 set of soft copy) of above mentioned documents within 15 days, for Purchaser's approval.
4.6.3	"As-Built" documents	Final signed "As-built" documents for the equipment in 3 sets (hard copy), 1 no. soft copy and 1 no. CD. These documents shall include signed Routine & Acceptance Test Certificates also.
4.7.0	Packing, Marking, Shipping, Handling and Storage	Every component/kit/box shall be properly sealed/ packed for protection against damage.
a)	Identification Labels:	<p>Markings / Labels shall be on both sides of every packed box.</p> <ol style="list-style-type: none"> <li>1) Identification number/type designation (as per manufacturer's standard)</li> <li>2) Voltage grade, size, description of the Kit (including the voltage grade, size, type of the cables, for which it is to be used)</li> <li>3) Batch no., lot no., etc.</li> <li>4) Quantity</li> <li>5) a) Purchase Order no. &amp; date b) Purchaser's name c) BSES's SAP code number</li> <li>6) Weight (kg) of each Cable Termination Kit and of each box containing kits.</li> <li>7) Manufacturer's name</li> <li>8) Month &amp; Year of Manufacturing</li> <li>9) Date of packing, Shelf life (if applicable)</li> <li>10) In case, the termination kit is for RMU, following text shall be written in bold letters, with higher font size : "For RMU Application".</li> </ol>
b)	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

**5.0.0 Quality Assurance (QA)**

5.1.0	Vendor's Quality Plan (QP)	To be submitted for Purchaser's approval.
5.2.0	Sampling Method	Sampling Method for quality checks shall be as per manufacturer's standard practice / ESI guidelines and Purchaser's prior approval shall be taken for the same.
5.3.0	Inspection Hold-Points	To be mutually identified, agreed and approved in Quality Plan.

**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)****6.0.0 Deviations**

6.1.0.	Deviations	<p>a) Deviations from this specification shall be listed by bidder clause wise along with optional offer and has to submit the list along with bid./quotation. BSES will review the deviations and if BSES is agreed with the deviation, seller has to take written confirmation from BSES on deviation during tender evaluation..</p> <p>b) In the absence of any list of deviations from the Seller with bid as well as written confirmation from BSES on deviations, it will be assumed by the Buyer that the Seller complies with the Specification fully.</p> <p>c) Any deviations mentioned in any other submitted bid documents (i.e.in filled GTP, Catalog, BSES old approval, buyer's/seller's standards etc) by seller without separate deviation sheets will not consider as a deviation from this tech spec at any stage of contract.</p>
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**7.0.0 Delivery**

7.1.0.	Delivery	Despatch of Material: Vendor shall despatch the material, only after the Routine Tests/Final Acceptance Tests (FAT) of the material witnessed/waived by the Purchaser, and after receiving written Material Despatch Clearance (MDC) from the Purchaser.
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**8.0.0 Inspection Expenses**

Not Applicable

**9.0.0 Penalty**

Joint/Termination failure under warranty in regards to poor quality joint, poor work man ship, etc. shall be in the account of vendors. All kind of losses due to Joint/Termination failure shall be recovered from vendor.



BSES-TS-45-TERM-R0

**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**

**Annexure – A: Guaranteed Technical Particulars (GTP)**

The Seller is deemed to have examined all parts of the Specification documents and to have been fully informed, as to the nature of work and the conditions related to its performance.

S No.	Description	Purchase requirement	Vendor's data
1	Manufacturer's name		
2	Purchase Order no. & date		
3	Guarantee Period (minimum)	60 Months (from date of commissioning) / 66 Months (from date of receipt at Purchaser's store), whichever is earlier	
4	Applicable IS / IEC Standard followed by Vendor (incl. type test standard)		
5	Voltage Grade (kV)		
5.1	Lightning Impulse Voltage Withstand Test		
5.2	4Uo AC voltage withstand test for 4 hours	To be conducted on Installed joint at works	
6	Continuous operating temperature	90 deg. C	
7	Functional Requirements		
7.1	Method of Stress Control and Discharge Suppression		
7.2	Method of Insulation build-up and screening		
7.3	Method of earth bond a) Size and no. of braids b) Size of armour support c) No. of hose clips		
7.4	Method of mechanical protection a) for 3-core Cable b) for 1-core Cable		
7.5	Method of protection against corrosion (type & coating thickness of protective layer on steel mat)		
7.6	Method of conductor continuity a) For crimping connector b) For mechanical connector		



**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**

8	Description of items in the Kit, which are imported /sourced From Principal /Sub-suppliers		
9	Names of items in the Kit and their respective shelf life (months   years)		
10	Kit Content Table (KCT) enclosed? (Refer Annexure — B)	Yes / No	
11	Drawing for connector (ferrule) enclosed	Yes / No (If yes, mention the document reference)	
12	Is Annexure - D (Technical Deviation Sheet) duly filled-in?		
13	Packing (Qty) i) Packing of every Kit h) Group Packing	1 no -- No. of Kits per Box -- No. of Boxes	
14	Installation Procedure enclosed?	Yes / No (If yes, mention the document reference)	
15	Quality Assurance Plan (QAP for raw materials, in-process inspection, factory testing) is enclosed?	Yes / No	
16	Whether all heat-shrinkable and moulded components of the kit meet the requirements of and have been tested in accordance with EA TS -09-1 3.(for heat-shrinkable joints)	Yes / No (If yes, details of test report no. /Date /name of test laboratory to be mentioned.)	
17	Type Test Reports (TTR) (Relevant test report no. & date, With type, size, other details of each type of Kit.)  a) Prepared Joint:  CPRI TTR as per BIS / IEC enclosed?  b) Loose Components:  CPRI TTR as per EA TS 09-13 enclosed?	Yes/No     Yes/No	

**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**

18	Printing details on each of the Heat- shrinkable and Moulded components	(Mention the text, presently printed on each of the component)	
19	OFC kit (For OFC embedded cable only 66Kv, 3CX300 sqmm , 33Kv, 3cx400 sqmm and 11kv, 3cx400 sqmm)	Yes/no	

**Annexure – B: Kit Content Table (KCT)**

Vendor shall submit KCT as a consolidated table, consisting of all data, such as:

**A. Heading**

1. Voltage grade, size, description of the Kit  
(Including the voltage grade, size, type of the cables, for which it is to be used)
2. Type designation (as per manufacturer's standard)

**B. Details / Parameters**

(For each component/item of the KCT)

1. Lot no. /Batch no., etc.
2. Item number (manufacturer's standard)
3. Description
  - a) Material, type, make and grade
  - b) Dimensions cross sectional area
  - c) Colour,
  - d) Other description, if any
4. Function of the item
5. Quantity
6. Make/Name/Location of manufacturer/sub-vendor
7. a) Minimum supplied (or in expanded form ) diameter  
b) Maximum freely recovered diameter
8. a) Minimum supplied (or in expanded form ) thickness  
b) Maximum freely recovered thickness

**C. Notes on the KCT**

Markings, printings, other details for individual/group of components are to be mentioned on KCT. For example:

- a) Printing of item code, size, batch no., etc.
- b) Printing on components
- c) Other embossing or engraving, if any.

(Note: Vendor may attach an Annexure, for any additional information, if required.)

### Annexure – C: Routine and Acceptance Test

#### A. Visual Examination

Condition of selected items / components, as per sampling method, shall be recorded. Some of the normal check-points can be as follows:

1. Every component shall be verified in quantity and description as per KCT.
2. All items shall be free from any defects, pin holes, cracks, etc.
3. Metallic components to be free from sharp edges.

#### B. Measurements of Dimensions

(Required / observed dimension — length, diameter, etc.)

1. Supplied dimensions
2. Recovered dimensions

#### C. Destructive Testing

On various heat-shrinkable / moulded components of ready Kits

(Items 3 and 4 are applicable only for heat-shrinkable components)

1. Tensile Strength
2. Wall Thickness Ratio
3. Heat Shock
4. Longitudinal Change, after full recovery
5. Ultimate Elongation
6. Low Temperature Flexibility
7. Dielectric Strength
8. Volume Resistivity

#### D. Routine Test Reports (RTR)

(Typical)

Each RTR shall clearly indicate P.O. no. & date and also BSES's SAP code no. RTR shall record the serial numbers of the kits selected, as per vendor's sampling method. Following details, besides vendor's/manufacturers standard check-points, shall appear in every RTR.

### Annexure – D: Technical Deviation Sheet

Sr No.	Clause No.	Deviation

**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)****Annexure – E: Service Conditions**

(Atmospheric conditions at Site)

1	Delhi	
a)	Average grade Atmospheric Condition:	Heavily Polluted, Dry
b)	Maximum altitude above sea level	1000 M
c)	Ambient Air temperature	Highest 50 deg C, Average 40 deg C
d)	Minimum ambient air temperature	0 deg C
e)	Relative Humidity	90 % Max
f)	Thermal Resistivity of Soil	150 Deg. C cmm
g)	Seismic Zone	4
h)	Rainfall	750 mm concentrated in four months

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)

Annexure – F: Bimetallic Aluminium / Copper Lug

**LUG FOR  
240/300 sqmm CABLE**

**LUG FOR  
120/150 sqmm CABLE**

**CONDUCTIVE MATERIAL**

ALUMINIUM BARREL >=99.95%  
 COPPER PLAM >=99.95%  
 FINAL METAL STATE FULLY ANNEALED, INCLUDING JOINT  
 JOINING METHOD BARREL SHALL BE FRICTION WELDED TO THE PLAM THUS ACHIEVING THE  
 THE BEST POSSIBLE TRANSITION BETWEEN THE COPPER PLAM AND ALUMINIUM  
 BARREL

**FINISH** BRIGHT

1) ALL TEST SHALL BE CARRIED OUT AS PER ICE-61238-1  
 2) BARRELS SHALL BE CAPPED AND FILLED WITH GREASE SD AS TO  
 AVOID OXIDATION OF THE ALUMINIUM  
 3) LUGS SHALL HAVE MARKING AS MAKE & SIZE ENDESSSED ON LUG.

SIZE	ALUMINIUM					COPPER						
	NA	BC	B	G	H	I	MC	NO	J	F	K	
120/150	15.3	21.5	6.00	NA	83.0	23.0	17.0	35.0	42.0	7.3	3.00	110.0
240/300	21.9	31.0	7.00	83.0	90.0	20.0	17.0	35.0	42.0	7.3	3.17	117.0

DRWN	CHKD	APPR	DATE	SCALE	TITLE
NAKSH	NAKSH	03	11/24/13	1/10	BIMETALLIC ALUMINIUM/COPPER LUG

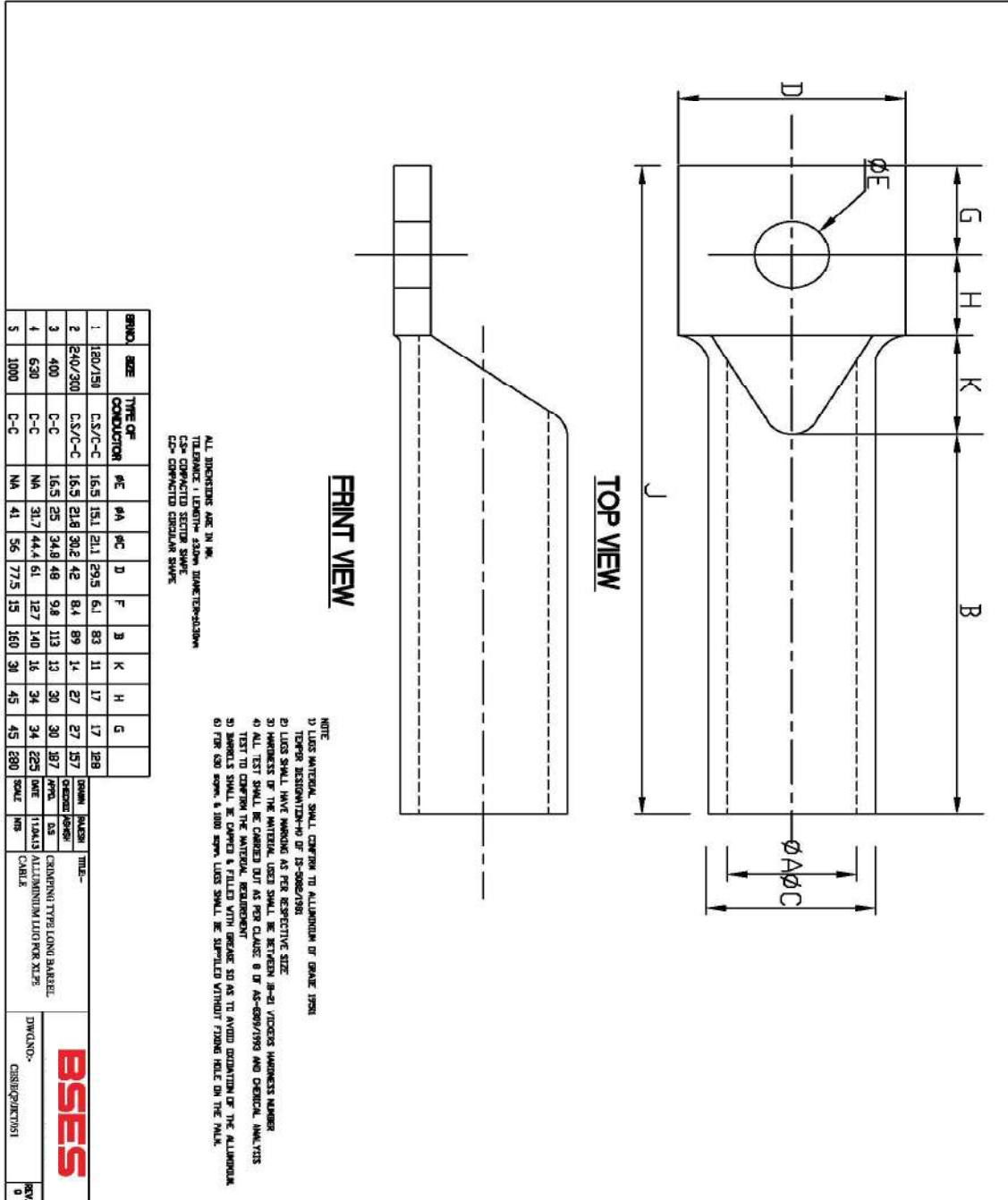
DRG.DWG.-  
CS8180/11/2014

REV. 0

NOTE-ALL DIMENSIONS ARE IN MM.

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)

Annexure – G: Aluminum/Copper Lug For XLPE Cable



**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**

**Annexure-H**

<b>SOP FOR REPAIRING OF CABLE FAULT (Shall be part of PO)</b>		
Sl. No	Activity	Responsibility
<b>Initiation</b>		
1	Identify and isolate fault and inform GNIIT in case of cable fault	Break down team
2	Updation of the details in OMS against respective feeder tripping event.	GNIIT
<b>Fault Location</b>		
1	Information sent to FLC team and SDO.	GNIIT
2	Mobilize FLC team and cable jointing contractor.	SDO
3	Identification of fault location	FLC Team
<b>Preparation for Jointing</b>		
1	Seeking permission from road owning agency	SDO
2	Payment of RR charges to Road owning agency	Finance
3	Digging	Cable jointing contractor
4	Cut faulty section and Pre-test (HV test) cable for multiple fault	Cable jointing contractor
5	BOQ estimation for jointing work ( type, size and length of cable, type of jointing kit)	Cable jointing contractor
6	Filling material reservation slip ( MRS) in SAP	SDO
7	Issuing and transporting material from store.	Cable jointing contractor
<b>Jointing</b>		
1	Cable preparation ( overlap length of cable, slide of armour, build up with inner sheath etc)	Cable jointing contractor (for jointing details refer to manufacturer instruction manual)
2	Copper tape shields	
3	Core preparation	
4	Location of parts in completed joints	
5	Earthing of connection	
6	Completion of joints	
7	Take Photographs before, during and after jointing and send to CES	SDO
8	Supervision during jointing	SDO
9	Sending failed joint to Division store	Cable jointing contractor
<b>Completion and reporting</b>		
1	Intimate to breakdown team about joint completion.	Cable jointing contractor
2	Conduct HV test	Break down team
3	Restore of Supply through jointed cable	Break down team
4	Backfilling, compaction of excavated soil and removing of excess earth from the site	Cable jointing contractor



BSES-TS-45-TERM-R0

**Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**

5	Completion information in Job Card (Details of work done, material consumption, location, feeder name and joint tag no., date, supervisor name, jointer name) sent to SDO	Cable jointing contractor
6	Above information sent to GNIIT	SDO
7	Send information about GPS location of Cable fault to GIS	SDO
8	Daily report of cable jointing to CES	Division Head
9	Updating of information in OMS including supervisor name, jointer name, feeder name	GNIIT
10	Information to include GPS location of cable fault.	GNIIT




Special Note-

- 1) Joints to be done preferably during day. In case of constraints, DGM (O&M) to authorize for night time jointing with supervisor
- 2) Daily joint report to be shared with CES
- 3) Bi-monthly analysis of faulty joint for ensuring warranty compliance to be organized at circle level by contractor in presence of DGM (O&M) and CES
- 4) Certification of job card for payment by DGM (O&M) subject to OMS compliance CES to check any gaps.
- 5) After completion of jointing (33kV and 66kV), all the joints shall be covered with RCC coffin. Coffin shall be filled with white sand complete from the hole provided at the top of the coffin.



## Technical Specification For LT Cable Joints and Terminations

Specification no – SP-LTJKT-06-R1

Prepared by		Reviewed by		Approved by		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
AV		GS		AA		R1	02/06/2017

**Technical Specification For LT Cable Joints and Terminations****Index**

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**Technical Specification For LT Cable Joints and Terminations****1.0.0 Scope of supply**

Design, manufacture, testing of LT jointing and termination kits (1.1 KV) at manufacturers works before dispatch, packing, delivery of material and submission of documents to purchaser.

**2.0.0 Codes & standards**

S No.	Title	Indian Standard
2.1	Cable accessories for extruded power cable	IS 13573 (Part 1):2011
2.2	Cross-linked Polyethylene (XLPE) Insulated PVC sheathed cables : Part 1 : For working voltages from up to and including 1.1 kV	IS – 7098 Part 1 : 1988
2.3	Methods of test for cables	IS - 10810: 1984
2.4	Ferrule	IS:8308, IS:5082
2.5	Electricity Association - Technical Specification -09-13 Material component for use in Electric Power Cable Termination & Joints for System voltage above 1000 V up to 36 kV	EA TS - 09 - 13
2.6	Test method for electric cables	IEC 885 Part 1 -3
2.7	Power cables with extruded Insulation and their accessories for rated voltages from 1kV up to 30kV.	IEC 60502-2009
2.8	Standards Methods for Liquid, Inclined -Plane Tracking and Erosion of Insulation Material.	ASTM D 2303
2.9	Specification, for 1.1 kV Cable joint & Terminations kit.	EN 50393

**3.0.0 Distribution System Data**

3.1	Supply	a. Single Phase 2 wire (AC) b. 3 Phase 4 Wire (AC)
3.2	Voltage	240 V $\pm$ 6% (415V Phase to phase)
3.3	Frequency	50 Hz $\pm$ 5%
3.4	System Neutral	Solidly Earthed

**4.0.0 Environmental Condition Delhi**

4.1	Average grade atmospheric Condition	Heavily Polluted, Dry
4.2	Maximum altitude above sea level	1000 M
4.3	Ambient Air temperature	Highest 50 Deg C, Average 40 Deg C
4.4	Minimum ambient air temperature	0 Deg C
4.5	Relative Humidity	100 % Max
4.6	Thermal Resistivity of Soil	150 Deg C cm/W
4.7	Seismic Zone	4
4.8	Rainfall	750 mm concentrated in four months

**Technical Specification For LT Cable Joints and Terminations****5.0.0 Cable Construction:**

5.1	Size of the cables	<ol style="list-style-type: none"> <li>1. 2C X 10 Sqmm – circular</li> <li>2. 2C X 25 Sqmm - filler</li> <li>3. 4C X 25 Sqmm</li> <li>4. 4C X 50 Sqmm</li> <li>5. 4C X 95 Sqmm</li> <li>6. 4C X 150 Sqmm</li> <li>7. 4C X 300 Sqmm</li> </ol>
5.2	Conductor	<ol style="list-style-type: none"> <li>a. Electrolytic Grade stranded Aluminum Conductor</li> <li>b. Grade: H2/ H4 as per IS: 8130/84 (For Al)</li> <li>c. Shape: compacted sector shaped stranded</li> <li>d. Class 2</li> </ol>
5.3	Insulation	Extruded XLPE
5.4	Inner sheath	Extruded Inner Sheath of Black PVC type ST-2.
5.5	Armour	Galvanized steel flat strip armour GI Wire
5.6	Outdoor Sheath	Extruded outer sheath of PVC (ST-2)
5.7	Maximum Conductor Temperature	Continuous- 90 Deg C, Short Circuit- 250 Deg C

**6.0.0 Cable Jointing Kits**

6.1	Type	Heat Shrinkable straight through joint Kits.
6.2	Size	Suitable for cable sizes mentioned in clause no. 3.1 and Purchaser's Requisition.
6.3	Conductor Connection	<ol style="list-style-type: none"> <li>a. By long barrel AL Ferrule (Please refer drawing mentioned in annexure 'x'.</li> <li>b. Corrosive inhibition paste (M/s Jainson or equivalent) inside the ferrule with plastic end caps.</li> <li>c. Ferrule shall be marked for size of the cable for which it is suitable.</li> <li>d. Crimping mark shall be provided on ferrule.</li> <li>e. Inner edge of ferrules should be chamfered for easy insertion of cable core.</li> </ol>
6.4	Insulation	<ol style="list-style-type: none"> <li>a. Heat shrinkable Insulating tubing for providing insulation over ferrule.</li> <li>b. The reinstated insulation of each core over conductor connector (Ferrule) shall have a single length of heat shrinkable tubing, recovered over the connector with a final minimum overlap of 30 mm on each core. The minimum recovered thickness of insulation shall be 1.5 mm.</li> </ol>
6.4.1	Core spacers	Shall be provided.
6.5	Armour Continuity	A flexible tinned cooper conductor of braided construction shall provide electrical continuity of steel wire armour. The conductor shall be bonded to the armour wires by a combination of a galvanized steel ring inserted under the

**Technical Specification For LT Cable Joints and Terminations**

		wires and stainless steel horse clips (steel grade SS 304). The arrangement shall ensure that temperature rise at bonding point is limited to 160 °C.
6.5.1	Conductor Size	Tinned Copper Conductor/strip/braid
6.5.2	25 Sqmm	16 sq.mm
6.5.3	50 Sqmm	30 sq.mm
6.5.4	95 Sqmm, 150 Sqmm and 300 Sqmm	50 sq.mm
6.6	Mechanical Protection:	The joint shall incorporate a steel screen surrounding the insulated core for full length of the joint. The metallic screen shall be in electrical contact with steel wire armour, but shall not be considered as forming part of armour continuity bond. The steel screen in combination with external heat shrinkable tube shall provide protection to the insulated cores from damages by impacts.
6.7	Covering over the Joints:	The Joint shall be protected from corrosion by heat shrinkable tubes internally coated with mastic or heat activated sealant to provide an environmental seal to the joint. One or two tubes shall be provided. Length of the outer sealing sleeve shall be 500 mm for 25 sq.mm & shall be 1000 mm for 300 sq.mm.
6.8	Identification:	Heat shrinkable tubing shall be printed with batch no./Date/Shrinkage ratio/size etc.

**7.0.0 Cable Termination Kits**

7.1	Type	Heat Shrinkable outdoor termination Kits.
7.2	Size	Suitable for cable sizes mentioned in clause no. 3.1 and Purchaser's Requisition.
7.3	Conductor Connection	<ol style="list-style-type: none"> <li>By long barrel AL Lug (Please refer drawing mentioned in annexure 'x'.</li> <li>Corrosive inhibition paste (M/s Jainson or equivalent) inside the ferrule with plastic end caps.</li> <li>Lug shall be marked for size of the cable for which it is suitable.</li> <li>Crimping mark shall be provided on ferrule.</li> <li>Inner edge of Lug should be chamfered for easy insertion of cable core.</li> </ol>
7.4	Insulation	<ol style="list-style-type: none"> <li>The minimum length of outer sleeve shall be shall be 1000mm.</li> <li>It shall also have UV rating to protect from direct sun light exposure.</li> <li>Each Phase and neutral tube shall have different colour for easy identification. Preferably, Red, Yellow, Blue colour to be used for Phases and Black for neutral. If the same is not possible then at least, Red colour to be used for Phases and Black for neutral.</li> </ol>

**Technical Specification For LT Cable Joints and Terminations**

		d. Lug seal with HMA to be provided for lug sealing.
7.4.1	Core spacers	Shall be provided.
7.5	Armour Continuity	A flexible tinned copper braid Insulated with Heat shrink tube shall provide electrical continuity of steel wire armour. The fault current capacity of copper braid should withstand the cable fault current capacity based upon different size of cable as defined in IS: 13234. The conductor shall be bonded to the armour wires by a combination of galvanized steel ring inserted under the wires and stainless steel horse clips (steel grade SS 304). The arrangement shall ensure that temperature rise at bonding points shall be limited to permissible temperature of cable. Earthing braid should be provided with length sufficient to take one complete turn on armour and then continue to the other end of the armour with one turn around, This one turn will ensure the firm contact with the armour to tighten this braid worm drive clips two per side to be provided with back up ring the remaining 70 % of braid will be insulated with heat shrink tubes to ensure the Insulated earth at Heat shrink breakout region.

**8.0.0 Properties of Heat shrinkable components:**

8.1	Heat Shrinkable Components General properties	Components shall be capable of being stored without deterioration within temperature range of 10 Deg C to 45 Deg. C and shall have unlimited shelf life. Sealant activated by heat shall be used in conjunction with heat shrinkable components to provide an environmental seal to the completed joint.
8.2	Electric Strength	$\geq 8$ kV/mm
8.3	Heat shock 250 °C for 15 Min.	No splitting, dripping or flowing.
8.4	Tensile Strength	$\geq 12$ Mpa ( 120 kg/sq.mm)
8.5	Elongation	$\geq 200\%$
8.6	After Thermal Ageing at 120°C for 500Hrs.	
8.7	Tensile Strength	$\geq 10$ Mpa (100 kg/sq.mm)
8.8	Elongation	$\geq 100\%$

**Technical Specification For LT Cable Joints and Terminations****9.0.0 Quality Assurance, Inspection & Testing**

9.1	Vendor Quality Plan	To be submitted for purchaser's approval.
9.2	Sampling methods	Sampling Method for quality checks shall be as per relevant IS/ IEC/ EA TS-09-13 guidelines and Purchaser's prior approval shall be taken for the same.
9.3	Inspection Hold- Points	To be mutually identified, agreed and approved in Quality Plan.
9.4	Type test	<ol style="list-style-type: none"><li>Joints and terminations shall be type tested from CPRI / ERDA as per IS 13573 -Part1.</li><li>Randomly selected sample shall also be type tested without any commercial implication from the offered lot in the event of order.</li><li>Loose components shall be tested as per EA TS -09-13.</li></ol>
9.5	Routine tests	As per relevant IS and EA TS -09-13
9.6	Acceptance test	<ol style="list-style-type: none"><li>Visual Inspection- The offered kits shall be free from any visible defects,</li><li>Physical verification of contents - all the contents shall be checked as per kit contents list enclosed by the bidder,</li><li>Electric Strength test for Insulation tubing.</li><li>Elongation tests for all types of tubing.</li><li>Wall thickness ratio</li><li>Longitudinal change after full recovery.</li><li>Tracking and corrosion resistance test.</li><li>Tensile strength.</li></ol>
9.7	Inspection	<ol style="list-style-type: none"><li>Purchaser reserves the right to inspect /witness all tests on the meters at Seller's works at any time, prior to dispatch, to verify compliance with the specification/ standards.</li><li>Manufacturer should have all the facilities/ equipments to conduct all the acceptance tests as per clause 14.3 relevant standards and tampers logics as per approved GTP. All the equipments including tamper logs kits/ jigs should be calibrated.</li><li>In-process and / or final inspection call intimation shall be given in advance to purchaser.</li></ol>
9.8	Guaranteed Life	Joint shall be guaranteed for a period of 66 months against defective design & material & shall be replaced free of cost to BSES if failed due to design / material defect.



**Technical Specification For LT Cable Joints and Terminations****10.0.0 Packing and Marking Shipping, Handling and Storage**

10.1	Packing	a. In 7 Ply corrugated box made out of 150 GSM Virgin Kraft Paper. b. Protection against shocks & vibration
10.2	Packing identification labels	Manufacturer Name, Number of items, Month & Year of manufacturing, Shelf life of Kit, Property of BSES
10.3	Corrugated Box contents	Kit components in proper packing with label indicating component name, quantity & shelf life. Bill of material sheet Instruction sheet for step by step jointing in English & Hindi

**11.0.0 Deviations**

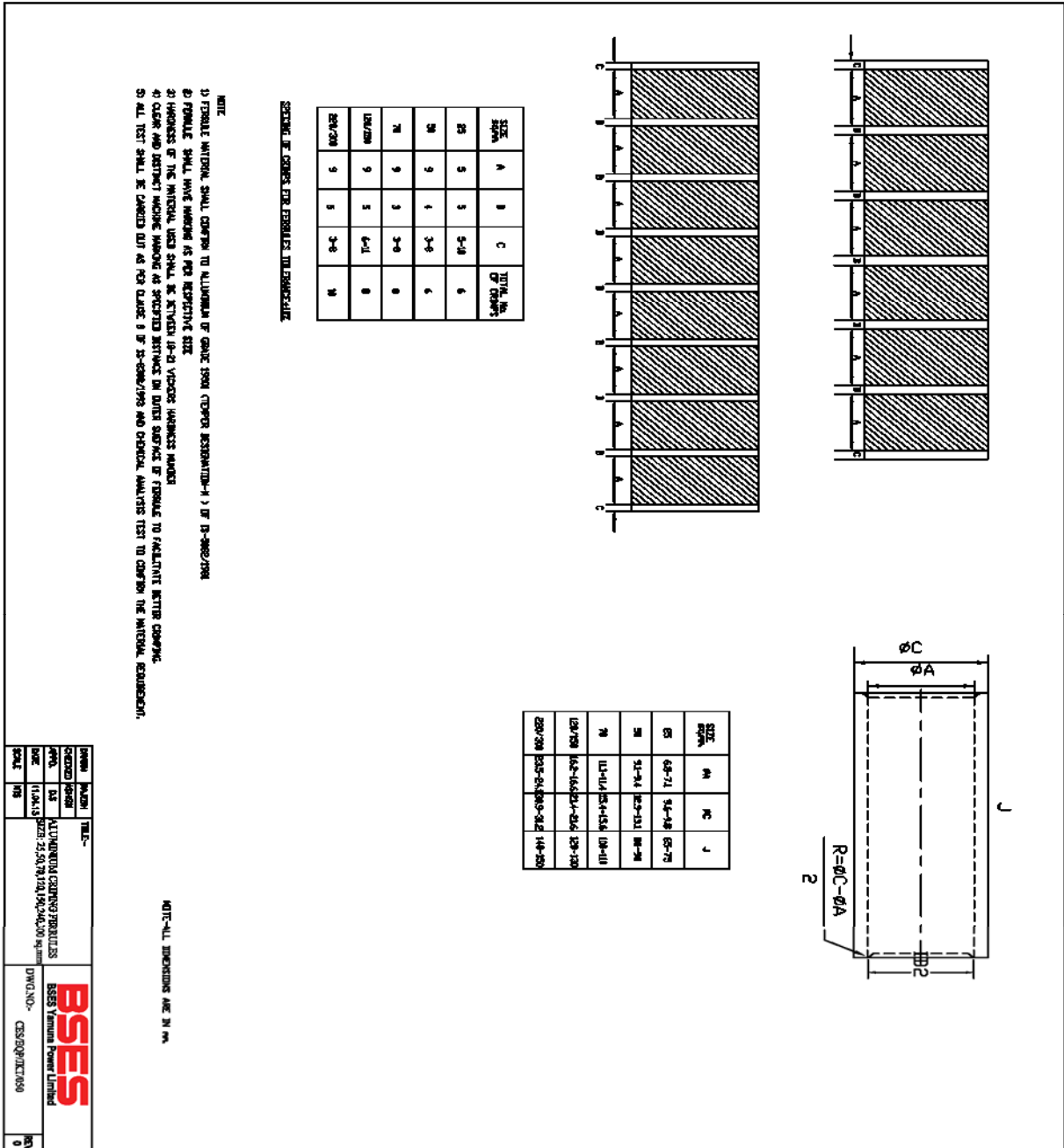
12.1	Deviations to this specification to be submitted in writing by Vendor. Bidder to submit copy of this specification along with company seal & signature on each page.
------	--

**12.0.0 Drawing Submission:**

12.1	The seller has to submit following: along with bid
12.1.1	GTP (duly filled-in)
12.1.2	Deviation sheet, if any.
12.1.3	GA / cross sectional drawing of complete joint/ termination and individual components.
12.1.4	01 no's sample of each type of kit.
12.1.5	Detailed reference list of customers using the offered product during the last 5 years with similar design and rating
12.1.6	Manufacturer's quality assurance plan and certification for quality standards
12.1.7	Type test reports for the same type, size & rating.
12.1.8	Complete product catalogue and Manual.
12.1.9	Recommended accessories or any other hardware for five years of operation.
12.2	Seller has to submit following drawings for buyer's Approval (A) / Reference (R) After award of contract -
12.2.1	Program for production and testing (A)
12.2.3	Guaranteed Technical Particulars (A) and Kit contents.
12.2.4	GA drawing
12.2.5	Detailed installation and commissioning instructions
12.2.6	Quality plan and field quality plan.
12.3	Submittals required prior to dispatch
12.3.1	Inspection and test reports, carried out in manufacturer's works
12.3.2	Test certificates of all bought out items
12.3.5	Number of Documents required at different stages shall be per Annexure- A
12.3.6	Duly signed & stamped copies of the drawings / documentation are required to be submitted to BSES for approval.

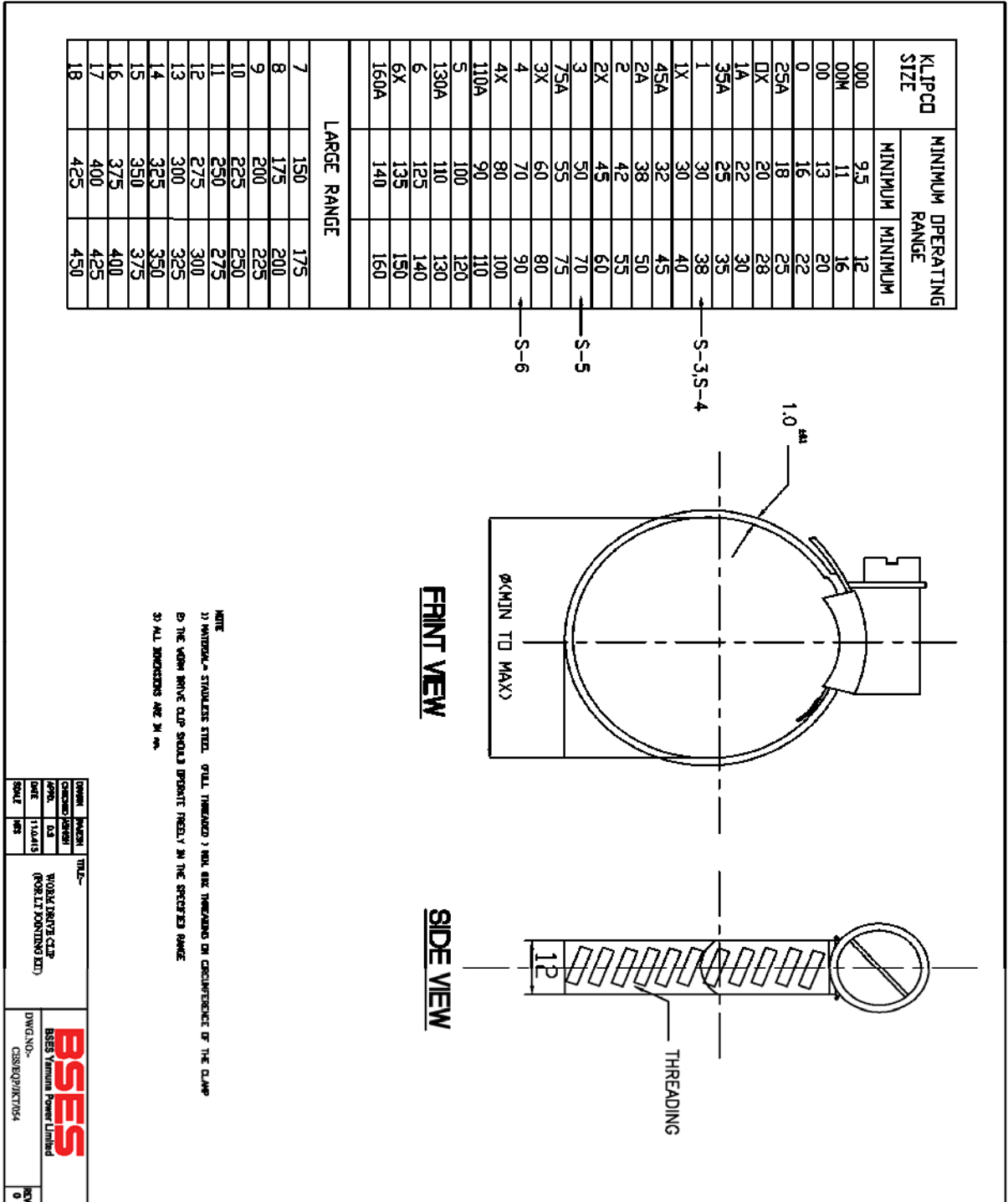
## Technical Specification For LT Cable Joints and Terminations

### Annexure A: Drawing of AI Crimping Ferrule

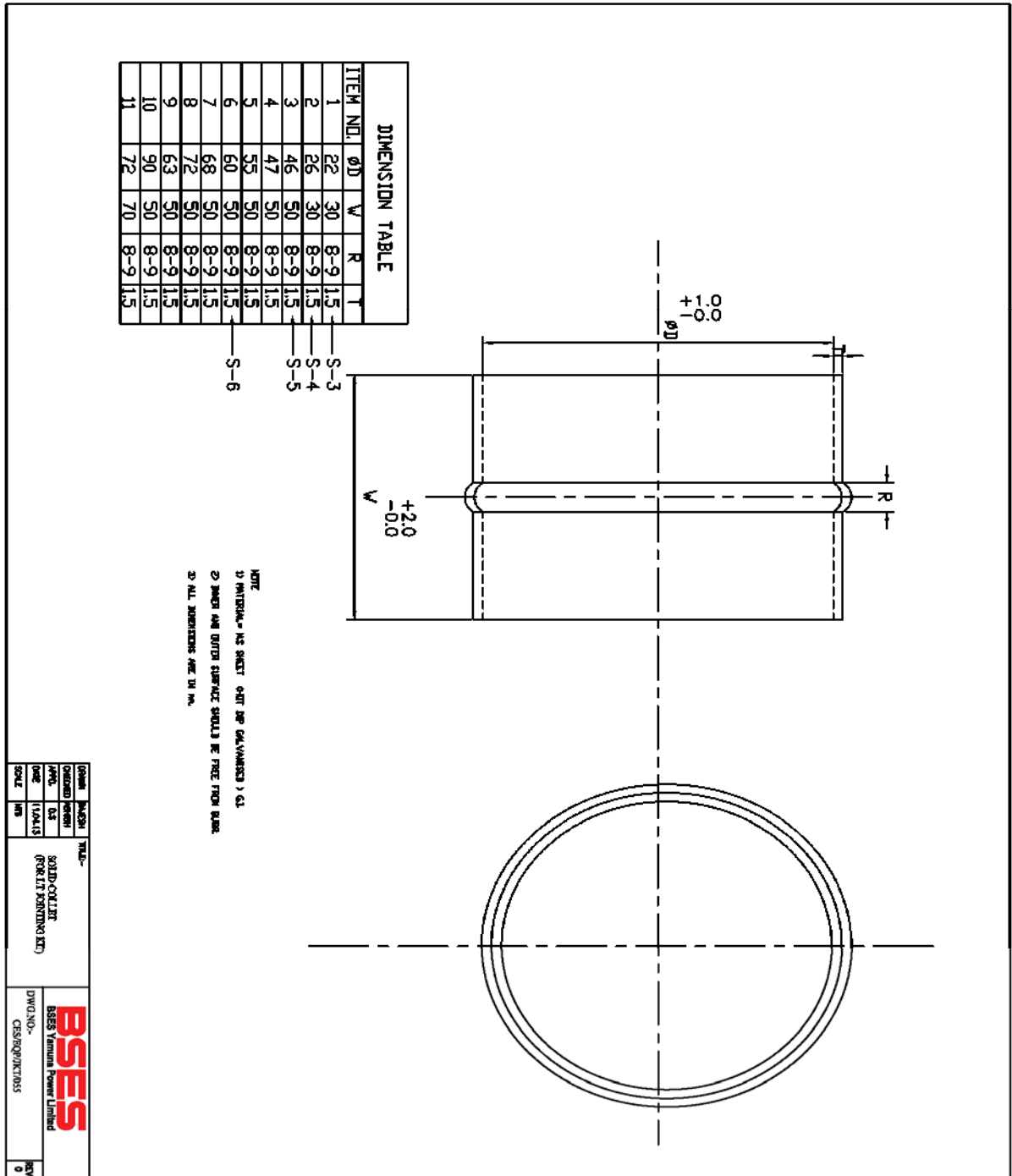


## Technical Specification For LT Cable Joints and Terminations

### Annexure B: Drawing of Worm Drive Clip

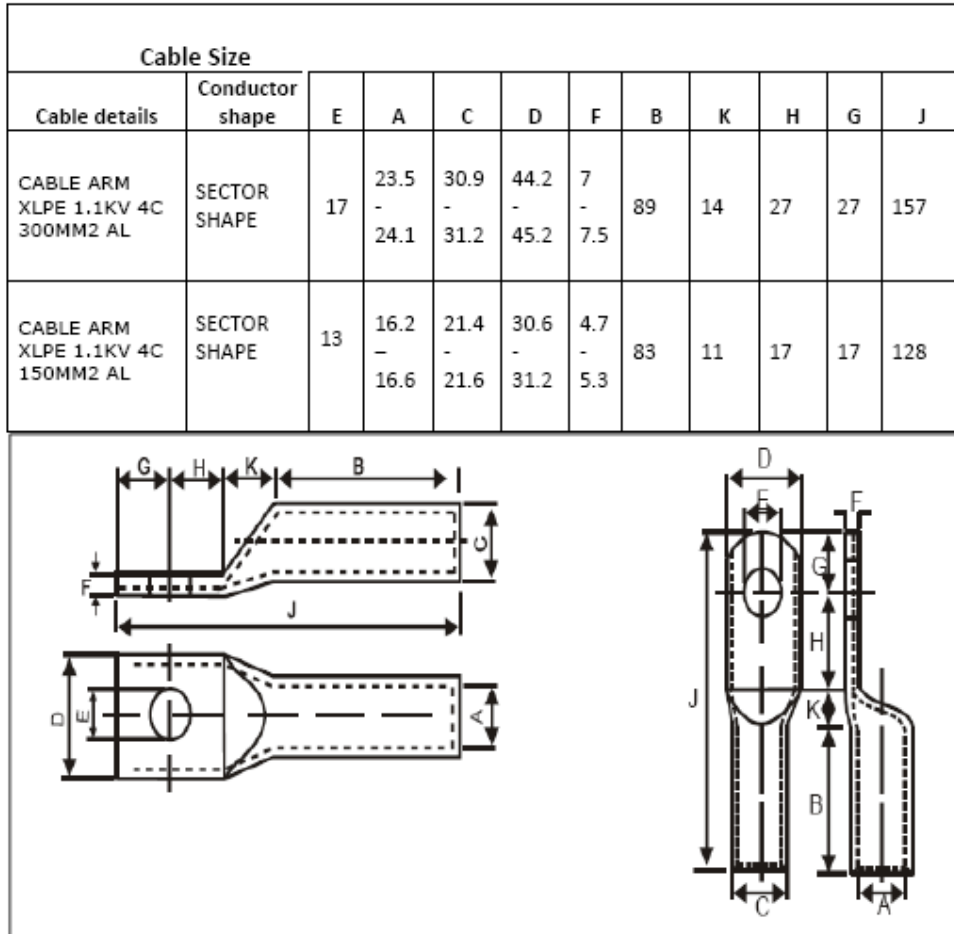


## Annexure C: Drawing of Solid Collet



## Technical Specification For LT Cable Joints and Terminations

### Annexure D: Drawing of Aluminum Lug



NOTE: ALL DIMENSIONS ARE IN MM



Technical Specification of  
LT Power Cable(Single & Multi-Core)

Specification no – BSES-TS-01-LTPC-R0

Rev:	0	
Date:	31 Mar 2022	
Prepared by	Abhishek Vashistha	
	Rohit Patil	
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	Amit Tomar	
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	K. Sheshadri	

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**TECHNICAL SPECIFICATION OF LT POWER CABLE****1.0 SCOPE OF SUPPLY**

The specification covers design, manufacture, shop testing, packing and delivery of 1100 Volts grade, Aluminium conductor XLPE insulated power cables.

**2.0 CODES & STANDARDS**

The cables shall be designed, manufactured and tested in Accordance with the following Indian & IEC standards.

2.1	IS- 7098 (Part-1)	Cross linked polyethylene insulated PVC sheathed cables for working voltages upto and including 1100V.
2.2	IS- 6474	Polyethylene insulation & sheath of electric cables.
2.3	IS- 5831	PVC insulation and sheath of electrical cables.
2.4	IS : 10810	Methods of tests for cables.
2.5	IS : 8130	Conductors for insulated electrical cables and flexible cords.
2.6	IS : 3975	Low carbon galvanized steel wires, formed wires and tapes for armouring of cables.
2.7	IS- 4026	Aluminum ingots, billets and wire bars (EC grade)
2.8	IS-5484	EC Grade aluminium rod produced by continuous casting and rolling
2.9	IS : 10418	Specification for drums for electric cables.
2.10	IS : 3961	Recommended current ratings for cables.
2.11	IS:1255	Installation and Maintenance of power cables upto and including 33 kV rating.
2.12	IS:4826	Specification for hot-dipped galvanized coatings on round steel wires
2.13	IS:1717	Metallic Materials – Wire – Simple torsion test
2.14	IEC 60228	Conductors of insulated cables. Guide to the dimensional limits of circular conductors.
2.15	IEC 60331	Fire resisting characteristics of electric cables.
2.16	IEC 60332 – 3	Tests on electric cables under fire conditions. Part 3: Tests on bunched wires or cables.
2.17	IEC 60502	Extruded solid dielectric insulated power cables for rated voltages from 1kV to 30 kV.
2.18	IEC 60754 – 1	Test on gases evolved during combustion of materials from cables. Part 1: Determination of the amount of halogen acid gas evolved during combustion of polymeric material taken from cables.
2.19	IEC 60811	Common test methods for insulating and sheathing materials of electric cables
2.20	IEC 60885	Electric test methods for electric cables
2.21	IEC 60304	Standard colours for insulation for low frequency cables and wires.
2.22	IEC 60227	PVC insulated cables of rated voltages up to and including 460/760 V.



**TECHNICAL SPECIFICATION OF LT POWER CABLE**

2.23	IEC 1034	Measurement of smoke density of electric cables burning under defined conditions
2.24	ASTMD 2843	Standard Test Method for density of Smoke from the burning or decomposition of cables
2.25	ASTM 2863	Standard Test Method for measuring of minimum oxygen concentration
2.26	IEC 60754-1	Test on gases evolved during combustion of materials for cables. Part 1 – Determination of the Halogen Acid gas Content
2.27	IS 1554 part 1	Specification for PVC insulated (Heavy duty) Electric cable

**3.0 CABLE DESIGN**

Description of each item mentioned in the specification (the text, BOQ, GTP or any site specific requirement) shall be followed along with IS: 7098 – P1

3.1	Conductor	a) Electrolytic Grade Stranded Aluminium Conductor												
		b) Grade: H2 as per IS: 8130/1984												
		c) Class 2												
		d) Chemical Composition as per IS 4026												
		e) Shape& Size:												
		<table border="1"> <thead> <tr> <th>S. no.</th> <th>Shape</th> <th>Single core (sq.mm)</th> <th>Multi core (sq.mm)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Compacted Circular</td> <td> <ul style="list-style-type: none"> <li>• 1cx25</li> <li>• 1cx95</li> <li>• 1cx300</li> <li>• 1cx630</li> <li>• 1cx1000</li> </ul> </td> <td> <ul style="list-style-type: none"> <li>• 2cx10</li> </ul> </td> </tr> <tr> <td>2</td> <td>Sector</td> <td>---</td> <td> <ul style="list-style-type: none"> <li>• 2cx25</li> <li>• 4cx25</li> <li>• 4cx50</li> <li>• 4Cx150</li> <li>• 4Cx300</li> <li>• 4Cx400</li> </ul> </td> </tr> </tbody> </table>	S. no.	Shape	Single core (sq.mm)	Multi core (sq.mm)	1	Compacted Circular	<ul style="list-style-type: none"> <li>• 1cx25</li> <li>• 1cx95</li> <li>• 1cx300</li> <li>• 1cx630</li> <li>• 1cx1000</li> </ul>	<ul style="list-style-type: none"> <li>• 2cx10</li> </ul>	2	Sector	---	<ul style="list-style-type: none"> <li>• 2cx25</li> <li>• 4cx25</li> <li>• 4cx50</li> <li>• 4Cx150</li> <li>• 4Cx300</li> <li>• 4Cx400</li> </ul>
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3.2	Insulation	Extruded XLPE insulation as per IS : 7098 part-1												
3.3	Core Identification	a) Single Core Cable – Natural b) Two Core Cable – Red & Black c) Four Core Cable – Red, Yellow, Blue and Black												
3.4	Inner Sheath	a) For Single Core Cable – Inner Sheath Not Required b) For 2 Core cable- Pressurized Extruded, Black PVC type ST-2 (IS 5831-1984) c) For 4 core cable –Extruded Black PVC type ST-2 (IS 5831-1984)												
3.5	Armour	a) For 2C X 10 mm <sup>2</sup> – Galvanized Steel round wire. b) For all sizes above 10 mm <sup>2</sup> -Galvanized Steel Strip c) Armour not required for single core cables d) Minimum area of coverage of armouring shall be 90%												

**TECHNICAL SPECIFICATION OF LT POWER CABLE**

		<p>e) The breaking load of armour joint shall not be less than 95% of that of armour wire / strip</p> <p>f) Zero negative tolerance for thickness of armour strip shall be as per IS:3975</p> <p>g) Zinc rich paint shall be applied on strip/wire and its joint surface.</p>
3.6	Outer Sheath	<p>a) Extruded FRLS outer sheath of PVC (ST-2) shall be as per IS:5831</p> <p>b) Colour :</p> <ul style="list-style-type: none"> <li>• For multi core cables-<b>Orange/Yellow as per tender requirement</b></li> <li>• For single core cables – <b>Orange/Black as per tender requirement</b></li> </ul> <p>c) FRLS Outer sheath of all the LT cables shall be UV resistant; as these cables are laid in air exposed to sun. Bidder to ensure the same for these requirements supported by required test.</p> <p>d) Shape of the cable over the outer sheath shall be circular, when manufactured/completed.</p> <p>e) The FRLS outer Sheath shall be embossed with following minimum text:</p> <ol style="list-style-type: none"> <li>i) The voltage designation</li> <li>ii) Type of construction /cable code (For e.g. A2XWY/A2XFY)</li> <li>iii) FRLS</li> <li>iv) Manufacture name/Trade mark</li> <li>v) Number of Cores and nominal cross section area of conductor</li> <li>vi) Name of buyer i.e BSES</li> <li>vii) Month &amp; year of manufacturing</li> <li>viii) IS reference , i.e. IS:7098</li> <li>ix) P.O No. and Date</li> <li>x) Font size shall be 5/5mm</li> <li>xi) ISI mark</li> </ol> <p>The embossing shall be progressive, automatic, in line and marking shall be legible and indelible.</p> <p>Following points shall be printed on every meter of cable</p> <ol style="list-style-type: none"> <li>i. Progressive (Sequential) length of cable at every meter, starting from zero for every drum. Colour filled in for the progressive marking, shall be with proper contrast in colouring.</li> <li>ii. Drum number marking on every meter of the cable length</li> </ol>
3.7	Bending Radius	Bending Radius of cable shall comply to IS:1255
3.8	Sealing of cable end	Both ends of the cable shall be sealed by means of non-hygroscopic

**TECHNICAL SPECIFICATION OF LT POWER CABLE**

		heat shrinkable PVC caps
3.9	FRLS Properties	Oxygen Index : Not less than 29% as per ASTM 2863
		Temperature Index : 250 Deg C at Oxygen Index 21 (when tested as per ASTM D 2863)
		Max Acid Gas Generation – Not more than 20% as per IEC -60754-1
		Light Transmission - Minimum 40% when tested as per ASTM D 2843 (Smoke Density rating shall be max 60%)
		Flammability Test – IEC 60332 part -1

**4.0 CABLE DRUM**

4.1	Reference Standard	Cable drum shall comply with IS: 10418.
4.2	Type of Drum	Wooden drums with anti termite treatment. (The drums shall be provided with M.S spindle plate and nut-bolts arrangement as per IS : 10418 )
4.3	Drum Length & Tolerance	<ul style="list-style-type: none"> <li>• For 2C X 10 mm<sup>2</sup> Cable - 1000+/-5% Mtr</li> <li>• For all Other cable sizes - 500 +/-5% Mtr</li> </ul>
4.4	Overall Tolerance	-2 % for the total cable length for the entire order.
4.5	Short Length of Cable	<p>a) Minimum acceptable length (Max. is 525 mtr) shall be 1 % of the total ordered qty. &amp; no length shall be less than 250 mtr. Manufactures shall be taken prior approval from BSES Engineering for any short length supply. Short length will be accepted in last lot.</p> <p>b) Manufacture shall not be allowed to put two cable pieces of different short length in same cable drum</p>
4.6	Preventive Measure for cable Drum	<p>a) The surface of the drum and outer most cable layer shall be covered with water proof layer</p> <p>b) Ferrous part of wooden drum shall be treated with suitable rust preventive paint/coating to minimize rusting during storage.</p>
4.7	Drum Identification Labels	<p>a) Drum identification number</p> <p>b) Cable voltage grade</p> <p>c) Cable code (eg. A2XFY/A2XWY)</p> <p>d) Number of cores and cross sectional area</p> <p>e) Cable quantity i.e cable length (Meters)</p> <p>f) Purchase order number, date &amp; SAP item code</p> <p>g) Total weight of cable and drum (kg)</p> <p>h) Manufacture’s and Buyer’s name</p> <p>i) Month &amp; year of manufacturing</p> <p>j) Direction of rotation of drum; an arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.</p> <p>k) Cable length final end-marking (i.e reading at the inner end</p>

**TECHNICAL SPECIFICATION OF LT POWER CABLE**

and reading at the outer end, just before packing shall be marked on the drum.

**5.0 PACKING, SHIPPING, HANDLING & STORAGE**

5.1	Shipping information Plan	The seller shall be give complete shipping information concerning the weight ,size of each package
5.2	Transit Damage	The seller shall be held responsible for all transit damage due to improper packing/inside cable damaged found in store/site
5.3	Cable Drum Handling	The drum shall be with M.S spindle plate( with nut –bolts) of adequate size to suit the spindle rod , normally required for handling the drums , according to expected weight of the cable drums as per IS:10418

**6.0 QUALITY ASSURANCE, TESTING& INSPECTION**

All the tests shall be carried out in accordance with IEC / IS standards.

6.1	Quality Assurance Plan	In event of order manufacturer has to submit the signed copy of QAP.
6.2	Inspection hold points	AS per approved QAP (QAP shall be approved at the time of GTP approval)
6.3	Routine Test	a) Measurement of Electrical Resistance b) HV test with power frequency AC voltage
6.4	Type Test	<b>For bid participation–</b> (a) Bidder must be submitted cable type tested report from CPRI/ERDA/NABL approved lab for the type, size & rating of similar or higher sizes of offered cable along with bid. <b>After award of P.O.-</b> (b) If a bidder has valid type test report from CPRI/ERDA lab for the type, size & rating of similar or higher sizes of offered cable (including FRLS)—No need to conduct fresh type test from CPRI/ERDA lab. (c) If a bidder has valid type test report from CPRI/ERDA lab for the type, size & rating of similar or higher sizes of offered cable (except FRLS)—Need to conduct only fresh type test of FRLS properties test from CPRI/ERDA/NABL lab(list of tests mentioned in clause 3.9)without any commercial implication to BSES. (d) If a bidder has valid type test report from NABL lab for the type, size & rating of similar or higher sizes of offered cable (including FRLS)—Need to conduct complete type test (including FRLS properties) from CPRI/ERDA lab without any

**TECHNICAL SPECIFICATION OF LT POWER CABLE**

		<p>commercial implication to BSES. (Type test shall not be more than 5 years old. If the type test report is more than 5 years old (max 10 years), it can be considered subject to no change in their design)</p> <p>(e) UV resistance test to be carried out on one sample from CPRI/ERDA/NABL Accredited Lab as per ASTM standard (sample shall meet minimum 80% retention in tensile strength and elongation after exposure of 21 days as per ASTM standard).</p>
6.5	Acceptance Test (Shall be conducted as per Cl.15.2 of IS 7098 Part-1 & IS 1554 part 1 for each lot of cable)	<p>a) For cable sizes up to 25 mm<sup>2</sup> – one sample for chemical composition and purity test of aluminium shall be conducted per 300km of ordered quantity and multiple thereof.</p> <p>b) For cable sizes 50mm<sup>2</sup> – one sample for chemical composition and purity test of aluminium shall be conducted per 100km of ordered quantity and multiple thereof.</p> <p>c) For cable sizes above 50 mm<sup>2</sup> – one sample for chemical composition and purity test of aluminium shall be conducted upto 50km of ordered quantity and multiple thereof.</p> <p>d) Chemical composition and purity test of aluminium shall be conducted from the lot offered to BSES on each size involved in the purchase order. Test shall be carried out at NABL accredited third party lab without any price implication to BSES.</p> <p>e) The sample will be selected either during acceptance test or after receipt of cable in BSES Stores.</p>
6.6	Inspection	<p>a) The buyer reserves the right to witness all tests specified on completed cables</p> <p>b) The buyer reserves the right to inspect cables at the seller's works at any time prior to dispatch either in finished form or during manufacturing, to prove compliance with the specifications.</p> <p>c) In-process and final inspection call intimation shall be given in 10 days advance to purchaser/CES.</p>
6.7	Test Certificates	Complete test certificates (routine & acceptance tests) need to be submitted along with the delivery of cables.

**7.0 DOCUMENT SUBMISSION MATRIX**

Document/Drawing submission shall be as per the matrix given below:

- a. All documents/drawings shall be provided in soft copy only via mail or in returnable Pen drives
- b. Language of the documents shall be English only.
- c. Document check sheet compliance shall be the first sheet for each submission stage i.e. Technical bid, Drawing Approval, Pre Dispatch, Pre closure

**TECHNICAL SPECIFICATION OF LT POWER CABLE**

- d. No submission is acceptable without check list compliance.
- e. Deficient/ improper or incomplete document/ drawing submission shall be liable for rejection.
- f. Order of documents shall be strictly as per the check list.
- g. Any document not included in the below table but necessary for detailed engineering shall be deemed to be included in bidder's scope

S No.	Detail of Document	Bid	Approval	Pre Dispatch
1	Guaranteed Technical Particulars (GTP)	Required	Required	
2	Deviation Sheet, if any	Required	Required	
3	Detailed cross sectional drawing of cable	Required	Required	
4	Dimensional drawing of cable drum	Required	Required	
4	Type test reports of offered type and rating of cable	Required	Required	
5	BIS certificate	Required		
6	Complete cable catalogue	Required		
7	Make of Raw Materials	Required	Required	
8	Cable de-rating factors	Required	Required	
9	Armour coverage calculation		Required	
10	Inspection test reports and Routine Test Certificates carried out in manufacturer's works			Required
12	Test certificates of all raw materials			Required
13	Calibration test reports of instruments			Required

**8.0 PROGRESS REPORTING**

8.1	Outline Document	To be submitted for purchaser approval for outline of Production-inspection, testing-inspection, packing, dispatch, documentation programme.
8.2	Detailed Progress Report	To be submitted to purchaser once a month containing a) Progress on material procurement b) Progress on fabrication (As applicable) c) Progress on assembly (As applicable) d) Progress on internal stage inspection e) Reason for any delay in total programme f) Details of test failures if any in manufacturing stages. g) Progress on final box up constraints/forward path.

**9.0 DEVIATION**

- a) Deviations from this specification shall be listed separately by bidder clause wise (format given below) along with optional offer and has to submit the list along with bid/quotation. BSES will review the deviations and if BSES is agreed with the deviation, seller has to take written confirmation from BSES on deviation during tender evaluation.
- b) In the absence of any separate list of deviations from the bidders with bid as well as written confirmation from BSES on deviations, it will be assumed by the Buyer that the Seller complies with the Specification fully.
- c) Any deviations mentioned in any other submitted bid documents (i.e.in filled GTP, Catalog, BSES old approval, buyer's/seller's standards etc) by seller without separate deviation sheets will not consider as a deviation from this tech spec at any stage of contract.

Deviation sheet format

Sl. No.	Document Name	Clause No.	Deviation	Reason	Merit to BSES

**TECHNICAL SPECIFICATION OF LT POWER CABLE****10.0 Annexure -A****GUARANTEED TECHNICAL PARTICULARS (Multi-core)****(Standard Cable sizes are 2cx10, 2cx25, 4cx25, 4cx50, 4C X 95, 4cx150, 4cx300, 4cx400)****For each size /rating separate GTP need to be furnished**

<b>Sr. No.</b>	<b>Description</b>	<b>Buyer's Requirement</b>	<b>Seller's data</b>
	Manufacture Contact Person & Number		
	Purchase Req. No.	.....	
	Guarantee Period: ( Min )	60 Months (from date of commissioning) / 66 months (from date of receipt at purchaser's store) whichever is earlier	
	Applicable IS / IEC Standard followed by vendor	As mentioned in the clause no – 2.0	
1	Make	...	
2	Type (as required by purchaser)		
A	For 2CX10Sqmm	A2XWY	
B	For Sizes above 10 mm <sup>2</sup>	A2XFY	
3	Voltage Grade (kV)	1.1	
4	Maximum Conductor temperature		
A	Continuous	90°C	
B	Short time	250°C	
5	Conductor		
A	Material and Grade	As per Cl.3.1	
B	Make of Al	Ref Annexure D	
C	Size (mm <sup>2</sup> )	..... mm <sup>2</sup>	
D	Min no. of wires in each conductor (Nos.)	As per Manufacturer Standard	
E	Min Dia. of wires in each conductor before compaction (mm)	As per Manufacturer Standard	



**TECHNICAL SPECIFICATION OF LT POWER CABLE**

<b>Sr. No.</b>	<b>Description</b>	<b>Buyer's Requirement</b>	<b>Seller's data</b>
F	Shape of Conductor	As per Cl.3.1 (e)	
G	Diameter over conductor (mm)	.....	
H	Maximum Conductor resistance at 20 ° C(Ohm/Km)	As per Table 2 of IS 8130	
6	Insulation		
A	Insulation Material	As per Cl. 3.2	
B	Nominal thickness (mm)	As per Table 3 of IS 7098 Part-1	
C	Diameter over Insulation (mm) Approx.	.....	
D	Make of insulation compound	Ref: Annexure D	
7	Inner Sheath		
A	Material and Type	As per Cl. 3.4	
B	Minimum thickness	As per Table 5 of IS 7098 Part-1	
C	Approx. dia. Over sheath (mm)	.....	
8	Galvanized Steel Armour	as per purchaser's site - specific condition	
A	Material		
a)	For 2CX10 mm <sup>2</sup>	G.I. Wire	
(i)	Wire Dia. (mm)	1.4+/-0.040	
(ii)	No. of wires	As per Manufacturer Standard	
b)	For sizes above 10 mm <sup>2</sup>	G.I. Strip	
(i)	Strip size ( Width and Thickness)	4x0.8 (Zero negative tolerance for thickness)	
(ii)	No. of Strips	As per Manufacturer Standard	
B	Area covered by Armour	Min 90% and calculations shall be strictly as per Annexure-D	
C	Dia. over Armour – Approx.(mm)	.....	

**TECHNICAL SPECIFICATION OF LT POWER CABLE**

<b>Sr. No.</b>	<b>Description</b>	<b>Buyer's Requirement</b>	<b>Seller's data</b>
9	Outer Sheath (FRLS)		
A	Material and Type	As per Cl. 3.6	
B	Minimum Thickness	As per Table 8 of IS 7098 Part-1	
C	Colour	Orange	
D	Embossing Details	As per Cl.3.6 (e)	
10	Approx. overall dia. (mm)	.....	
11	Overall order tolerance	- 2 % for the total cable length for the entire order	
12	Cable Drum		
A	Type of Drum	Wooden	
B	Drum Length & tolerance	As per Spec. Cl. 4.3 & 4.4	
C	Marking on Drum	As per Spec. Cl. 4.7	
D	Drums provide with MS Spindle plate & nut bolts arrangement (as per IS:10418)	Required	
13	End Cap	Required	
14	Weights	.....	
a)	Net Weight of cable ( Kg/Km. ) – Approx		
b)	Weight of empty drum	Kg	
c)	Weight of cable with drum	Kg	
15	Continuous current rating for standard I.S condition laid direct		
a)	In ground 30° C	Amps	
b)	In duct 30° C	Amps	
c)	In Air 40° C	Amps	
16	Short circuit current for 1 sec of Conductor (kAmp)	.....	
17	Electrical Parameters at Maximum operating temperature:		
A	AC Resistance	Ohm/Km	

**TECHNICAL SPECIFICATION OF LT POWER CABLE**

<b>Sr. No.</b>	<b>Description</b>	<b>Buyer's Requirement</b>	<b>Seller's data</b>
B	Reactance at 50 C/s	Ohm/Km	
C	Impedance	Ohm/Km	
D	Capacitance	Micro farad / Km	
18	Recommended minimum bending radius	..... x O/D	
19	De-rating factor for following Ambient temperature in	Ground / Air	
a)	At 30° C		
b)	At 35° C		
c)	At 40° C		
d)	At 45° C		
e)	At 50° C		
20	Group factor for following Nos. of cables laid	Touching / Trefoil	
a)	3 Nos.		
b)	4 Nos.		
c)	5 Nos.		
d)	6 Nos.		
21	Process of Cross linking of Polyethylene	Dry/ Sioplas Cure	
22	Type test	Is copy of latest valid TTR for respective Sizes enclosed? Yes /No	
23	FRLS Properties	As per IS 1554, Part-1	
	Oxygen Index	As per IS 1554, Part	
	Temperature Index	As per IS 1554, Part	
	Max Acid Gas Generation	As per IS 1554, Part	
	Light Transmission / Smoke Density	As per IS 1554, Part	

**11.0 ANNEXTURE- B****GUARANTEED TECHNICAL PARTICULARS (Single Core)****(Separate GTP needs to be furnished for 25, 95, 300, 500, 630 & 1000 mm<sup>2</sup> cables)**

**TECHNICAL SPECIFICATION OF LT POWER CABLE**

<b>S.No.</b>	<b>Description</b>	<b>Buyer's Requirement</b>	<b>Seller's data</b>
	Manufacture Contact Person & Number		
	Purchase Req. No.	.....	
	Guarantee Period: ( Min )	60 Months (from date of commissioning) / 66 months (from date of receipt at purchaser's store) whichever is earlier	
	Applicable IS / IEC Standard followed by Vendor	As mentioned in the clause no-2.0	
1	Make	.....	
2	Type	A2XY (Un-armoured)	
3	Voltage Grade (kV)	1.1kV	
4	Maximum Conductor temperature		
A	Continuous	90°C	
B	Short time	250°C	
5	Conductor		
A	Material and Grade	As per Cl. 3.1	
B	Size (mm <sup>2</sup> )	.....mm <sup>2</sup>	
C	Min no. of wires in each conductor (Nos.)	As per Manufacturer Standard	
D	Min Dia. of wires in each conductor before compaction (mm)	As per Manufacturer Standard	
E	Shape of conductor	Compacted Circular	
F	Diameter over conductor (mm)	.....	
G	Maximum Conductor resistance at 20 ° C(Ohm/Km)	As per Table 2 of IS 8130	
H	Make of Al	Ref Annexure D	
6	Insulation	As per Table 3 of IS7098 Part-1	
A	Insulation Material	As per Cl. 3.2	

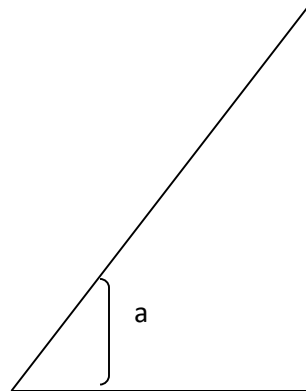
**TECHNICAL SPECIFICATION OF LT POWER CABLE**

<b>S.No.</b>	<b>Description</b>	<b>Buyer's Requirement</b>	<b>Seller's data</b>
B	Nominal thickness (mm)		
(i)	For 1Cx300 mm <sup>2</sup>	1.8 mm	
(ii)	For 1Cx500 mm <sup>2</sup>	2.2 mm	
(iii)	For 1Cx630 mm <sup>2</sup>	2.4 mm	
iv)	For 1Cx1000 mm <sup>2</sup>	2.8 mm	
C	Diameter over Insulation (mm) Approx.	.....	
D	Make of insulation compound	Ref: Annexure D	
7	Inner Sheath	Not applicable	
8	Armour	Not applicable	
9	FRLS Outer Sheath		
A	Material and Type	As per Cl. 3.6	
B	Minimum Thickness	As per Table 8 of IS 7098 Part-1	
C	Colour	Orange	
D	Embossing Details	As per Cl.3.6 (e)	
10	Approx. overall dia. (mm)	.....	
11	Overall order tolerance	-2 % for the total cable length for the entire order	
12	Cable Drum		
A	Type of Drum	Wooden	
B	Drum Length & tolerance	As per Spec. Cl. 4.3 & 4.4	
C	Marking on Drum	As per Spec. Cl. 4.7	
D	Drums provide with MS Spindle plate & nut bolts arrangement (as per IS:10418)	Required	
13	End Cap	Required	
14	Weights	.....	
a)	Net Weight of cable ( Kg/Km. ) – Approx		
b)	Weight of empty drum	Kg	

**TECHNICAL SPECIFICATION OF LT POWER CABLE**

<b>S.No.</b>	<b>Description</b>	<b>Buyer's Requirement</b>	<b>Seller's data</b>
c)	Weight of cable with drum	Kg	
15	Continuous current rating for standard I.S condition laid direct		
a)	In ground 30° C	Amps	
b)	In duct 30° C	Amps	
c)	In Air 40° C	Amps	
16	Short circuit current for 1 sec of Conductor (kAmp)	.....	
17	Electrical Parameters at Maximum operating temperature:		
A	AC Resistance	Ohm/Km	
B	Reactance at 50 C/s	Ohm/Km	
C	Impedance	Ohm/Km	
D	Capacitance	Micro farad / Km	
18	Recommended minimum bending radius	..... x O/D	
19	Derating factor for following Ambient temperature in	Ground / Air	
a)	At 30° C		
b)	At 35° C		
c)	At 40° C		
d)	At 45° C		
e)	At 50° C		
20	Group factor for following Nos. of cables laid	Touching / Trefoil	
a)	3 Nos.		
b)	4 Nos.		
c)	5 Nos.		
d)	6 Nos.		
21	Process of Cross linking of Polyethylene	Dry/ Sioplas Cure	
22	Type test	Is copy of latest valid TTR for respective Sizes enclosed?	

S.No.	Description	Buyer's Requirement	Seller's data
		Yes /No	
23	FRLS Properties		
	Oxygen Index	As per IS 1554, Part	
	Temperature Index	As per IS 1554, Part	
	Max Acid Gas Generation	As per IS 1554, Part	
	Light Transmission / Smoke Density	As per IS 1554, Part	

**12.0 ANNEXTURE – C****ARMOUR COVERAGE PERCENTAGE**

$$\text{Percent coverage} = \frac{N \times d}{W} \times 100$$

Where,

N = number of parallel wires / Strips

d = diameter of wire / width of formed wires

$W = \pi \times D \times \cos a$ ,

D = diameter under armour

a = angle between armouring wire / formed wires and axis of cable

$\tan a = \pi \times D/C$ , and

C = lay length of armouring wires / formed wires.

Min 90% armour coverage shall be provided both in case of wires and strips.

The gap between armour wires / formed wires shall not exceed one armour wire / Formed wire space and there shall be no cross over / over-riding of armour wire / Formed wire so, the minimum area of coverage of armouring shall be 90%.

**13.0 ANNEXTURE – D****LIST OF SUB-VENDORS**

<b>Sr. No.</b>	<b>Description of Material</b>	<b>Sub-Vendors</b>
1	E.C Grade Aluminium Rod	Bharat Aluminium Co. Ltd. (BALCO) Hindustan Aluminium Co. Ltd. (HINDALCO) National Aluminium Co. Ltd. (NALCO)
2	XLPE Compound	Kkalpana Industries Ltd. KLJ Polymers and Chemicals Ltd. Dow Chemical, U.S.A Borealis, Sweden Hanwha, Seoul, South Korea
3	PVC Compound	Kkalpana Industries Ltd. KLJ Polymers and Chemicals Ltd. Universal SCJ Plastic Sriram Polytech Shri Ram Vinyl, Kota
4	GI Strip	Tata Balaji Systematic Mica Wires Pvt Ltd. Bansal Industries




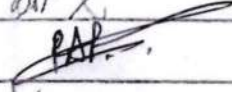

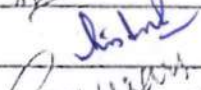
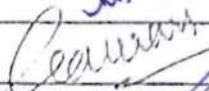

# BSES

## TECHNICAL SPECIFICATION

FOR

## FRLS CONTROL CABLE

SPECIFICATION NO. – BSES-TS-57-CCAB-R0

Rev:		0
Pages:		11
Date:		20 April 2022
Prepared by	Abhishek Vashista	
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Reviewed by	Puneet Duggal	
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	Gopal Nariya	

**TECHNICAL SPECIFICATION FOR FRLS CONTROL CABLE**

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**TECHNICAL SPECIFICATION FOR FRLS CONTROL CABLE****1.0 SCOPE**

The scope of supply includes Design, Manufacture, Testing at manufacturer's works before dispatch, packing, delivery including unloading and stacking at site/store of Control Cable complete with all accessories.

**2.0 STANDARDS & CODES**

Materials, equipments and methods used in the manufacture of Cable shall conform to the latest edition of following:

<b>S No.</b>	<b>STANDARD</b>	<b>DESCRIPTION</b>
2.1	IS- 1554 Part-1	PVC insulated Cables
2.2	IS- 5831 : 1984	PVC insulation & sheath of electric cables.
2.3	IS- 10810 : 1984	Methods of test for cables.
2.4	IS- 8130 : 1984	Conductors for insulated electric cables and flexible cords.
2.5	IS- 3961 Part 2	Recommended current ratings for PVC insulated and PVC sheathed heavy duty Cables
2.6	IS- 3975 : 1999	Mild steel wires, formed wires and tapes for armouring of cables.
2.7	IS- 10418 : 1982	Drums for Electric Cables
2.8	IEC 60228 Ed.3.0 b	Conductors of insulated cables.
2.9	IEC 60332-3-21 Ed.1.0 b	Tests on electric cables under fire conditions. Part 3-21. Tests on bunched wires or cables.
2.10	IEC 60502-1 Ed. 2.1 b	Power cables with extruded insulation and their accessories for rated voltage from 1kV upto 30kV –Part 1: cables for rated voltages of 1kV and 3kV
2.11	IEC 60811	Common test methods for insulating and sheathing materials of electric cables.
2.12	IEC 60885 Ed.1.0 b	Electric test methods for electric cables.
2.13	IEC 60227	PVC insulated cables of rated voltages up to and including 450/750 V.
2.14	IEC 60028 Ed. 2.0 b	International Standard of Resistance for Copper
2.15	ASTMD 2843	Standard Test Method for density of Smoke from the burning or decomposition of cables
2.16	ASTM 2863	Standard Test Method for measuring of minimum oxygen concentration
2.17	IEC 60754-1	Test on gases evolved during combustion of materials for cables. Part 1 – Determination of the Halogen Acid gas Content

**TECHNICAL SPECIFICATION FOR FRLS CONTROL CABLE****3.0 SERVICE CONDITIONS**

Control Cables to be supplied against this specification shall be suitable for satisfactory operation under the following conditions-

3.1	Average grade atmosphere	Heavily polluted, Dry
3.2	Maximum altitude above sea level	1000M
3.3	Relative Humidity	100%
3.4	Ambient air temperature	Highest 50 Deg C Average 40 Deg C Minimum 0 Deg C
3.5	Operating temperature	0 Deg C - 50 Deg C
3.6	Rainfall	750mm concentrated in four months

**4.0 DESIGN FEATURES**

(Refer Annexure – “A”)

<b>S No.</b>	<b>Parameters</b>	<b>Technical Requirements</b>
4.1	Cable construction Features	Size & dimensions of each item mentioned under this clause shall be followed as detailed out in GTP, refer Annexure A
4.2	Conductor	<ul style="list-style-type: none"><li>Stranded, plain copper, circular</li><li>Shall be made from high conductivity copper rods</li></ul>
4.3	Insulation	Extruded PVC Insulation Type A as per IS 5831
4.4	Core Identification	As per IS 1554 Part 1
4.5	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2 as per IS 5831
4.6	Armour	<ul style="list-style-type: none"><li>As per Clause 13.2 of IS 1554 Part-1: Galvanized steel round wire armour.</li><li>Minimum area of coverage of armouring shall be not less than 90 %. ( refer Annex C of IS 1554-part 1 for % calculation)</li></ul>

**TECHNICAL SPECIFICATION FOR FRLS CONTROL CABLE**

<b>S No.</b>	<b>Parameters</b>	<b>Technical Requirements</b>
4.7	Outer Sheath	<ul style="list-style-type: none"><li>a) Extruded outer sheath of PVC type ST-2 as per IS 5831 having FRLS properties</li><li>b) Color : Black</li><li>c) The Outer Sheath shall be embossed with:<ul style="list-style-type: none"><li>i. The voltage designation</li><li>ii. Type of construction / cable code (for e.g. AYWY)</li><li>iii. Manufacturers Name or Trade mark</li><li>iv. Number of Cores and nominal cross sectional area of conductors</li><li>v. The drum progressive length of cable and individual drum number at every meter. (By Printing)</li><li>vi. Name of buyer i.e. BSES</li><li>vii. Month &amp; Year of Manufacturing</li><li>viii. P.O. No. and P.O. Date</li></ul></li></ul>
4.8	FRLS Properties	<ul style="list-style-type: none"><li>a) Oxygen Index : Not less than 29% as per ASTM 2863</li><li>b) Temperature Index: 250°C at Oxygen Index 21 (when tested as per ASTM D 2863)</li><li>c) Max Acid Gas Generation – Not more than 20% as per IEC -60754-1</li><li>d) Light Transmission - Minimum 40% when tested as per ASTM D 2843 (Smoke Density rating shall be max 60%)</li><li>e) Flammability Test – As per IEC 60332-III, Cat – B, IEC 60332- I, IS- 10810 – Part 53, IS:10810 – Part 61 &amp; 62 (Category A)</li></ul>
4.9	Sealing of cable end	Both ends of the cable shall be sealed with PVC Cap.
4.10	Drum length & tolerance	500 mtr (+/- 5%)
4.11	Overall tolerance in cable length	- 2 %
4.12	Short length of cables	<ul style="list-style-type: none"><li>a) Minimum acceptable short length shall be above 100 meters. Manufacturer shall be required to take prior approval from engineering for any short length supply.</li><li>b) Manufacturer shall not be allowed to put two cable pieces of different short lengths in same cable drum.</li><li>c) Only 1% of the total ordered quantity.</li></ul>

**TECHNICAL SPECIFICATION FOR FRLS CONTROL CABLE****5.0 QUALITY ASSURANCE PLAN, INSPECTION AND TESTING**

<b>S No.</b>	<b>Parameters</b>	<b>Technical Requirements</b>
5.1	Quality Assurance Plan	QAP Shall be submitted by vendor for approval. Inspection and testing of the material shall be carried out accordingly.
5.2	Type test	Cables must be of type tested as per relevant IS/IEC/ASTM. Type test conducted either from CPRI/ERDA/NABL third party accredited lab will be treated as valid. Type test reports shall be submitted for the type, size & rating of cable offered along with bid.
5.3	Routine test	Each drum length of cable shall be subjected to the routine tests as mentioned in IS 1554 part -1
5.4	Acceptance Tests	The sampling & acceptance tests Shall be conducted, as per IS 1554 Part-1 and approved QA plan, for each lot of cable during the inspection of lot at manufacturer's works.
5.5	Inspection	a) The buyer reserves the right to inspect cables at the Seller's works at any time prior dispatch, to verify compliance with the specifications.  b) In-process and final inspection call intimation shall be given in 15 days advance to purchaser.  c) In the event of any discrepancy in the test reports i.e. test reports not acceptable or any type tests (including special /additional tests, if any) not carried out, same shall be carried out without any cost implication to BSES before dispatch of cable.
5.6	Test certificates	Test certificates (routine and acceptance) shall be submitted along with the dispatch documents.

**TECHNICAL SPECIFICATION FOR FRLS CONTROL CABLE****6.0 PACKING, SHIPPING, HANDLING & SITE SUPPORT**

6.1	Packing	The cable shall be wound on wooden drums (with anti termite treatment and M.S. spindle plate with nut-bolts). Cable should be packed conforming to Indian / international standards. The drum shall be fully enclosed by suitable packing preferably PP sheeting.
6.2	Drum identification label	The following information shall be marked on the drum: a) Drum identification number b) Trade name or trade mark; if any c) Name of manufacturer d) Name of buyer i.e. BSES e) Cable voltage grade f) Cable code (e.g. YWY) g) Number of cores and cross sectional area h) Purchase order number with SAP item code i) Year and month of manufacturing j) Direction of rotation of drum (an arrow) k) Net weight of cable in drum and gross weight of cable with drum l) Batch no or Lot no. m) Cable length initial reading & end reading shall be marked on drum. Cable starting end shall be taken out from winding to read this drum reading with proper sealing to protect against external damage.
6.3	Shipping	The seller shall give complete shipping information concerning the gross weight, size of each packing.
6.4	Handling & Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet/manual needs to be furnished before commencement of supply.
6.5	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

**7.0 DEVIATIONS**

7.1	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification.
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**TECHNICAL SPECIFICATION FOR FRLS CONTROL CABLE****8.0 DOCUMENT SUBMISSION MATRIX**

Document/Drawing submission shall be as per the matrix given below. All documents/drawings shall be provided in soft copy only in returnable Pen drives. Language of the documents shall be English only. Incomplete submission shall be liable for rejection.

<b>S No.</b>	<b>Description</b>	<b>Bid</b>	<b>Approval</b>	<b>Pre Dispatch</b>
8.1	Guaranteed Technical Particulars (GTP)	required	required	
8.2	Deviation Sheet, if any	required	required	
8.3	Detailed cross sectional drawing of cable	required	required	
8.4	Dimensional drawing of Cable Drum		required	
8.5	Type test reports for the offered type and rating of cable	required	required	
8.6	BIS Certificate	required		
8.7	Make of Raw Materials	required	required	
8.8	Cable de-rating factors	required	required	
8.9	Manufacturer's Quality Assurance Plan		required	
8.10	Detailed installation & commissioning instructions		required	
8.11	Test certificates of all raw materials			required
8.12	Inspection and routine test reports, carried out in manufacturer's works			required



**TECHNICAL SPECIFICATION FOR FRLS CONTROL CABLE****Annexure – A: Guaranteed Technical Particulars (Data by Supplier)**

(Standard Cable sizes are 2Cx2.5, 4Cx2.5, 6C X 2.5, 8Cx2.5, 10Cx2.5, 12C X 2.5 mm<sup>2</sup>)

**For each size separate GTP need to be furnished**

**\*For any size other than standard sizes mentioned, GTP should be as per IS or requirement whichever applicable**

<b>Sr.</b>	<b>Description</b>	<b>Buyer's requirement</b>	<b>Vendor's Data</b>
	Purchase Req. No.	....	
	Guarantee Period: 5 Years	60/66 Months	
1.0	Make	To be specified by vendor	
2.0	Type ( AS PER IS 1554 part -1 )	YWY	
3.0	Voltage Grade (KV)	1.1	
4.0	Maximum Conductor temperature		
a)	Continuous (° C)	70°C	
b)	Short time (° C)	160°C	
5.0	Conductor		
a)	Size (mm <sup>2</sup> )	2.5	
b)	No. of wires in each conductor	As per Manufacturer standard	
c)	Dia. of wires in each conductor before compaction (mm)	As per Manufacturer standard	
d)	Shape of Conductor	As per Clause 4.2 of specification	
e)	Diameter over conductor mm	To be specified by vendor	
f)	Maximum Conductor resistance at 20 ° C (Ohm/Km)	As per Table 2 of IS 8130	
6.0	Insulation	As per Table 1 of IS:5831 – 1984	
a)	Nominal thickness (mm)	As per Clause 4.3 of specification & Table 2 of IS 1554( Part-1)	
b)	Minimum thickness (mm)		
c)	Core Identification	As per IS 1554 Part 1	
d)	Approx. dia. over Insulation (mm)	To be specified by	

**TECHNICAL SPECIFICATION FOR FRLS CONTROL CABLE**

<b>Sr.</b>	<b>Description</b>	<b>Buyer's requirement</b>	<b>Vendor's Data</b>
		vendor	
7.0	Inner Sheath	As per Table 2 of IS:5831 – 1984	
a)	Minimum thickness (mm)	As per Table 4 of IS 1554( Part-1)	
b)	Approx. dia. Over sheath (mm)	To be specified by vendor	
8.0	Galvanized Steel Armour	As per IS 1554-part 1	
a)	Number of armour wire	As per Manufacturer Std.	
b)	Nominal dia. of Round Wire	As per Table 5 of IS 1554( Part-1)	
c)	Dia. over armour – approx.	To be specified by vendor	
d)	Lay Ratio	To be specified by vendor	
e)	Confirm minimum 90% coverage (submit calculation)		
9.0	Outer Sheath (FRLS)	As per Table 2 of IS:5831 – 1984	
a)	Thickness (min)	As per Table 7 of IS 1554( Part-1)	
b)	Color	Black	
10.0	Approx. overall dia. (mm)	To be specified by vendor	
11.0	Drum length & tolerance	As per clause 4.10 of specification	
12.0	End Cap	Required	
13.0	Drums provide with MS Spindle plate & Nut bolts arrangement	Required	
14.0	Net Weight of cable ( Kg/Km. ) – approx.	To be specified by vendor	

**TECHNICAL SPECIFICATION FOR FRLS CONTROL CABLE**

<b>Sr.</b>	<b>Description</b>	<b>Buyer's requirement</b>	<b>Vendor's Data</b>
15.0	Continuous current rating for standard I.S. condition laid Direct		
a)	In ground 30° C      Amps	To be specified by vendor	
b)	In duct 30° C      Amps	To be specified by vendor	
c)	In Air 40° C      Amps	To be specified by vendor	
16.0	Short circuit current for 1 sec of conductor. (KAmp)	To be specified by vendor	
17.0	Electrical Parameters at Maximum Operating temperature:		
a)	Resistance (Ohm/Km ) (AC Resistance)	To be specified by vendor	
b)	Reactance at 50 C/s ( Ohm/Km )	To be specified by vendor	
c)	Impedance ( Ohm/Km )	To be specified by vendor	
d)	Capacitance (Micro farad / KM)	To be specified by vendor	
18.0	Recommended minimum bending radius	.... x O/D	
19.0	FRLS Properties		
a)	Oxygen Index	To be specified by vendor	
b)	Temperature Index	To be specified by vendor	
c)	Max Acid Gas Generation	To be specified by vendor	
d)	Light Transmission / Smoke Density	To be specified by vendor	

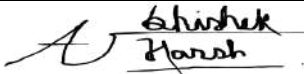




## Technical Specification

For

Fire Retardant Coating on Cables

Specification no – BSES-TS-88-FRCC-R0

Rev:	0	
Page	1 of 8	
Date:	06 May 2022	
Prepared by	Abhishek Harsh	 3267d7c3-82b5-46cb-b5a6-867ee7820a34
Reviewed by	Srinivas Gopu	 5d32525e-ed3a-4f41-b1c7-b8a5e77d1519
Approved by	Gaurav Sharma	 23dc2de2-95de-4472-99a7-dea873f472b6

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**TECHNICAL SPECIFICATION FOR FIRE RETARDANT COATING ON CABLES****1.0 SCOPE**

- This specification covers the design, manufacture, testing, supply, erection & commissioning of Fire retardant coating on cables and its accessories.

**2.0 CODES & STANDARDS**

- Material, equipment and methods used in the manufacturing of fire retardant coating on cables shall confirm to the latest edition of following standard

<b>Standard Name / No</b>	<b>Standard's Description</b>
Indian Electricity Act	Latest Edition
CBIP manual	Latest Edition
IEC 60331-11	Tests for electric cables under fire conditions – Circuit integrity – Part 11: Apparatus – Fire alone at a flame temperature of at least 750 degree C
IEEE 383	IEEE Standard for Qualifying Electric Cables and Splices for Nuclear Facilities
IEC 60754-1	Test on gases evolved during combustion of materials from cables
ASTM D2843	Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics
ASTM D2863	Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)

**3.0 SERVICE CONDITIONS**

3.1	Max Ambient Temperature	50 deg C
3.2	Max Daily average ambient temp	40 deg C
3.3	Min Ambient Temp	0 deg C
3.4	Maximum Humidity	95%
3.5	Minimum Humidity	10%
3.6	Maximum annual rainfall	750 mm
3.7	Average no of rainy days per annum	60
3.8	Rainy months	June to Oct
3.9	Altitude above MSL	300 M
3.10	Seismic Zone	IV

**4.0 GENERAL FEATURES**

4.1	Base Type	Water based Intumescent coating
4.2	Color	Off white
4.3	Density	1.3 ± 0.05 g/cc
4.4	Mix ratio by weight	Single component
4.5	Solids by weight	64 ± 2 %
4.6	ph	8
4.7	Toxicity	Non-toxic, asbestos and lead free
4.8	DFT	1.6 mm
4.9	Coverage	3.2kg±0.10 kg/m <sup>2</sup> @1.6mm DFT
4.10	Drying time	Surface dry in 30 mins
4.11	Functional Cure Time	48 hours
4.12	Application temperature	10-30°C
4.13	Temperature endurance	>1100°C
4.14	Application method	Brushing, Airless spraying
4.15	Fire Rating	2 Hours
4.16	Features	
4.16.1	Solvent free	Required
4.16.2	Eco friendly	Required
4.16.3	Free of any fibers including asbestos	Required
4.16.4	Single component, ready to apply/use	Required
4.16.5	Easy to apply using a paint brush/spray	Required
4.16.6	No de-rating effect on cables	Required
4.16.7	Added fire protection for existing cables	Required
4.16.8	Compatible with different sheathing chemistries of electrical cables	Required
4.17	Test	
4.17.1	Fire Resistance/Circuit Integrity	As per IEC 60331-11
4.17.2	Flame Retardance	As per IEEE 383
4.17.3	Flammability	As per IS 10810 (P-53)
4.17.4	HCL	As per IEC 60754-1
4.17.5	Smoke density	As per ASTM D2843
4.17.6	Limiting oxygen index	As per ASTM D2863
4.18	Make	Stanvac/3M/Demech

- Note- Any make other than specified in table above shall be subject to BSES Approval.

**5.0 DEVIATIONS**

Deviation from this specification shall be stated in writing with the tender by reference to the specification clause/ GTP/ Drawing and description of alternative offer. In absence of such a statement, it shall be assumed by the buyer that the seller complies fully with this specification.

**6.0 QUALITY, INSPECTION & TESTING**

6.1	Vendor quality plan	To be submitted for purchaser approval
6.2	Inspection points	To be mutually identified & agreed in quality plan
6.3	Type test	Equipment shall be type tested from CPRI/ERDA/NABL accreted lab as per IEC/IS/UL standard.
6.4	Routine test	As per relevant standard
6.5	Acceptance test	To be performed in presence of Owner at manufacturer works shall be as per approved QAP

**7.0 GTP**

Vendor must submit clause wise compliance against specification at the time of drawing approval.

**8.0 DRAWING AND DATA SUBMISSION MATRIX**

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
8.1	Contact Person Name, Email ID and Mobile Number	Required	Required		
8.2	Deviation Sheet (as per "Deviations" Clause)	Required			
8.3	GTP	Required	Required		
8.4	Relevant Type Test as per IS/IEC/UL	Required	Required		



**TECHNICAL SPECIFICATION FOR FIRE RETARDANT COATING ON CABLES**

<b>S. No</b>	<b>Head</b>	<b>Bid</b>	<b>Drawing Approval</b>	<b>Pre Dispatch</b>	<b>Pre Closure</b>
8.5	Manufacturer's quality assurance plan and certification for quality standards		Required		
8.6	Sizing Calculation of Associated Equipment		Required		
8.7	Recommended Spares for five years of operation)		Required		
8.8	Drawings	Required	Required		
8.9	QAP		Required		
8.10	BOQ		Required		
8.11	Make of all Component as per specification		Required		
8.12	Installation, erection and commissioning manual		Required		
8.13	Inspection Reports			Required	
8.14	As manufacturing Drawings			Required	
8.15	Operation and Maintenance Manual			Required	
8.16	Trouble shooting manual			Required	
8.17	As built Drawings				Required

**9.0 PACKING**

9.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, module may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
9.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label

**TECHNICAL SPECIFICATION FOR FIRE RETARDANT COATING ON CABLES**

9.3	Packing Identification Label to be provided on each packing case with the following details
9.3.1	Individual serial number
9.3.2	Purchaser's name
9.3.3	PO number (along with SAP item code, if any) & date
9.3.4	Equipment Tag no. (if any)
9.3.5	Destination
9.3.6	Project Details
9.3.7	Manufacturer / Supplier's name
9.3.8	Address of Manufacturer / Supplier / it's agent
9.3.9	Description and Quantity
9.3.10	Country of origin
9.3.11	Month & year of Manufacturing
9.3.12	Case measurements
9.3.13	Gross and net weights in kilograms
9.3.14	All necessary slinging and stacking instructions

**10.0 SHIPPING**

10.1	Shipping	The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, Overhead lines, free access etc. from the Manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed Packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.
		The seller shall be responsible for all transit damage due to improper packing.

**11.0 HANDLING AND STORAGE**

11.1	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.
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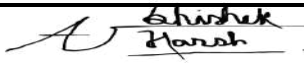




## Technical Specification

For

## 415 V AC Distribution Board

Specification no – BSES-TS-70-ACDB-R0

Rev	0	
Page	1 of 17	
Date	05 May 2022	
Prepared by	Jeena Borana	 <small>b8b1c444-d6e3-4459-b793-d46d1e00a2fc</small>
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Reviewed by	Srinivas Gopu	 <small>5d32525e-ed3a-4f41-b1c7-b8a5e77d1519</small>
Approved by	Gaurav Sharma	 <small>23dc2de2-95de-4472-99a7-dea873f472b6</small>

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## 1 SCOPE

This specification covers the design, engineering, manufacture, assembly and testing at manufacturer's works and supply of 415V AC Distribution board (ACDB) along with all hardware and accessories required for installation and operation.

Specification covers Type 1 and Type 2 ACDB. Type 1 ACDB is for Grid Substations while Type 2 ACDB is for BSES HT Customers.

## 2 STANDARDS & CODES

2.1	IS:8623	Specification for factory built assemblies of switchgear & control gear for voltages up to and including 1000V AC/1200 V DC.
2.2	IS 60947-1	Specification for Low-voltage Switchgear and Control gear - Part 2 : Circuit Breakers
2.3	IS:10118	Code of practice for selection, installation and maintenance switchgear and controlgear
2.4	IS:2705	Current Transformers
2.5	IS:3231	Electrical relays for power system protection
2.6	IS:1248	Electrical Indicating instruments
2.7	IS:4794	Switches and push buttons
2.8	IS:6005	Code of practice of phosphating iron and steel
2.9	IS:5082	Wrought Aluminum and aluminum alloys for electrical purposes
2.10	IS 3043	Code of practice for Earthing

## 3 SERVICE CONDITIONS

3.1	System Configuration	3 Phase 4 Wire with neutral solidly grounded
3.2	Supply Voltage	415 volt +/- 10%
3.3	Supply frequency	50Hz
3.4	Location	Indoor
3.5	Average grade atmosphere	Heavily polluted, Dry
3.6	Maximum altitude above sea level	1000M
3.7	Ambient air temperature	Highest 50Deg C Average 40Deg C
3.8	Minimum ambient air temperature	0 Deg C
3.9	Relative Humidity	100%
3.10	Rainfall	750mm concentrated in four months

**4 ACB CONFIGURATION****4.1 TYPE 1 ACDB CONFIGURATION**

4.1.1	Incomers	<ul style="list-style-type: none"> <li>a. Two incomers, each having Motorized 630A MCCB. MCCBs shall have microprocessor based over current and earth fault release.</li> <li>b. Auto changeover shall be provided between the two incomers</li> <li>c. Manual castle key interlock required between two incomers</li> <li>d. Castle key for Local /Remote operation</li> </ul>			
4.1.2	Outgoing feeders	<ul style="list-style-type: none"> <li>a. The number of outgoing feeders from AC boards shall be such that each substation equipment is fed by separate feeder (refer below).</li> <li>b. Utilization category of MCBs shall be C.</li> </ul>			
	<b>Application</b>	<b>Type of Switchgear</b>	<b>No of Poles</b>	<b>Rating (A)</b>	<b>Quantity</b>
4.1.3	Transformer Oil filtration	MCB	4	200	2
4.1.4	Welding(Outdoor)	MCB	2	63	4
4.1.5	Power Socket(Indoor)	MCB	4	32	5
4.1.6	Outdoor Lighting	MCB	4	32	2
4.1.7	Indoor Lighting	MCB	4	32	2
4.1.8	Battery Charger	MCB	4	63	2
4.1.9	BMK	MCB	4	32	8
4.1.10	Marshalling Box(PTR)	MCB	4	32	3
4.1.11	AC Supply	MCB	4	32	2
4.1.12	UPS	MCB	2	16	1
4.1.13	11kV Switchgear	MCB	2	32	3
4.1.14	CRP	MCB	2	32	2
4.1.15	RTU/SCADA	MCB	2	16	2
4.1.16	Fire Fighting	MCB	2	16	2
4.1.17	EPAX	MCB	2	16	1

**TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD**

4.1.18	Power Socket (Outdoor)	MCB	2	16	4
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**4.2 TYPE 2 ACDB CONFIGURATION**

4.2.1	Incomers	<ul style="list-style-type: none"> <li>a. Two incomers, each having Motorized 400 A MCCB.</li> <li>b. Auto changeover shall be provided between the two incomers</li> <li>c. Manual castle key interlock required between two incomers</li> <li>d. Castle key for Local /Remote operation</li> </ul>			
4.2.2	Outgoing feeders	<ul style="list-style-type: none"> <li>a. The number of outgoing feeders from AC boards shall be such that each substation equipment is fed by separate feeder (refer below).</li> <li>b. Utilization category of MCBs shall be C.</li> </ul>			
	<b>Application</b>	<b>Type of Switchgear</b>	<b>No of Poles</b>	<b>Rating (A)</b>	<b>Quantity</b>
4.2.3	Welding	MCB	2	63	1
4.2.4	Power Socket	MCB	4	32	3
4.2.5	Outdoor Lighting	MCB	4	16	2
4.2.6	Indoor Lighting	MCB	4	16	2
4.2.7	Battery Charger	MCB	4	32	2
4.2.8	AC Supply	MCB	4	32	2
4.2.9	Switchgear	MCB	2	32	2
4.2.10	RTU/SCADA	MCB	2	16	2
4.2.11	Fire Fighting	MCB	2	16	2

**5 CONSTRUCTION**

5.1	General construction	<ul style="list-style-type: none"> <li>a. Board shall be of modular construction with provision for compartmentalization for Incomer and non-compartmentalization for outgoing feeders.</li> <li>b. It shall be free-standing type comprising dust-tight and vermin-proof sheet steel cabinets suitable for indoor installation with IP-54 degree of protection.</li> <li>c. Necessary busbar support insulators, cable glands, cable supports and terminal blocks etc. The board shall be of single front type.</li> </ul>
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**TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD**

5.2	Material	The Board shall be made out of at least 2.5 mm thick cold rolled steel sheet (CRCA), suitably reinforced to provide flat level surfaces. No welds, rivets, hinges or bolts shall be visible from outside.
5.3	Equipment Mounting	a) All switches provided on the distribution board shall be on front side of the cabinets, operable from outside. b) All MCBs shall be flush mounted operable from front side of ACDB. c) All instruments and control devices shall be mounted on the front of cabinets and fully wired to the terminal blocks.
5.4	Operating Height	≤ 1.6 meter
5.5	Busbar housing	a) The busbars shall be housed in totally enclosed busbar chambers. b) Incoming connections from the busbar to various feeders shall be designed so as not to disturb cable connections. c) Busbar arrangement should ensure safety of the operation/maintenance personnel and facilitate working on any outgoing module without the need for switching off in-feed to the adjacent modules, as far as possible
5.6	Outgoing Cable Termination	For Outgoing cable termination, vertical arrangement of Terminal Blocks shall be provided with ratings in descending order.
5.7	Cable glands	Compression type cable glands shall be provided to hold the cables to avoid any pressure or tension on the terminal block connections.
5.8	Gland Plate	Gland plate shall be 3.0mm thick with metallic knockout punches
5.9	Doors	a) The doors of cable cabinets shall be lockable hinged type b) Doors shall be fitted with double lipped gaskets. c) Bus bar side shall have bolted doors.
5.10	Drawing Pocket	Shall be Provided to keep "As Built Drawings"

**6 BUSBAR**

6.1	Material	Busbar shall be of aluminum.
6.2	Size (phase and neutral)	a) Main busbar - 80x10 sqmm for Type 1 ACDB b) Main busbar – 50X10 sqmm for Type 2 ACDB c) Busbar dropper size Incomers - MCCB-80x10 sqmm for Type 1 ACDB d) Busbar dropper size Incomers - MCCB-50x10 sqmm for Type 2 ACDB
6.3	Supports	The busbar shall be supported by means of durable non-hygroscopic, non-combustible and non-tracking polyester fiberglass material or porcelain. Supports shall be capable of withstanding the maximum short circuit stresses
6.4	Sleeves and shrouds	Busbars shall be encased in heat-shrinkable sleeves of insulating material which shall be suitable for the operating temperature of busbars during normal service. The busbar joints shall be provided with removable thermosetting plastic shrouds.

**7 MCCB**

7.1	MCCB type	4 pole
7.2	MCCB design ambient temperature	50deg C
7.3	MCCB Housing	Thermoplastic material resistant to fire & abnormal heat , non hygroscopic
7.4	MCCB Terminal	Silver coated copper with phase barriers, spreader terminals & shrouds
7.5	De-rating at 50Deg ambient temperature	No derating (0%)
7.6	MCCB rated 3 phase short circuit breaking capacity Ics = Icu	36kA minimum at 415v and 50Hz
7.7	MCCB rated 3 phase short circuit withstand capacity, Icw	8kA for 1sec
7.8	MCCB SC making current capacity	75kA peak
7.9	MCCB rated insulation level	1000V
7.10	MCCB mechanical & electrical endurance	As per IS 13947 / IEC
7.11	MCCB utilization category	B as per IS / IEC 947
7.12	MCCB indications	ON, OFF & TRIP
7.13	MCCB protection	MCCBs shall have microprocessor based over current and earth fault release.

**TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD**

7.14	Tripping characteristic required	
7.14.1	Overload setting	Range 60-100%In (Set on 95%)
7.14.2	Short Circuit setting	Range 200-1200%In (Set on 300%)
7.14.3	Earth fault setting	To be provided
7.15	MCCB Clearances in air	As per table XIII of IS 13947-1
7.16	MCCB temperature rise limits	As per table 2 & 3 of IS 13947-1
7.17	MCCB Ingress Protection	IP2X Minimum (pollution degree minimum 2)
7.18	MCCB additional features	Sealing/padlocking of operating knob in OFF position Sealing/padlocking of operating knob in OFF position isolation suitable with positive contact

**8 CURRENT TRANSFORMER**

8.1	Type	Cast-resin type, Class-E insulation, rated for 120% current continuous
8.2	Provision	Shall be provided in incomer for metering. Separate Neutral CT shall be connected in the neutral for detecting earth fault for both the incomer.
8.3	Secondary current	5A
8.4	Metering CT Class	1.0
8.5	Burden	Based on requirement

**9 TERMINALS AND WIRING**

9.1	Secondary Wiring	
9.1.1	Grade and type	1100 V grade, PVC insulated, FRLS type stranded flexible copper wire.
9.1.2	Ferruling	Each wire shall bear an identifying ferrule or tag at each end or connecting point.
9.1.3	Size	Appropriate size copper based on rated current and application subject to a minimum of 2.5sqmm copper
9.2	Terminals	Terminals of appropriate size shall be provided inside each cabinet for incoming and outgoing cables.
9.2.1	Grade	1100 V grade, molded piece terminals complete with insulated barriers, washers, nuts and lock nuts.
9.2.2	Power Terminals type	Stud type, nut driver operated

**TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD**

9.2.3	Control terminals type	Stud type, screw driver operated suitable for minimum 6sqmm wire.
9.2.4	Spare terminals	20% spare terminals should be provided in each terminal block.
9.2.5	Accessibility	Placement of terminals shall enable proper cable termination. Terminals shall be readily accessible for inspection and maintenance.
9.2.6	Marking	The terminals shall be serially numbered to facilitate installation and maintenance.
9.3	Cable troughs	Shall be provided for wiring of each terminal block with 50% spare capacity

**10 METERS, INDICATIONS AND PUSH BUTTONS**

10.1	Meters	
10.1.1	Multifunction Meter	For incomer feeders. Meter should have facility to store peak load current in memory.
10.1.2	Type	Digital with inbuilt phase selector
10.1.3	Communication Protocol	RS485 on MODBUS
10.1.4	Accuracy Class	1.0
10.1.5	Auxiliary supply	240VAC with 10% tolerance
10.2	Indicating lamps	Indicating lamps shall be of low wattage cluster LED type.
10.2.1	Incomer/ Outgoing On	Red
10.2.2	Incomer/ Outgoing Off	Green
10.2.3	Incomer/ Outgoing Trip	Amber
10.3	Push buttons	For manual operation of incomer

**11 NAME PLATES & MARKINGS**

11.1	Panel nameplate	Panel shall have a nameplate clearly indicating the following: a) Manufacturer's Name & Country: b) Panel Serial No.: c) Customer Name: BSES Yamuna / Rajdhani Power Ltd d) PO No. & date: e) Type of Panel: f) Current rating: g) Rated Voltage and Frequency: h) Month and year of Manufacture: MM/YYYY i) Guarantee period:
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**TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD**

11.2	Feeder nameplate	Large and bold name plate carrying the feeder identification shall be provided on the top of each module. Blank insert type name plates shall be provided on each outgoing feeder.
11.3	Equipment nameplate	a) All equipment mounted on front side as well as equipment mounted inside the panels shall be provided with individual name plates with equipment designation engraved. b) All front mounted equipment shall also be provided at the rear with individual name plates engraved with tag numbers corresponding to the one shown in the panel internal wiring to facilitate easy tracing of the wiring.
11.4	Danger plate	Panel shall have a danger plate of anodized aluminum clearly indicating the danger logo and voltage details.
11.5	Material	Non-rusting metal or 3 ply lamicoide. Nameplates shall be black with white engraving lettering. Stickers are not allowed.
11.6	Fixing	All nameplates/rating plates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.
11.7	Markings	Each switch shall bear clear inscription identifying its function. Similar inscription shall also be provided on each device whose function is not otherwise identified. If any switch or device does not bear this inscription separate nameplate giving its function shall be provided for it. Switch shall also have clear inscription for each position indicating e.g. Trip-Neutral close, ON-OFF etc.

**12 FINISHING**

12.1	Primer	Two coats
12.2	Finish	Powder Coating
12.3	Colour shade	RAL 7032 (Siemens Grey)
12.4	Paint thickness	70 microns (minimum)

**13 APPROVED MAKE OF COMPONENTS**

13.1	Switch	Siemens / L&T (Salzer)
13.2	HRC Fuse Links	GE/ Siemens/ L&T
13.3	Meters	Rishabh/Schneider/AE
13.4	AC Contractors	L&T/Siemens/Telemecanique/GE/ABB
13.5	Terminals	Connectwell/Elmex/Wago/Phoenix
13.6	Push buttons / Actuator	L&T/Siemens/Vaishno/Schneider
13.7	MCCB	L&T/Siemens/ ABB/GE/Schneider
13.8	MCB	Datar/Legrand/Hager/Schneider/ABB
13.9	Indicating lamps	Vaishno/Binay/Teknic/Siemens/Mimic/C&S

**14 QUALITY ASSURANCE PLAN, INSPECTION AND TESTING**

<b>S No.</b>	<b>Parameters</b>	<b>Technical Requirements</b>
14.1	Quality Assurance Plan	QAP Shall be submitted by vendor for approval. Inspection and testing of the material shall be carried out accordingly.
14.2	Type test	Equipment should be of type tested quality only, type test certificate to be submitted along with offer. Test reports from CPRI/ERDA accredited laboratory only acceptable.
14.3	Routine /Acceptance test	As per relevant Indian standard
14.4	Inspection	<ul style="list-style-type: none"> <li>a) The buyer reserves the right to inspect equipment at the Seller's works at any time prior dispatch, to verify compliance with the specifications.</li> <li>b) In-process and final inspection call intimation shall be given in 15 days advance to purchaser.</li> <li>c) In the event of any discrepancy in the test reports i.e. test reports not acceptable or any type tests (including special /additional tests, if any) not carried out, same shall be carried out without any cost implication to BSES before dispatch of equipment.</li> </ul>
14.5	Test certificates	Test certificates (routine and acceptance) shall be submitted along with the dispatch documents.

**15 PACKING, SHIPPING, HANDLING & SITE SUPPORT**

15.1	Packing Protection	The packing shall be fit to withstand rough handling during transit and storage at destination. The test set should be properly protected against corrosion, dampness & damage.
15.2	Packing for accessories and spares	Robust non-returnable packing case with all the above protection & identification Label. The bidder should get the packing list approved before dispatching the material.
15.3	Packing Identification Label	<p>On each packing case, following details are required:</p> <ul style="list-style-type: none"> <li>a) Individual serial number</li> <li>b) Purchaser's name</li> <li>c) PO number (along with SAP item code, if any) &amp; date</li> <li>d) Equipment Tag no. (if any)</li> <li>e) Destination</li> <li>f) Manufacturer / Supplier's name</li> <li>g) Address of Manufacturer / Supplier / it's agent</li> <li>h) Description</li> <li>i) Country of origin</li> <li>j) Month &amp; year of Manufacturing</li> </ul>

**TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD**

		k) Case measurements l) Gross and net weight m) All necessary slinging and stacking instructions
15.4	Shipping	The seller shall be responsible for all transit damage due to improper packing.
15.5	Handling and Storage	Manufacturer instruction shall be followed.
15.6	Detail handling & storage instruction sheet / manual to be furnished before commencement of supply.	

**16 DEVIATIONS**

16.1	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.
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**17 DOCUMENT SUBMISSION MATRIX**

Drawing submission shall be as per the matrix given below.

- All documents/ drawing shall be provided in soft copy only through mail.
- Language of the documents shall be English only.
- Incomplete submission shall be liable for rejection.
- Document check sheet compliance shall be the first sheet for each submission stage i.e. Technical bid, Drawing Approval, Pre Dispatch
- No submission is acceptable without check list compliance.
- Order of documents shall be strictly as per the check list.
- Any drawing not included in the below table but necessary for detailed engineering shall be deemed to be included in bidder's scope.

<b>S No.</b>	<b>Documents to be submitted</b>	<b>Bid</b>	<b>Approval</b>	<b>Pre Dispatch</b>
17.1	Guaranteed Technical Particulars (GTP)	Required	Required	
17.2	Deviation Sheet, if any	Required	Required	
17.3	GA drawing, SLD, Wiring Diagram	Required	Required	

**TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD**

<b>S No.</b>	<b>Documents to be submitted</b>	<b>Bid</b>	<b>Approval</b>	<b>Pre Dispatch</b>
17.4	Type test reports(not more than 5 years old) from CPRI/ERDA	Required	Required	
17.5	Reference List of major customers using the offered product from last 5 years	Required		
17.6	Performance certificates executed in last 5 years			
17.7	Make of Raw Materials	Required	Required	
17.8	Manufacturer's Quality Assurance Plan		Required	
17.9	Complete product catalogue and Manual		Required	Required
17.10	Test certificates of all raw materials			Required
17.11	Inspection and routine test reports, carried out in manufacturer's works			Required



**ANNEXURE A GUARANTEED TECHNICAL PARTICULARS**

S. No.	Description	Specification requirement	Vendor Data
<b>1.0</b>	<b>GENERAL FEATURES</b>		
1.1	Make		
1.2	Type		
1.3	Reference Standard		
1.4	Rated Operational voltage	415V AC $\pm$ 10%	
1.5	Rated Nominal Current	630A	
1.6	Rated frequency	50 Hz (+3%, -5%)	
1.7	Rated Insulation voltage	1100V	
1.8	Rated Impulse withstand voltage	8kV	
1.9	Service supply for heating, lighting and power sockets	240VAC $\pm$ 10%,	
1.10	Mounting	Floor (Free standing)	
1.11	Connections	Cable entry – Bottom	
1.12	Configuration	Single front	
1.13	Enclosure thickness		
1.13.1	Load Bearing Member	$\geq$ 2.5mm	
1.13.2	Doors and Covers	$\geq$ 2 mm	
1.14	Enclosure Material	CRCA Sheet/GI	
1.15	Enclosure degree of protection	IP 54	
1.16	Mechanical safety interlocks	As specified in technical specification	
1.17	Incomer Power Cable Termination	2Rx4Cx300sqmm	
	Outgoing Cable Termination	a) 200A MCB- 4Cx150sqmm b) 63A MCB- 4Cx50sqmm c) 32A MCB- 4Cx25 sqmm d) 16A MCB- 2Cx10 sqmm	
	Cable Termination Type	From Bottom of Panel	
	Clearance	150 mm clearance to be maintained from the bottom of the TB and the gland plate	
1.18	Paint shade	RAL 7032 (Siemens Grey)	
1.19	Typical vertical section (Overall dimension (mm) and weight ( Kg))	Required	
1.19.1	Incomer		
1.19.2	Outgoings		
1.20	Dimensions of the ACDB Panel	L (mm) X D (mm) X H (mm)	

**TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD**

S. No.	Description	Specification requirement	Vendor Data
1.21	Weights of the ACDB Panel	(in kg.)	
1.22	Marking on the panel	As per the specification	
<b>2.0</b>	<b>INCOMER MCCB</b>		
2.1	Make & Model of MCCB	Required	
2.2	Catalogue of MCCB	Required	
2.3	Continuous Current at 40 deg C/ 50 deg C	630A	
2.4	Rated ultimate breaking capacity at rated voltage	50kA	
2.5	Rated service breaking capacity Ics	Ics = 100% Icu at rated voltage	
2.6	Rated making current	Icm = 220% Icu	
2.7	Utilization Category	A	
2.8	Overload setting	50 -100% (Inverse time characteristics)	
2.9	Overcurrent setting	200-1000% (Instantaneous characteristics)	
2.10	Earthfault setting	20-100% (Instantaneous)	
2.11	Dimension(HxWxD)	Required	
2.12	Weight	Required	
<b>3.0</b>	<b>BUS AND BUS TAPS</b>		
3.1	Make		
3.2	Material and grade of buses and joints	High conductivity electrolytic grade aluminum	
3.3	Reference standard		
3.4	Continuous Current (at site condition, 50°C ambient) within cubicle	630A	
3.5	Cross sectional Area		
3.6	DC resistance	ohm/m/ph	
3.7	Skin-effect ratio		
3.8	Reactance	ohm/m/ph	
3.9	Losses-middle phase	w/m/ph	
3.10	Minimum clearance of bus bar and joints	Required	
3.10.1	Phase to phase (mm)		
3.10.2	Phase to earth (mm)		
3.11	Bus bar insulation	a. Heat shrinkable sleeves rated for maximum operating voltage b. Cast resin shrouds for joint	

**TECHNICAL SPECIFICATION FOR 415V AC DISTRIBUTION BOARD**

S. No.	Description	Specification requirement	Vendor Data
3.12	Bus joints	Silver	
3.13	Bus bar support insulator	Required	
3.13.1	Spacing (mm)		
3.13.2	Make		
3.13.3	Type		
3.13.4	Reference standard		
3.13.5	Voltage class (kV)		
3.13.6	Minimum creepage distance (mm)		
3.13.7	Cantilever strength (Kg/sq.cm.)		
<b>4.0</b>	<b>CURRENT TRANSFORMER</b>		
4.1	Make		
4.2	Type	Resin Cast	
4.3	Reference standard		
4.4	CT ratios		
4.5	Class of Insulation	Class-E	
4.6	Protection class	5P20	
4.7	Metering class	5	
4.8	VA burden for Relaying CT-Incomer	Based on requirement.	
<b>5.0</b>	<b>AMMETERS/MULTIFUNCTION METERS AND VOLTMETERS</b>		
5.1	Make & Model no.		
5.2	Type	Digital with inbuilt phase selector	
5.3	Communication Protocol	RS485 on MODBUS	
5.4	Accuracy class	1	
<b>6.0</b>	<b>CONTROL &amp; INDICATIONS</b>		
6.1	Push button		
6.1.1	Make and model no.		
6.1.2	Type	Flush mounted type with touch proof terminals	
6.2	LEDs		
6.2.1	Make & Model no.		
6.2.2	Type	Flush mounted type with touch proof terminals	
<b>7.0</b>	<b>TERMINAL BLOCKS</b>		
7.1	Make & Model no.		
7.2	Spare terminals	Equal to 20% of active terminals in each TB	
7.3	Power terminals	Stud type, screw driver operated	

<b>S. No.</b>	<b>Description</b>	<b>Specification requirement</b>	<b>Vendor Data</b>
7.4	Control terminals	Stud type, screw driver operated suitable for minimum 6sqmm wire.	
<b>8.0</b>	<b>TESTS</b>		
8.1	Confirmation of routine tests to be performed as per IS 60947	Yes/No	
8.2	IP 55 test shall be carried out during inspection	Yes/No	
8.3	Confirmation of Type tests to be performed (or report submitted) as per IS 60947	Type test report no./date	
8.4	Confirmation of Acceptance tests to be performed during inspection as per IS 60947	Yes/No	
8.5	Temperature rise test to be carried out at NABL accredited lab.	Yes/No	
<b>9.0</b>	Deviation sheet against each clause of the specification	To be submitted	

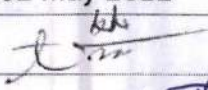

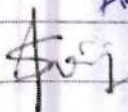
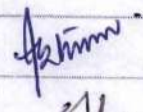
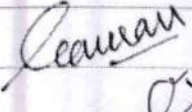
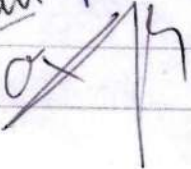
# BSES

## Technical Specification

Of

## Direct Current Distribution Board

Specification no – BSES-TS-71-DCDB-R0

Rev:		0
Pages:		1 of 16
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**TECHNICAL SPECIFICATION FOR DCDB****1 SCOPE**

This specification covers the design, engineering, manufacture, assembly and testing at Manufacturer's works and supply of 220 VDC/50 VDC Distribution board (DCDB) along with all hardware and accessories required for installation and operation.

Specification covers Type 1 and Type 2 DCDB. Type 1 DCDB is for Grid Substations while Type 2 DCDB is for BSES HT Customers.

**2 STANDARDS AND CODES**

2.1	IS:8623	Specification for factory built assemblies of switchgear & control gear for voltages up to and including 1000V AC/1200 V DC.
2.2	IS 60947-1	Specification for Low-voltage Switchgear and Controlgear - Part 2 :Circuit Breakers
2.3	IS:10118	Code of practice for selection, installation and maintenance switchgear and control gear
2.4	IS:2705	Current transformers
2.5	IS:3231	Electrical relays for power system protection
2.6	IS:1248	Electrical Indicating instruments
2.7	IS:4794	Switches and push buttons
2.8	IS:6005	Code of practice of phosphating iron and steel
2.9	IS:5082	Wrought Aluminium and aluminum alloys for electrical purposes
2.10	IS 3043	Code of practice for Earthing

**3 SERVICE CONDITION**

3.1	Location	Indoor
3.2	Average grade atmosphere	Heavily polluted, Dry
3.3	Maximum altitude above sea level	1000M
3.4	Ambient air temperature	Highest 50Deg C Average 40Deg C
3.5	Minimum ambient air temperature	0 Deg C
3.6	Relative Humidity	100%

**TECHNICAL SPECIFICATION FOR DCDB**

3.7	Rainfall	750mm concentrated in four months
3.8	Seismic Zone	IV

**4 CONSTRUCTION**

4.1	General construction	It shall be free-standing type comprising dust-tight and vermin-proof sheet steel cabinets suitable for indoor installation with IP-54 degree of protection. Necessary busbar support insulators, cable glands, cable supports and terminal blocks etc. The board shall preferably be of single front type.
4.2	Material	The Board shall be made cold rolled steel sheet having Thickness of 2.5 mm of load bearing member and 2 mm for Doors and covers , suitably reinforced to provide flat level surfaces. No welds, rivets, hinges or bolts shall be visible from outside.
4.3	Equipment Mounting	All switches provided on the distribution board shall be on front side of the cabinets, operable from outside. All instruments and control devices shall be mounted on the front of cabinets and fully wired to the terminal blocks.
4.4	Busbar housing	The busbars shall be housed in totally enclosed busbar chambers. Incoming connections from the busbar to various feeders shall be designed so as not to disturb cable connections. Busbar arrangement should ensure safety of the operation/maintenance personnel and facilitate working on any outgoing module without the need for switching off in-feed to the adjacent modules, as far as possible
4.5	Cable alleys	A cable alley preferably 230 mm wide shall be provided in each vertical section for taking cables into the compartments. Cable alleys shall be provided on sides of busbar chamber.
4.6	Cable entry	Cable entry should be from bottom
4.7	Cable glands	Compression type cable glands shall be provided to hold the cables to avoid any pressure or tension on the terminal block connections.
4.8	Gland Plate	Gland plate shall be 3.0mm thick.
4.9	Doors	The doors of cabinets shall be lockable and shall be fitted with double lipped gaskets.
4.10	Gasket	All doors, removable covers and panels shall be gasketed all around with neoprene gaskets. Gaskets shall be embedded through machine only.
4.11	Ventilating louvers	Ventilating louvers shall have screens and filters. The screens shall be made of either brass or GI wires mesh.



**TECHNICAL SPECIFICATION FOR DCDB**

4.12	Foundation	The panels shall be fixed on the embedded foundation channels with intervening layers anti vibration strips made of shock absorbing materials.
4.13	Base Frame	Base frames shall be supplied along with panels. 100mm channel painted black.
4.14	Mounting	Equipment on front of panel shall be flush mounted. No equipment shall be mounted on the doors.
4.15	Working level	The center lines of switches, push buttons and indicating lamps shall not be less than 750mm and higher than 1600mm from panel base.
4.16	Dimension	500(L)X500(D)X1800(H) mm <sup>3</sup>

**5 CONFIGURATION**

5.1	Incomers	One incomers having Double Pole DC MCB with Aux Switch.			
5.2	Outgoing feeders	All outgoing feeders shall have MCB. Number of outgoing feeders shall be as per table attached			
Application	No of Poles	Type-1		Type-2	
		Rating of MCB (In Amp)	Quantity	Rating of MCB (In Amp)	Quantity
Incomer	2	100	1	50	1
Emergency Lighting DB	2	32	1	16	1
Fire Alarm System	2	32	1	16	0
SCADA	2	32	2	16	1
CRP/33 kV/66 kV Switchgear	2	32	4	16	1
11 kV Switchgear	2	32	4	16	0
Testing Purpose	2	32	1	16	1
NIFPS	2	32	4	16	0
Spare 1	2	100	1	50	1
Spare 2	2	32	4	16	2

**TECHNICAL SPECIFICATION FOR DCDB****6 BUSBARS**

6.1	Material	Busbar shall be of tinned electrolytic copper or Aluminium
6.2	Size	Suitable for carrying the rated continuous current of 100 A and short circuit current of 15 kA. Busbars shall be continuous throughout the panel. Temperature rise should be limited to 40 degrees over ambient.
6.3	Supports	The busbar shall be supported by means of durable non-hygrosopic, non-combustible and non-tracking polyester fiberglass material or porcelain. Supports shall be capable of withstanding the maximum short circuit stresses.
6.4	Sleeves and shrouds	Busbars shall be encased in heat-shrinkable sleeves of insulating material which shall be suitable for the operating temperature of busbars during normal service. The busbar joints shall be provided with removable thermosetting plastic shrouds.

**7 TERMINALS AND WIRING**

7.1	Wiring	
7.1.1	Grade and type	1100 V grade, PVC insulated, FRLS type stranded flexible copper wire.
7.1.2	Ferruling	Each wire shall bear an identifying ferrule or tag at each end or connecting point.
7.1.3	Spare	20% Spare Wiring
7.2	Terminals	Terminals of appropriate size shall be provided inside each cabinet for incoming and outgoing cables.
7.2.1	Grade	1100 V grade, moulded piece terminals complete with insulated barriers, washers, nuts and lock nuts.
7.2.2	Power Terminals type	Stud type, nut driver operated
7.2.3	Control terminals type	Stud type, screw driver operated
7.2.4	Spare terminals	20% spare terminals should be provided in each terminal block.
7.2.5	Accessibility	Placement of terminals shall enable proper cable termination. Terminals shall be readily accessible for inspection and maintenance.
7.2.6	Marking	The terminals shall be serially numbered to facilitate installation and maintenance.

**TECHNICAL SPECIFICATION FOR DCDB****8 METERS, INDICATIONS, PUSH BUTTONS & HEATERS**

8.1	Meters	
8.1.1	Ammeter	DC Moving coil ammeter of size 96 sq.mm. with external shunt. Rating of Ammeter shall be 0-100A DC.
8.1.2	Voltmeter	DC Moving coil voltmeter of size 96.sq.mm to read the DC Bus voltage. Rating of Voltmeter shall be 0-300VDC
8.1.3	Type	Digital type, connected through instruments transformers of suitable rating.
8.2	Indicating lamps	Indicating lamps shall be of low wattage cluster LED type.
8.2.1	Incomer/ Outgoing On	Red
8.2.2	Incomer/ Outgoing Off	Green
8.2.3	Incomer/ Outgoing Trip	Amber
8.3	Push buttons	For manual operation of incomer MCB
8.4	Heaters	Cubicle space heater having rating of 100W. Thermostat for space heater shall be provided with temperature range 0-90 <sup>o</sup>
8.5	CFL	Cubicle lamp shall be provided in DCDB having rating of 11 W.

**9 NAME PLATES & MARKINGS**

9.1	Panel nameplate	Panel shall have a nameplate clearly indicating the following: a. Panel Serial No.- b. Customer Name - BSES Yamuna/Rajdhani Power Ltd c. PO No. & date - d. Type of Panel - e. Current rating - f. Guarantee period -
9.2	Feeder nameplate	Large and bold name plate carrying the feeder identification shall be provided on the top.
9.3	Equipment nameplate	a. All equipment mounted on front side as well as equipment mounted inside the panels shall be provided with individual name plates with equipment designation engraved. b. All front mounted equipment shall be also provided at the rear with individual name plates engraved with tag numbers corresponding to the one shown in the

**TECHNICAL SPECIFICATION FOR DCDB**

		panel internal wiring to facilitate easy tracing of the wiring.
9.4	Material	Non-rusting metal or 3 ply lamicoïd. Nameplates shall be black with white engraving lettering. Stickers are not allowed.
9.5	Fixing	All nameplates/rating plates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.
9.6	Markings	Each switch shall bear clear inscription identifying its function. Similar inscription shall also be provided on each device whose function is not other wise identified. If any switch or device does not bear this inscription separate nameplate giving its function shall be provided for it. Switch shall also have clear inscription for each position indicating e.g. Trip-Neutral close, ON-OFF etc.

**10 FINISH**

10.1	Primer	Two coats
10.2	Paint	Two finishing coats of epoxy based paint of Shade RAL 7032 with glossy finish.
10.3	Paint thickness	50 microns (minimum)

**11 APPROVED MAKES OF COMPONENTS**

11.1	Switch	Siemens / L&T (Salzer)
11.2	HRC Fuse Links	GE/ Siemens/ L&T
11.3	Meters	Rishabh/Schneider/AE
11.4	Terminals	Connectwell/Elmex/Wago/Phoenix
11.5	Push buttons / Actuator	L&T/Siemens/Vaishno/Schneider
11.6	MCB	Datar/Legrand/Hager/Schneider/ABB
11.7	Indicating lamps	Vaishno/Binay/Teknic/Siemens/Mimic/C&S

**TECHNICAL SPECIFICATION FOR DCDB****12 INSPECTION AND TESTING**

12.1	Type test	Equipment should be of type tested quality only, type test certificate to be submitted along with offer. If the manufacturer's lab is accredited by govt. / authorized body then it shall be acceptable for type testing.
12.2	Acceptance & Routine tests	As per relevant Indian standard

**13 PACKING, SHIPPING, HANDLING AND SITE SUPPORT**

13.1	Packing Protection	The packing shall be fit to withstand rough handling during transit and storage at destination. The test set should be properly protected against corrosion, dampness & damage.
13.2	Packing for accessories and spares	Robust non-returnable packing case with all the above protection & identification Label. The bidder should get the packing list approved before dispatching the material.
13.3	Packing Identification Label	On each packing case, following details are required:
13.3.1	Individual serial number	
13.3.2	Purchaser's name	
13.3.3	PO number (along with SAP item code, if any) & date	
13.3.4	Equipment Tag no. (if any)	
13.3.5	Destination	
13.3.6	Manufacturer / Supplier's name	
13.3.7	Address of Manufacturer / Supplier / it's agent	
13.3.8	Description	
13.3.9	Country of origin	
13.3.10	Month & year of Manufacturing	
13.3.11	Case measurements	
13.3.12	Gross and net weight	

**TECHNICAL SPECIFICATION FOR DCDB**

13.3.13	All necessary slinging and stacking instructions	
13.4	Shipping	The seller shall be responsible for all transit damage due to improper packing.
13.5	Handling and Storage	Manufacturer instruction shall be followed.
13.6	Detail handling & storage instruction sheet / manual to be furnished before commencement of supply.	

**14 DEVIATIONS**

14.1	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.
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**15 DOCUMENT SUBMISSION**

Drawing submission shall be as per the matrix given below. All documents/ drawing shall be provided on A3/A4 sheet in box file with separators for each section. Also provide USB containing pdf with bid for soft copy. Language of the documents shall be English only. Deficient/ improper document/ drawing submission may liable for rejection

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
15.1	Contact Person Name, Email ID and Mobile Number	Required			
15.2	Deviation Sheet	Required	Required		
15.3	Type Test	Required			
15.4	Any Technological Advancement in DCDB	Required			
15.5	Manufacturer's quality assurance plan and certification for quality standards				
15.6	General Arrangement		Required		
15.7	Door Layout		Required		
15.8	Internal Layout		Required		

**TECHNICAL SPECIFICATION FOR DCDB**

15.9	SLD		Required		
15.10	Schematic Circuit diagram		Required		
15.11	Bus Bar Arrangement		Required		
15.12	Cable Alley Arrangement		Required		
15.13	GTP	Required	Required		
15.14	QAP		Required		
15.15	BOQ		Required		
15.16	Foundation diagram		Required		
15.17	TB Detail		Required		
15.18	Name Plate Detail		Required		
15.19	Make of all Component as per specification		Required		
15.20	Inspection Report			Required	
15.21	As manufacturing Drawings			Required	
15.22	Operation and Maintenance Manual			Required	Required
15.23	Trouble shooting manual			Required	Required
15.24	As built Drawings				Required
15.25	Test Report				Required

**16 GUARANTEED TECHNICAL PARTICULARS**

Vendor must submit clause wise compliance in Excel sheet against specification at the time of drawing approval clearly highlighting the deviations from specification against each clause.

<b>S. No.</b>	<b>Description</b>	<b>Specification requirement</b>	<b>Bidder's Data</b>
16.1	<b>GENERAL FEATURES</b>		
16.1.1	Make		
16.1.2	Type		
16.1.3	Reference Standard		
16.1.4	Rated Operational voltage	220 VDC/50 VDC	

**TECHNICAL SPECIFICATION FOR DCDB**

16.1.5	Rated Nominal Current	100	
16.1.6	Rated Insulation voltage	1100V	
16.1.7	Rated Impulse withstand voltage	8kV	
16.1.8	Service supply for heating, lighting and power sockets	240VAC±10%	
16.1.9	Mounting	Floor (Free standing)	
16.1.10	Connections	Cable entry – Bottom	
16.1.11	Configuration	Single front	
16.1.12	Enclosure thickness		
a	Load Bearing Member	≥2.5mm	
b	Doors and Covers	≥2 mm	
c	Gland Plate	3 mm	
16.1.13	Enclosure Material	CRCA Sheet	
16.1.14	Enclosure degree of protection	IP 54	
16.1.15	Power Cable Termination	Suitable for 4CX50 Sq.mm Al	
16.1.16	Paint shade	RAL 7032 (Siemens Grey)	
16.1.17	Typical vertical section (Overall dimension (mm) and weight ( Kg))	Required	
16.1.18	Incomer		
16.1.19	Outgoings		
16.1.20	Dimensions of the DCDB Panel	500(L)X500(D)X1800(H) mm <sup>3</sup>	
16.1.21	Weights of the DCDB Panel	(in kg.)	
16.1.22	Marking on the panel	As per the specification	
16.1.23	Cable Alley Width	230 mm	
16.1.24	Cable Gland	Compression Type	
16.1.25	Gasket Material	Neoprene	



**TECHNICAL SPECIFICATION FOR DCDB**

16.1.26	Ventilating louvers	Required	
16.1.27	Base Frame	100mm channel	
16.2	<b>MCB</b>		
16.2.1	Make	<b>Datar/Legrand/Hager/Schneider/ABB</b>	
16.2.2	Incomer	100A/50 A	
16.2.3	Emergency Lighting DB	32A/16 A	
16.2.4	Fire Alarm System	32A/16 A	
16.2.5	SCADA	32A/16 A	
16.2.6	CRP	32A/16 A	
16.2.7	11 kV Switchgear	32A/16 A	
16.2.8	Testing Purpose	32A/16 A	
16.2.9	NIFPS	32A/16 A	
16.2.10	Spare 1	100A/50 A	
16.2.11	Spare 2	32A/16 A	
16.3	<b>BUS AND BUS TAPS</b>		
16.3.1	Make		
16.3.2	Material	Tinned electrolytic copper or Aluminum	
16.3.3	Reference standard		
16.3.4	Continuous Current (at site condition, 50°C ambient) within cubicle		
16.3.5	Short Circuit withstand Current for 1 sec	15 KA	
16.3.6	Cross sectional Area		
16.3.7	DC resistance	ohm/m/ph	
16.3.8	Reactance	ohm/m/ph	

**TECHNICAL SPECIFICATION FOR DCDB**

16.3.9	Losses-middle phase	w/m/ph	
16.3.10	Minimum clearance of bus bar and joints	Required	
16.3.11	Phase to phase (mm)		
16.3.12	Phase to earth (mm)		
16.3.13	Bus bar insulation	i. Heat shrinkable sleeves rated for maximum operating voltage	
		ii. Cast resin shrouds for joint	
16.3.14	Bus joints	Silver	
16.3.15	Bus bar support insulator	Required	
16.3.16	Spacing (mm)		
16.3.17	Make		
16.3.18	Type		
16.3.19	Reference standard		
16.3.20	Voltage class (kV)		
16.3.21	Minimum creepage distance (mm)		
16.3.22	Cantilever strength (Kg/sq.cm.)		
16.4	<b>Wiring and Terminals</b>		
16.4.1	<b>Wiring</b>		
a	Grade and type	1100 V grade, PVC insulated, FRLS type stranded flexible copper wire.	
b	Ferruling	Each wire shall bear an identifying ferrule or tag at each end or connecting point.	
c	Spare	20% Spare Wiring	
16.4.2	<b>Terminals</b>		
a	Grade	1100 V grade, moulded piece terminals complete with insulated barriers, washers, nuts and lock nuts.	
b	Power Terminals type	Stud type, nut driver operated	
c	Control terminals type	Stud type, screw driver operated	
d	Spare terminals	20% spare	

**TECHNICAL SPECIFICATION FOR DCDB**

e	Accessibility	Placement of terminals shall enable proper cable termination. Terminals shall be readily accessible for inspection and maintenance.	
f	Marking	The terminals shall be serially numbered to facilitate installation and maintenance.	
16.5	<b>METERS, INDICATIONS, PUSH BUTTONS &amp; HEATERS</b>		
16.5.1	Ammeter	DC Moving coil ammeter of size 96 sq.mm. with external shunt. Rating of Ammeter shall be 0-100A DC.	
a	Model No Ammeter		
b	Make of Ammeter		
16.5.2	Voltmeter	DC Moving coil voltmeter of size 96.sq.mm to read the DC Bus voltage. Rating of Voltmeter shall be 0-300VDC	
a	Model No Voltmeter		
b	Make of Voltmeter	Rishabh/Schneider/AE	
c	Type	Digital type	
16.5.3	Indicating lamps	Cluster LED type.	
a	Make of Indicating lamps	Vaishno/Binay/Teknic/Siemens/Mimic/C &S	
b	Incomer/ Outgoing On	Red	
c	Incomer/ Outgoing Off	Green	
d	Incomer/ Outgoing Trip	Amber	
e	Push buttons Make	L&T/Siemens/Vaishno/Schneider	
16.5.4	Heaters	Cubicle space heater having rating of 100W. Thermostat for space heater shall be provided with temperature range 0-90 <sup>o</sup>	
16.5.5	CFL	Cubicle lamp shall be provided in DCDB having rating of 11 W.	
16.6	<b>NAME PLATES &amp; MARKINGS</b>		

**TECHNICAL SPECIFICATION FOR DCDB**

a	Panel nameplate	Panel Serial No.-	
b		Customer Name - BSES Yamuna/Rajdhani Power Ltd	
c		PO No. & date -	
d		Type of Panel -	
e		Current rating -	
f		Guarantee period -	
16.6.1	Feeder nameplate	As per Spec	
a	Equipment nameplate	As per Spec	
b	Material	As per Spec	
c	Fixing	As per Spec	
d	Markings	As per Spec	
16.7	<b>FINISH</b>		
a	Primer	Two coats	
b	Paint	Two finishing coats of epoxy based paint of Shade RAL 7032 with glossy finish.	
c	Paint thickness	50 microns (minimum)	



## Technical Specification

Of

50 V and 220 V Lithium Ion Battery Bank

Specification no – BSES-TS-72-LiBB-R0

Rev: 0  
Pages: 1 of 14  
Date: 29 Apr 2022

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## 1 SCOPE

This specification covers the design, manufacture, testing, supply, erection & commissioning of 50 V & 220 V Li Ion Battery Bank.

Specification covers Type 1 and Type 2 Li Ion Battery Bank. Type 1 Battery Bank is for Grid Substations while Type 2 Battery Bank is for BSES HT Customers.

## 2 CODES & STANDARDS

Material, equipment and methods used in the manufacturing of Li Ion battery shall confirm to the latest edition of following standard

S. No	Standard Name / No	Standard's Description
2.1	Indian Electricity Act	Latest Edition
2.2	CBIP manual	Latest Edition
2.3	IEC 62281,62619, 61000-4-2	Safety of primary and secondary lithium cells and batteries, Safety requirements for secondary lithium cells and batteries, for use in industrial applications, Electrostatic Discharge Immunity Test
2.4	IEC 62133, IEC 62620:2014,	Battery Safety
2.5	IEC 61960	Performance tests, Designations, markings, dimensions, and other requirements
2.6	IEC 61959	Tests and requirements for verifying the mechanical behavior.
2.7	IS 5	Paint and Enamels
2.8	IS 13703	LV Fuses
2.9	IS 5578	Guide for marking insulated conductors
2.10	IS 694	Polyvinyl Chloride Insulated Unsheathed And Sheathed Cables/Cords With Rigid And Flexible Conductor For Rated Voltages Up To And Including 450/750 V
2.11	IS 1248	Direct Acting Indicating Analogue Electrical Measuring Instruments and their Accessories
2.12	IEEE	Relevant Standard
2.13	UL 1642	Individual cell compliance
2.14	UL 1973	Battery module complies, test methods and requirements to ensure safety during transport other than for recycling or disposal
2.15	UL 2054	Household and commercial Batteries

### 3 SERVICE CONDITIONS

3.1	Max Ambient Temperature	50 deg C
3.2	Max Daily average ambient temp	40 deg C
3.3	Min Ambient Temp	0 deg C
3.4	Maximum Humidity	95%
3.5	Minimum Humidity	10%
3.6	Maximum annual rainfall	750 mm
3.7	Average no of rainy days per annum	60
3.8	Rainy months	June to Oct
3.9	Altitude above MSL	300 M
3.10	Seismic Zone	IV

### 4 DC DISTRIBUTION SYSTEM DATA

4.1	DC Supply	2 wire, with positive & negative polarity
4.2	Earth reference	Unearthed system
4.3	Voltage	50 VDC/ 220 VDC
4.4	Application	Standby DC back up for switchgear control supply & SCADA RTU

### 5 GENERAL FEATURES

5.1	Number of Modules	6 (Maximum)
5.2	Connection of Modules	Parallel
5.3	DC battery bank Ah rating	For Type-1 Li Ion Battery Bank a. 600 Ah for 50 V b. 300 Ah for 220 V For Type-2 Li Ion Battery Bank a. 200 Ah for 50 V b. 100 Ah for 220 V
5.4	Voltage Output	50 V / 220 V
5.5	Battery Efficiency	>90%
5.6	Gas Evolution from Battery	None
5.7	DC load curve	With High discharge characteristics.
5.8	Location of Module	Indoor
5.9	Ingress Protection	IP 4X
5.10	Installation	On cabinet, painted with anti-corrosive paint.



**TECHNICAL SPECIFICATION FOR Li ION BATTERY BANK**

5.11	Battery type	Li Ion Battery
5.12	Cell Chemistry	Different chemistry with material Manganese /Cobalt/iron/titanium etc subject to fulfillment of required parameters as mentioned in this specification.
5.13	Battery lifting/withdrawing arrangement	Suitable arrangement on Module
5.14	Battery Module marking	PO Number and Date, Customer Name- BSES Yamuna/Rajdhani Power Limited, Manufacturer name, month & year of manufacturer, Warranty Period, Nominal voltage, rated Ah capacity & cell number , Customer Care Number
5.15	Terminal polarity marking	Positive& negative marked on Module
5.16	Battery cell shorting metal links	Nickel plated copper with protective insulating sleeve
5.17	Insulating shrouds	For all battery terminals & shorting links
5.18	Insulating pads for battery rack	At the bottom of rack supports, made from high impact material
5.19	Battery suitable for Ripple content	5% minimum in DC charger output

**6 BATTERY MANAGEMENT SYSTEM**

Module must comprise BMS (Battery Management System) which monitors battery internal vital parameters, measures and displays various alarms/warnings; establish a communication link with the external system i.e. Charger, SCADA.

6.1	Arrangement	<ul style="list-style-type: none"> <li>a. Battery shall comprise of two strings of equal rating.</li> <li>b. In Type-1 Battery Bank, for 220 VDC, two strings of 150 Ah capacity shall be provided</li> <li>c. In Type-1 Battery Bank, for 50 VDC, two strings of 300 Ah capacity shall be provided</li> <li>d. In Type-2 Battery Bank, for 220 VDC, two strings of 50 Ah capacity shall be provided</li> <li>e. In Type-2 Battery Bank, for 50 VDC, two strings of 100 Ah capacity shall be provided</li> <li>f. Each battery string should have its own dedicated BMS.</li> <li>g. Refer Annexure –A for architecture</li> </ul>
6.2	Display	BMS shall have a display showing all measured parameters.
6.3	Communication	
6.3.1	Protocol For SCADA Interface	Modbus
6.3.2	Port	RS-485

**TECHNICAL SPECIFICATION FOR Li ION BATTERY BANK**

6.3.3	Key Battery Parameters to be Integrated With SCADA	As per Annexure-A
6.3.4	Status LED	Dual color type
6.3.5	SOC LED	Dual color type
6.3.6	In-built data logging	Upto 6 months
6.3.7	Protection feedback to SCADA	From S.No 7.4.7 to 7.4.13
6.4	Safety Feature	
6.4.1	Module reverse polarity protection	
6.4.2	Internal fuse	
6.4.3	Controllable internal fuse	
6.4.4	Protective terminal covering to avoid unintentional contact	
6.4.5	Secondary level hardware protection for overvoltage	
6.4.6	Heat propagation resistant cell holding structure	
6.4.7	Overvoltage protection	
6.4.8	Under voltage protection	
6.4.9	Over charging current protection	
6.4.10	Over discharge current protection	
6.4.11	Over temperature during discharge protection	
6.4.12	Over temp during charge protection	
6.4.13	Over internal FET temp protection	
6.5	Arrangement for Bypassing the BMS	

**7 CABINET**

7.1	Panel Type	a. Separate compartment shall be provided for both battery strings b. Simplex panel with Dimension 0.6x0.6x1.4 m <sup>3</sup>
7.2	Pocket	Pocket for Drawing is required
7.3	Display	a. Local LED Display on Cabinet shall be provided having key battery Parameters. b. Battery key parameters shall be as per Annexure-A
7.4	Ingress Protection	IP4Xin accordance with IS 13947
7.5	Cooling	Natural
7.6	Enclosure material	Pre-galvanized, cold-rolled sheet steel of thickness not less than 2.0 mm. Stiffeners shall be provided wherever necessary.
7.7	Doors	Double leaf doors shall be provided at the rear. Doors shall have handles with built-in locking facility
7.8	Gland Plate	At least two separate gland plates of removable type with gasket shall be provided for each panel. They shall be of sheet steel of thickness not less than 3.0 mm.

**TECHNICAL SPECIFICATION FOR Li ION BATTERY BANK**

7.9	Gaskets	All doors, removable covers and panels shall be Gasketed all around with neoprene gaskets
7.10	Foundation	The panels shall be fixed on the embedded foundation channels with intervening layers anti vibration strips made of shock absorbing materials
7.11	Base Frame	Base frames shall be supplied along with panels.
7.12	Earthing	50x6 sqmm GI Earth bus shall run through the cabinet and same shall be extended to outside of the panel from both sides for earthing purpose.
7.13	Pocket	Pocket shall be Provided for drawing placement purpose

**8 NAMEPLATES AND MARKING**

8.1	Panel nameplate	<ul style="list-style-type: none"><li>a. BSES Logo</li><li>b. Property of BSES</li><li>c. Name of manufacturer</li><li>d. Name of customer</li><li>e. Battery Rating</li><li>f. PO no. &amp; Date</li><li>g. Serial Number</li><li>h. Month &amp; year of manufacturing</li><li>i. Guarantee period</li><li>j. Manufacturer Call center no. &amp; email id</li><li>k. Weight of Panel</li></ul>
8.2	Name Plate Material	Anodized Aluminum 16SWG
8.3	Background	Satin Silver
8.4	Letter, Diagram & Border	Black
8.5	Process	Etching
8.6	Equipment ID Marking	Shall be given at the time of drawing approval. Following will be the features: <ul style="list-style-type: none"><li>a. Equipment ID shall be painted on any appropriate face of the equipment at a clearly readable height from the base level of the equipment.</li></ul>

**TECHNICAL SPECIFICATION FOR Li ION BATTERY BANK**

		<ul style="list-style-type: none"> <li>b. Font: Recommended type face for the signage is True type or Post script.</li> <li>c. Font Size: All painting should be in UPPERCASE. Recommended height of 50 mm with spacing between alphabets of 3 mm.</li> <li>d. Total No's of Character: 18</li> <li>e. Height of Font: 50 mm</li> <li>f. Height of Base: 100 mm</li> <li>g. Spacing between alphabets: : 3 mm</li> <li>h. Paint: Base coat – Dense Yellow. Letters – Black Quick Drying paint 2 coats.</li> </ul>
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**9 EQUIPMENT LIST**

9.1	Battery Cabinet
9.2	Battery Module
9.3	Communication cable
9.4	DC power cable
9.5	Cable terminal block/bus-bar
9.6	Earth cable
9.7	Tools and Accessories for Maintenance
9.8	Mandatory and Recommended Spares if Any

**10 INSPECTION & TESTING**

10.1	Type test	Equipment shall be type tested from CPRI/ERDA accredited lab as per IEC/IS/UL standard.
10.2	Routine test	As per relevant standard
10.3	Acceptance test	To be performed in presence of Owner at manufacturer works shall be as per approved QAP
10.4	Heating Compliance	JIS C8712
10.5	ROHS Compliance	Required

**11 GTP**

Vendor must submit clause wise compliance in Excel sheet against specification at the time of drawing approval clearly highlighting the deviations from specification against each clause.

**12 DEVIATIONS**

Deviation from this specification shall be provided in excel sheet with the tender by reference to the specification clause/ GTP/ Drawing and description of alternative offer. In

absence of such a statement, it shall be assumed by the buyer that the seller complies fully with this specification.

### 13 DRAWING AND DATA SUBMISSION MATRIX

Document submission shall be as per the matrix given below. All documents/drawing shall be provided in soft copy (in pen drive) for each section. Language of the documents shall be English only. Deficient/improper drawing submission may liable for rejection.

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
13.1	Contact Person Name, Email ID and Mobile Number	Required	Required		
13.2	Deviation Sheet(as per "Deviations" Clause)	Required			
13.3	GTP		Required		
13.4	Relevant Type Test as per IS/IEC/UL	Required	Required		
13.5	Manufacturer's quality assurance plan and certification for quality standards		Required		
13.6	Sizing Calculation of Associated Equipment		Required		
13.7	Recommended Spares for five years of operation)		Required		
13.8	<b>Li Ion drawing</b>				
13.8.1	General Arrangement	Required	Required		
13.8.2	Sectional Layout		Required		
13.8.3	Cabinet Layout		Required		
13.8.4	Battery Layout		Required		
13.8.5	SLD	Required	Required		
13.8.6	Schematic Circuit diagram and Scheme of Each type of Panel		Required		
13.8.7	Communication Architecture		Required		

**TECHNICAL SPECIFICATION FOR Li ION BATTERY BANK**

13.8.8	QAP		Required		
13.8.9	BOQ		Required		
13.8.10	Plan		Required		
13.8.11	Foundation Diagram		Required		
13.8.12	Make of all Component as per specification		Required		
13.8.13	Drawing of Substation Room		Required		
13.9	Installation, erection and commissioning manual		Required		
13.10	Inspection Reports			Required	
13.11	As manufacturing Drawings			Required	
13.12	Operation and Maintenance Manual			Required	
13.13	Trouble shooting manual			Required	
13.14	As built Drawings				Required

**14 PACKING**

14.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, module may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
14.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label
14.3	Packing Identification Label to be provided on each packing case with the following details	
14.3.1	Individual serial number	
14.3.2	Purchaser's name	
14.3.3	PO number (along with SAP item code, if any) & date	
14.3.4	Equipment Tag no. (if any)	
14.3.5	Destination	

**TECHNICAL SPECIFICATION FOR Li ION BATTERY BANK**

14.3.6	Project Details
14.3.7	Manufacturer / Supplier's name
14.3.8	Address of Manufacturer / Supplier / it's agent
14.3.9	Description and Quantity
14.3.10	Country of origin
14.3.11	Month & year of Manufacturing
14.3.12	Case measurements
14.3.13	Gross and net weights in kilograms
14.3.14	All necessary slinging and stacking instructions

**15 SHIPPING**

15.1	Shipping	<p>The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, Overhead lines, free access etc. from the Manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed Packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.</p>
		<p>The seller shall be responsible for all transit damage due to improper packing.</p>

**TECHNICAL SPECIFICATION FOR Li ION BATTERY BANK****16 HANDLING AND STORAGE**

16.1	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.
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**17 QUALITY AND ASSURANCE**

17.1	Vendor quality plan	To be submitted for purchaser approval
17.2	Inspection points	To be mutually identified & agreed in quality plan

**18 ANNEXURE A- BATTERY KEY PARAMETERS**

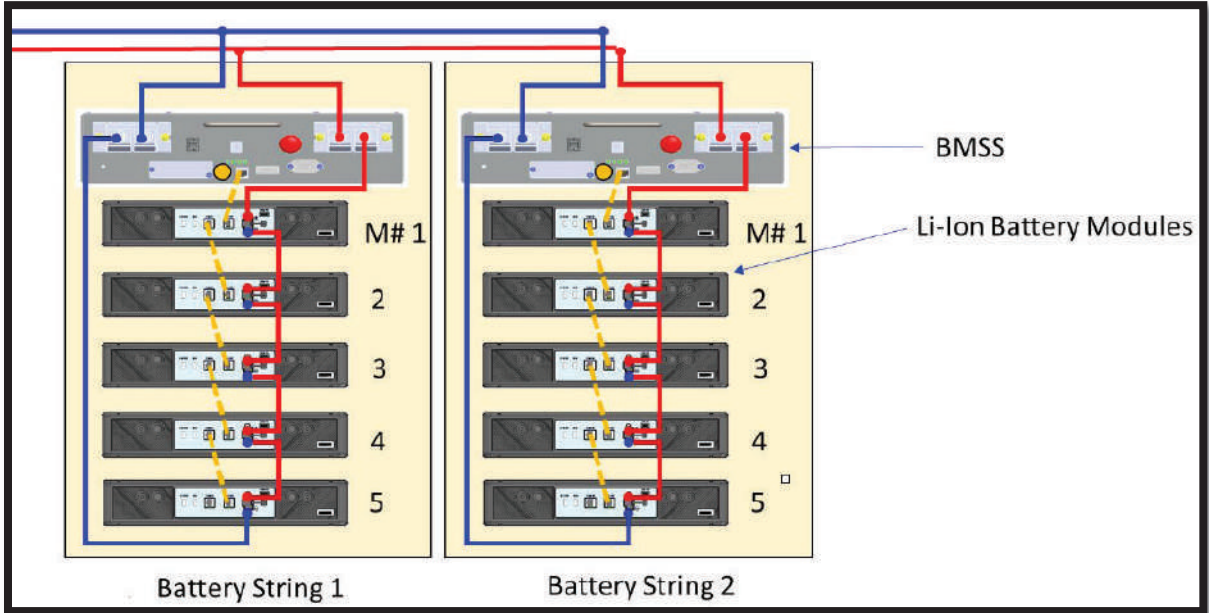
S.NO.	Description	BSES Requirement		Data to be filled by Manufacturer	
		50V	220V	50V	220V
18.1	Battery ( as per scope of supply) – Yes / No	Yes	Yes		
18.2	Battery type	Li-Ion	Li-ion		
18.3	Type/Model No.				
18.4	Cell Chemistry				
18.5	Battery nominal voltage with variation upto $\pm 5\%$				
18.6	Total battery bank CC-CV charging required in volts				
18.7	Nominal Voltage of each Cell				
18.8	No of cells in each module				
18.9	No. of modules				
18.10	Input charge voltage				
18.11	Charge current				
18.12	Discharge current				
18.13	Battery DOD	80% (minimum)	80% (minimum)		
18.14	Life cycle with 80% DOD	3000 (minimum)	3000 (minimum)		
18.15	Battery efficiency (watt hour round trip)	>92%	>92%		
18.16	Service life	10 Years	10 Years		



**TECHNICAL SPECIFICATION FOR Li ION BATTERY BANK**

18.17	Self-discharge rate per month	3% @ 25°C	3% @ 25°C		
18.18	Cut off voltage	45V	210V		
18.19	Submitted of deviation sheet for each specification clause no - Yes / No	Furnish each deviation if yes	Furnish each deviation if yes		
18.20	Battery rating offered in AH	600 AH/200 AH	300 AH/100 AH		
18.21	Rating at temperature 45 deg C	600 AH/200 AH	300 AH/100 AH		
18.22	Battery bank dimensions in mm ( length x depth x height)	As required	As required		
18.23	Battery Module weight in kg	As required	As required		
18.24	Heat generated by battery at rated full load (in Kw)	Less than 0.025kW/module	Less than 0.025kW/module		
18.25	Manufacturer of Li-Ion Battery Cells and Modules	Yes	Yes		
18.26	Manufacturer of Battery management system (BMS)	Yes	Yes		
18.27	Availability of Service team in India	Yes	Yes		
18.28	Built In Battery Management System	Yes	Yes		

#### 19 ANNEXURE B-BATTERY ARRANGEMENT



Battery System

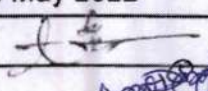
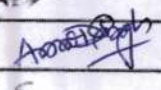
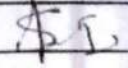
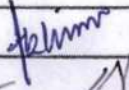
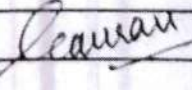
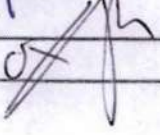
# BSES

## Technical Specification

For

### SMPS Based Battery Charger

Specification no – BSES-TS-73-SMPSBC-R0

Rev	0	
Page	1 of 11	
Date	05 May 2022	
Prepared by	Abhishek Harsh	
	Amar Singh	
Reviewed by	Srinivas Gopu	
	Abhinav Srivastava	
Approved by	Gaurav Sharma	
	Gopal Nariya	

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**TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER****1 SCOPE OF SUPPLY**

This specification covers the design, manufacturing, testing, supply, erection & commissioning of 20 VDC/ 50 VDC SMPS based 2X100% Float Cum Boost Charger at site for indoor installation with all necessary accessories associated with it.

Specification covers Type 1 and Type 2 Battery Charger. Type 1 Battery Charger is for Grid Substations while Type 2 Battery Charger is for BSES HT Customers.

**2 CODES & STANDARDS**

Material, equipment and methods used in the manufacture of battery charger shall confirm to the latest edition of following

Indian Electricity Rules	
Indian electricity act	
CBIP manual	
IS 3895	Specification for rectifier equipment in general
IS 5921	Printed circuit boards
IS 6619	Safety code for semiconductor devices
IS 4540	Semiconductor rectifier assemblies and equipment
IS 694	PVC Insulated Cables for Working Voltage up to and including 1100V
IS 1248	Direct Acting Electrical indicating instruments
IS 2705	Current transformer
IS 3156	Voltage transformer
IS 3231	Electric relay for power system protection
IS 5578	Guide for making of insulated conductors
IS 8623	Low voltage switchgear and control gear assemblies
IS 13703	Low voltage fuses for voltages not exceeding 1000AC
IS 12063	Degree of enclosure protection
IS5	Color of mixed paints
IS 6297	Transformer & inductors for electronic equipment
IS 6553	Environment requirements for semiconductor device
IS 4007	Terminals for electronic equipment

**3 SERVICE CONDITIONS**

3.1	Max Ambient Temperature	50 deg C
3.2	Max Daily average ambient temp	40 deg C
3.3	Min Ambient Temp	0 deg C
3.4	Maximum Humidity	95%
3.5	Minimum Humidity	10%
3.6	Maximum annual rainfall	750 mm

**TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER**

3.7	Average no of rainy days per annum	60
3.8	Rainy months	June to Oct
3.9	Altitude above MSL	300 M
3.10	Seismic Zone	IV

**4 CHARGER DESIGN FEATURES**

4.1	Type	SMPS Based
4.2	Rating	For Type-1 Battery Charger a. 70 A for 50 V b. 35 A for 220 V For Type-2 Battery Charger a. 35 A for 50 V b. 20 A for 220 V
4.3	Configuration	2X100% Float cum Boost Charger.
4.4	Incoming Supply	Provision of Two Incoming Supply with Auto Changeover Facility
4.5	Automatic Phase Sequence Corrector	a. For 3 phase supply in right sequence, phase conversion. b. Protect equipment from phase reversal, phase loss.
4.6	Panel type	Metal enclosed frame construction
4.7	Overall Dimension	L - 1500 mm x D - 700 mm x H - 1900 mm
4.8	Cable Entry	Bottom
4.9	Location	Indoor, non air conditioned environment
4.10	Doors for front access	With anti theft hinge & handle
4.11	Cover for rear access	With Allen screw M6 size & handle
4.12	Construction	Sheet metal 2.0mm thick CRCA
4.13	Base frame	75mm ISMC
4.14	Lifting lugs	Four number
4.15	Gland plate	3mm metallic, un drilled & removable type
4.16	Enclosure protection	IP42 Minimum
4.17	Power terminal	Bus bar type, minimum 300mm above gland plate
4.18	Control terminal	Nylon66 with brass clamp
4.19	Bus bar	Tinned copper with insulation sleeve
4.20	Earth bus bar	Aluminum sized for rated fault duty for 1sec
4.21	Earth bus internal connection to all non current carrying metal parts	By copper flexible wire 2.5 sqmm
4.22	Earth bus external connection to owner earth	Al bus on both sides of panel with two holes for M10 bolt
4.23	Cooling	With Exhaust Fan
4.24	Panel heater	Thermostatically controlled through MCB
4.25	Panel internal wiring	Multi strand flexible color coded PVC insulated copper wire 1.5 sqmm 1100volt grade with 1.5 sqmm ferruling

**TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER**

		(other than circuit wiring related to PCB cards )
4.26	Isolation & protection device	Mounted at height minimum 1000mm from bottom
4.26.1	MCCB	For charger input, output & battery input
4.26.2	Battery & test resistor load	Lockable change over switch with one position for charger, second for 'OFF' & third position for external test resistor.
4.27	Hardware (Nut, bolts & handle)	Stainless steel
4.28	Essential provision	Surge suppression, harmonic suppression, blocking diodes, filters for ripple control
4.29	Insulating shrouds	On all live parts, power semi conductors & electronic components
4.30	Ripple content in DC output	0.5 % maximum
4.31	DC output voltage regulation	Maximum $\pm 1\%$ of rating with AC input supply variation of $\pm 10\%$ from 415 volts, frequency variation of $\pm 5\%$ from 50 HZ and simultaneous load variation of 0-100%
4.32	Reverse polarity connection	Protected against reversed battery polarity
4.33	Charger efficiency	90% minimum at Rated Load
4.34	Noise output	65DB maximum
4.35	Charger selector switch	For auto/manual and float/boost selection, lockable type inside panel
4.36	Charging current settings	25% to 100% of rating
4.37	Charging current accuracy	2% of set current with input voltage variation of $\pm 10\%$ and frequency variation of $\pm 5\%$
4.38	Auto and Manual DC output adjustment range for float & boost charge (voltage & current)	By potentiometers inside panel, range suitable for battery bank. Charger suitable for other type of batteries if offered, shall be subject to buyer's approval.
4.39	Louvers	With stainless steel wire mesh
4.40	Gasket	Neoprene rubber
4.41	Panel illumination lamp with door switch	MCB controlled, with 5/15amp switch socket
4.42	Panel door keys	4 no. per panel, identical key for all panels
4.43	PCBs for electronic circuitry	With protective layer finish at back
4.44	PCB soldering	Preferably by wave soldering process
4.45	PCB/ electronic card mounting	With press fit type locking arrangement
4.46	Semiconductor component mounting	Shall not be on bakelite sheet

**5 METERING, ANNUNCIATION & INDICATION**

5.1	Ammeter (96x96mm)	Digital type, for AC input, DC output & battery current. Auxiliary supply for meters should be 48V to 230V AC/DC (Universal type)
5.2	Voltmeter (96x96mm)	Digital type, with selector switch for AC input, DC output & battery voltage. Auxiliary supply for meters should be 48V to 230V AC/DC (Universal type)

**TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER**

5.3	LED indication on panel front	
5.3.1	Status	
5.3.1.1	Input AC supply available on R,Y & B phase	Red/yellow/blue color LED
5.3.1.2	Float cum Boost charger AC MCCB 'ON'	Red color LED for each charger module
5.3.1.3	Charger output DC 'ON'	Red color LED for each charger module
5.3.1.4	Outgoing DCDB feeder ON	Red color LED for each other
5.3.2	Fault	
5.3.2.1	DC earth fault	Amber color LED
5.3.2.2	Battery MCCB OFF	Amber color LED
5.3.2.3	Charger output DC under/ over voltage	Amber color LED
5.3.2.4	AC mains undervoltage	Amber color LED
5.4	Annunciation	Hooter with isolating switch for fault annunciation.
5.5	Potential free contacts for remote indication to be wired upto terminal block	a. AC under voltage b. AC over voltage c. CH-A AC MCCB trip/OFF d. CH-B AC MCCB trip/OFF e. CH-A Rect/Cond. fuse fail f. CH-B Rect/Cond. fuse fail g. CH-A DC MCCB trip/OFF h. CH-B DC MCCB trip/OFF i. Battery MCCB trip/OFF j. CH-A DC under voltage k. CH-B DC under voltage l. CH-A DC over voltage m. CH-B DC over voltage n. Battery DC under voltage o. Battery DC over voltage p. DC Bus over voltage q. DC Earth fault r. Battery Charger in boost mode
5.6	Microprocessor based monitoring unit cum controller	Charger should have a microprocessor based controller
5.6.1	Analog signals to be monitored by controller	a. AC Input Voltage and current b. DC output voltage and current for Charger -1 and Charger -2 c. Battery voltage and current
5.6.2	Alarms/Faults signals to be monitored by controller	a. AC under voltage b. AC over voltage c. CH-A AC MCCB trip/OFF d. CH-B AC MCCB trip/OFF e. CH-A Rect/Cond. fuse fail f. CH-B Rect/Cond. fuse fail g. CH-A DC MCCB trip/OFF h. CH-B DC MCCB trip/OFF i. Battery MCCB trip/OFF



**TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER**

		<ul style="list-style-type: none"> <li>j. CH-A DC under voltage</li> <li>k. CH-B DC under voltage</li> <li>l. CH-A DC over voltage</li> <li>m. CH-B DC over voltage</li> <li>n. Battery DC under voltage</li> <li>o. Battery DC over voltage</li> <li>p. DC Bus over voltage</li> <li>q. DC Earth fault</li> <li>r. Battery Charger in boost mode</li> </ul>
5.6.3	SCADA Interfacing	Microprocessor controller should have RS485 port capable of transmitting all analog and alarm/fault signal to RTU on open MODBUS protocol. Any hardware/software required to achieve the said compatibility shall be in bidder's scope.
5.6.4	Display	Backlit display capable of displaying all the analog and fault/alarm signals mentioned above.

**6 APPROVED MAKE OF COMPONENTS**

6.1	Switch	Siemens / L&T (Salzer)
6.2	HRC Fuse Links	GE/ Siemens/ L&T
6.3	Diodes & SCR	Hirect/USHA/IOR
6.4	Meters	AE/Rishabh
6.5	AC Contractors &O/L Relay	L&T/Siemens/Telemecanique/GE/ABB
6.6	Terminals	Connectwell/Elmex/Wago/Phoenix
6.7	Push buttons / Actuator	L&T/Siemens/Vaishno
6.8	MCCB	L&T/Siemens/ ABB/GE
6.9	MCB	Datar/Legrand/Hager/Schneider
6.10	Indicating lamps LED type	Vaishno/Binay/Teknic/Siemens/Mimic

**7 MIMIC DIAGRAM, LABEL & FINISH**

7.1	Mimic diagram	To be provided
7.2	Name plate on panel front	
7.2.1	Material	Anodized aluminum 16SWG
7.2.2	Background	SATIN SILVER
7.2.3	Letter, diagram & boder	Black
7.2.4	Process	Etching
7.2.5	Name plate details	<ul style="list-style-type: none"> <li>a. Manufacturer name</li> <li>b. Month &amp; year of manufacture</li> <li>c. Equipment type</li> <li>d. Input &amp; Output rating</li> <li>e. Owner name &amp; order number</li> <li>f. Guarantee period</li> <li>g. Weight of panel</li> <li>h. Degree of protection</li> <li>i. Sr. No.</li> </ul>
7.3	Labels for meters, indication &	Anodized aluminum with white character on black

**TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER**

	all cards / sub assemblies in panel	background
7.4	Danger plate on front & rear side	Anodized aluminum with white letters on red background
7.5	Painting surface preparation	Shot blasting or chemical 7 tank process
7.6	Painting external finish	Powder coated polyester base grade A, shade –RAL 7032, uniform
7.7	Painting internal finish	Powder coated polyester base grade A, shade – white, uniform thickness 50 micron minimum
7.8	Labels for all components in panel	Anodized aluminum with white character on black background, fixed by rivets only
7.9	SLD	SLD of charges shall be provided at backside of the main door of Charger on Aluminium plate

**8 QUALITY ASSURANCE, INSPECTION & TESTING**

8.1	Vendor quality plan	To be submitted for purchaser approval
8.2	Inspection points	To be mutually identified & agreed in quality plan
8.3	Type test	Equipment should be of type tested quality only, type test certificate to be submitted along with offer. If the manufacturer's lab is accredited by govt. / authorized body then it shall be acceptable for type testing.
8.4	Routine test	As per relevant Indian standard
8.5	Acceptance test	To be performed in presence of Owner at manufacturer works <ul style="list-style-type: none"> <li>a. Physical inspection &amp; BOM, wiring check</li> <li>b. Insulation resistance test</li> <li>c. HV test for one minute</li> <li>d. Voltage regulation test</li> <li>e. Heat run test for 12 hours</li> <li>f. Measurement of efficiency, power factor &amp; ripple content</li> </ul>

**9 DEVIATIONS**

Deviation from this specification shall be stated in writing with the tender by reference to the specification clause/ GTP/ Drawing and description of alternative offer. In absence of such a statement, it shall be assumed by the buyer that the seller complies fully with this specification.

**10 GTP**

Vendor must submit clause wise compliance against specification at the time of drawing approval clearly highlighting the deviations from specification against each clause.

**TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER****11 DRAWING AND DATA SUBMISSION MATRIX**

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
11.1	Contact Person Name, Email ID and Mobile Number	Required	Required		
11.2	Deviation Sheet (as per "Deviations" Clause)	Required			
11.3	GTP		Required		
11.4	Relevant Type Test as per IS/IEC/UL	Required	Required		
11.5	Manufacturer's quality assurance plan and certification for quality standards		Required		
11.6	Sizing Calculation of Associated Equipment		Required		
11.7	Recommended Spares for five years of operation)		Required		
11.8	<b>Battery Charger Drawing</b>				
11.8.1	General Arrangement	Required	Required		
11.8.2	Sectional Layout		Required		
11.8.3	Cabinet Layout		Required		
11.8.4	SLD	Required	Required		
11.8.5	Schematic Circuit diagram and Scheme of Each type of Panel		Required		
11.8.6	Communication Architecture		Required		
11.8.7	QAP		Required		
11.8.8	BOQ		Required		
11.8.9	Plan		Required		
11.8.10	Foundation Diagram		Required		
11.8.11	Make of all Component as per specification		Required		
11.8.12	Drawing of Substation Room		Required		
11.9	Installation, erection and commissioning manual		Required		

**TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER**

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
11.10	Inspection Reports			Required	
11.11	As manufacturing Drawings			Required	
11.12	Operation and Maintenance Manual			Required	
11.13	Trouble shooting manual			Required	
11.14	As built Drawings				Required

**12 PACKING**

12.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, module may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
12.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label
12.3	Packing Identification Label to be provided on each packing case with the following details	
12.3.1	Individual serial number	
12.3.2	Purchaser's name	
12.3.3	PO number (along with SAP item code, if any) & date	
12.3.4	Equipment Tag no. (if any)	
12.3.5	Destination	
12.3.6	Project Details	
12.3.7	Manufacturer / Supplier's name	
12.3.8	Address of Manufacturer / Supplier / it's agent	
12.3.9	Description and Quantity	
12.3.10	Country of origin	
12.3.11	Month & year of Manufacturing	
12.3.12	Case measurements	
12.3.13	Gross and net weights in kilograms	
12.3.14	All necessary slinging and stacking instructions	
12.4	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, module may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
12.5	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label
12.6	Packing Identification Label to be provided on each packing case with the following details	

**TECHNICAL SPECIFICATION FOR SMPS BASED BATTERY CHARGER**

12.6.1	Individual serial number
12.6.2	Purchaser's name
12.6.3	PO number (along with SAP item code, if any) & date
12.6.4	Equipment Tag no. (if any)
12.6.5	Destination
12.6.6	Project Details
12.6.7	Manufacturer / Supplier's name
12.6.8	Address of Manufacturer / Supplier / it's agent
12.6.9	Description and Quantity
12.6.10	Country of origin
12.6.11	Month & year of Manufacturing
12.6.12	Case measurements
12.6.13	Gross and net weights in kilograms
12.6.14	All necessary slinging and stacking instructions

**13 SHIPPING**

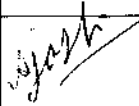
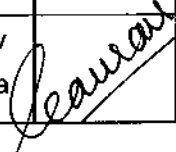

13.1	Shipping	The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, Overhead lines, free access etc. from the Manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed Packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.
		The seller shall be responsible for all transit damage due to improper packing.

**14 HANDLING AND STORAGE**

14.1	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.
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**Technical Specification  
For  
ABT/GRID Meter**

**Specification No. – SP-EMABT-70-R0**

Prepared by		Reviewed by		Approved by		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
Ashish Joshi		Gaurav Sharma		Devendra Sharma		R0	03.05.2016

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**RECORD OF REVISION**

Revision No	Revision Date	Item / clause no.	Nature of Change	Approved By



**1.0 SCOPE OF SUPPLY**

- a. Design, engineering, manufacture, assembly, testing, inspection at manufacturer's works before dispatch, packing and delivery of electronic HT tri-vector CT-PT operated energy meter suitable for ABT (Availability Based Tariff), Four Quadrant, Bi-Directional power flow, solidly earthed system with balanced and un-balanced loads for a power factor range from zero to unity (lagging and leading), with accuracy class 0.2s in accordance with this specification.
- b. Any accessories / hardware required for installation and operation for the meter.
- c. Software required for operation of meter and its interfacing with BSES system.
- d. All relevant drawings/documents/manuals for the meters and its accessories

**2.0 CODES & STANDARDS**

Following codes and standards (with latest amendments) are applicable-

<b>S No.</b>	<b>Code/Standard</b>	<b>Title</b>
2.1	Latest Edition	Indian Electricity Rules 1956
2.2	Latest Edition	Indian Electricity Act 1910
2.3	CEA	Regulation for installation and operation of meters
2.4	CBIP 325	CBIP Guide on static energy meters- Specification and testing
2.5	IS 14697	AC Static Transformer Operated Watthour & Var-hour Meter
2.6	IS 11448	Application Guide for AC Electricity Meters
2.7	IS 15707	Testing, Evaluation, Installation and maintenance of AC electricity meters.
2.8	IS 1401	Protection of Persons and Equipment by Enclosure
2.9	IS 15959	Data Exchange for Electricity meter- Reading Tariff and Load control- Companion specification
2.10	IS 4905	Methods of Random Sampling
2.11	IEC 60050	International Electro Technical Vocabulary
2.12	IEC 60736	Testing Equipment for Electrical Energy Meters
2.13	IEC 61000	Electromagnetic Compatibility
2.14	IEC 62052	Electricity Metering Equipment General Requirement, Tests & Test Conditions
2.15	IEC 62053	Electricity Metering Equipment Particular Requirements
2.16	IEC 62058	Electricity Metering Equipment - Acceptance Testing

In the event of direct conflict between various order documents, the precedence of authority of documents shall be as follows -

- i. Guaranteed Technical Particulars (GTP)
- ii. Specification including applicable codes & standards
- iii. Approved Vendor Drawings
- iv. Other documents

**3.0 SERVICE CONDITIONS**

3.1	Temperature Range	Operation range: -10 Deg C to 55 Deg C Limit range of operation: -25 to 60 Deg C Limit range of storage / transport : -25 to 70 Deg C
3.2	Relative Humidity	0 to 96 %

**4.0 DISTRIBUTION SYSTEM DATA**

4.1	Supply	3 phase 3 wire system
4.2	Voltage	11KV
4.3	Frequency	50 Hz $\pm$ 5%
4.4	System neutral	Solidly Earthed

**5.0 ELECTRICAL AND ACCURACY REQUIREMENTS**

5.1	Meter Type	Solid state, CT PT operated, 3 phase 4 wire, suitable for ABT metering
5.2	Accuracy Class	0.2s as per IS-14697 for both active and reactive energy.
5.3	Connection	CT and PT operated
5.4	Rated Voltage	3 x 63.5V (+30% & -40%) 110V (P-P) (+20% & -30%)
5.5	Rated basic current	- / 1A or - / 5A as per requirement
5.6	Rated maximum Current	Shall be two times of basic current.
5.7	Rated Frequency	50Hz +/- 5%
5.8	Power factor range	Bidirectional
5.9	Power Consumption in Voltage circuit	Less than 1 Watt & 5 VA per phase
5.10	Power consumption in Current circuit	1 VA per phase
5.11	Starting current	0.1% of I <sub>b</sub>
5.12	Meter constant	To be specified by bidder
5.13	Calibration	Meter shall be software calibrated at factory and modification in calibration shall not be possible at site by any means or external influence.
5.14	Insulation Level	Meter shall withstand an insulation test of 4 KV and impulse test at 8 KV
5.15	Accuracy	Meter shall comply as per IS 14697 and / or IEC 62053-22 (in case of conflict more stringent test procedure / results shall be acceptable)
5.16	Repeatability of error test	As per IS 14697
5.17	Starting and Running with No-Load	Meter shall be fully functional within 5 seconds of applying rated voltage to meter terminals. Meter shall not produce more than one output pulse count when voltage is applied with no current flowing in the current circuit. Meter shall pass test for No-load condition.
5.18	Voltage dips and interruptions	Voltage dips and interruptions shall not produce a change in the register of more than 0.001KWH and test output shall not produce a signal more than 0.001KWH as per IS 14697.
5.19	Short time over current	Meter shall not get damaged due to short time over currents. Meter shall perform correctly when back to its initial working

**TECHNICAL SPECIFICATION FOR ABT/GRID METER**

		conditions and the variation in error shall not exceed 0.1% @ $I_b$ and unity power factor. Meter shall be able to carry a short time over current of 20 times the maximum current for a period of 0.5 second as per IS 14697.
5.20	Influence of heating and self-heating	The temperature rise of the meter surface shall not exceed by more than 20K with an ambient at 45 DEG C. Meter shall comply clause for % error due to self heating as per table 10 of IS 14697.
5.21	Immunity to earth/phase fault	As per IS 14697
5.22	Limits of error due to Current variation	As per IS 14697
5.23	Limits of error due to influence quantities	<p>Meter shall work within guaranteed accuracy as per IS 14697/ IEC62053/ CBIP325 (most stringent standard to be followed) under and after influence of following :-</p> <ol style="list-style-type: none"> <li>Voltage variation</li> <li>Frequency variation</li> <li>10% third harmonic in current</li> <li>Reversed phase sequence</li> <li>Voltage unbalance</li> <li>Harmonic components in current and voltage circuit</li> <li>DC and even harmonics in AC current circuit</li> <li>Odd harmonics in AC current circuit</li> <li>Sub harmonics in AC current circuit</li> <li>Continuous (DC) "stray" magnetic induction of 67mT+/-5%.</li> <li>Continuous (DC) "abnormal" magnetic induction of 0.27T+/-5%.</li> <li>Alternating (AC) "stray" magnetic induction of 0.5mT+/-5%</li> <li>Alternating (AC) "abnormal" magnetic induction of 10mT.</li> <li>Alternating (AC) "abnormal" magnetic induction of 0.2T+/-5%.</li> <li>External magnetic field 0.5 T</li> <li>Electromagnetic HF fields</li> <li>Radio frequency interference</li> <li>DC immunity test</li> </ol>
5.24	Limits of error due to ambient temperature variation	As per IS 14697
5.25	Electromagnetic compatibility	Meter shall remain immune to electrostatic discharge, electromagnetic HF field and fast transient burst as per IS 14697
5.26	Radio Interference	Meter shall not generate conducted or radiated noise which interferes with other equipment

**6.0 CONSTRUCTION REQUIREMENTS**

6.1	General	Construction should be in accordance with IS14697.
6.2	Base Body	Opaque, UV stabilized polycarbonate of grade LEXAN 142A/ 943AA or Equivalent with V0 inflammability level
6.3	Top Cover	Transparent, UV stabilized polycarbonate of grade LEXAN 142A/ 943AA or Equivalent with V0 inflammability level
6.4	Assembly of base body and top cover	By ultrasonic welding
6.5	Terminal block	<ul style="list-style-type: none"><li>a. Material - Flame retardant glass filled polycarbonate of grade 500 R or equivalent.</li><li>b. Terminal block shall be capable of passing the tests as per ISO-75 for a temperature of 135C and pressure of 1.8MPa. The terminals shall be designed so as to ensure adequate and durable contact such that there is no risk of loosening or undue heating.</li></ul>
6.6	Terminal Cover	<ul style="list-style-type: none"><li>a. Material - UV stabilized transparent polycarbonate cover</li><li>b. Provision of sealing at two points through sealing screw.</li><li>c. Provision for cable entry from bottom.</li><li>d. Diagram of external connections should be embossed on terminal cover. Sticker is not acceptable.</li></ul>
6.7	Terminals	<ul style="list-style-type: none"><li>a. Suitable for 6mm<sup>2</sup> wire terminals with ring type lugs.</li><li>b. Material of terminals, screws and washers should be brass or tinned copper. MS terminals are not acceptable.</li><li>c. Current terminal connectors shall be provided with automatic CT shorting feature such that in event of disengagement, CT circuit is not get open circuited.</li><li>d. Meter shall have either in-built or separate test terminal block for site testing.</li><li>e. Terminals shall be tested for continuous current of 150 % I<sub>max</sub>.</li><li>f. Terminals shall be clearly marked for CT/PT etc.</li></ul>
6.8	Ingress Protection	IP 51 or better, but without suction in the meter.
6.9	Output device	Meter should have flashing LED visible from the front as output device to represent energy recording. The resolution shall be such that satisfactory accuracy test can be conducted at the lowest load in less than 5 minutes and starting current test in less than 10 minutes. Separate MWH/MVAH and MVARH LEDs are desirable.
6.10	Alarm LED	Meter shall have flashing LED visible from the front for alarms.
6.10	RTC	The meter shall have internal real time clock to set date and time with internal battery with accuracy of +/- 2 min or better in a year. All clock correction if done at site shall be registered in the meter's memory. Meter should have facility for RTC synchronization through AMR system.
6.11	Battery	Lithium ion battery with guaranteed shelf life of 10 years and capacity life of 15 years. Battery removal or total discharge should not affect the working of the meter.

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6.12	Memory	Non volatile memory independent of battery backup to store complete meter data. Data should be retained in the memory up to 10 year without any auxiliary power.
6.13	Self Diagnostic feature	Meter shall have self diagnostic for the following <ul style="list-style-type: none"> <li>a. Date and RTC</li> <li>b. Battery</li> <li>c. Non volatile memory</li> <li>d. Display</li> </ul>
6.14	Clearance and Creepage distance	As per IS 14697
6.15	Mounting	Surface / Flush mounted
6.16	Resistance against heat and fire	The terminal block and Meter case shall have safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them as per IS 14697.
6.17	Electronic components	All active & passive components should be surface mounting type and shall be assembled by state of the art assembly processes.
6.18	Power Supply	The power supply should comply with the relevant standards. Power supply unit of the meter should not be affected in case maximum voltage of the system appears across the terminals due to faults or due to wrong connections.
6.19	Measurement/ computing chips	Measurement/computing ASICs should be surface mounting type.
6.20	Protection against Corrosion	<ul style="list-style-type: none"> <li>a. Internal electrical components should be of electrolytic copper &amp; should be protected from corrosion, rust etc.</li> <li>b. Mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.</li> </ul>
6.21	Meter Sealing Arrangement	Sealing should be in accordance with IS and CEA metering regulations with latest amendments. Approval shall be taken from purchaser for location of seals.
6.21.1	Manufacturer's Seals	One Polycarbonate seal to be provided on meter cover.
6.21.2	BSES Seals	<ul style="list-style-type: none"> <li>a. One Hologram seal should be provided on each side of meter i.e two hologram seals should be provided. Meter sides should not have sharp edges to avoid damage to hologram seals.</li> <li>b. Polycarbonate seal should be provided on top cover. Seals will be issued to manufacturer free of cost.</li> </ul>
6.21.3	Seal record	Record of all seals shall be forwarded to purchaser with each lot.
6.22	Guarantee/ Warranty	66 months from the date of dispatch or 60 months from date of commissioning, whichever is earlier

**7.0 FUNCTIONAL REQUIREMENTS**

7.1	Instantaneous parameters	Following parameters shall be continuously updated by the meter hardware/software as per internal sampling and computation time and last updated value shall be available for downloading as and when required. <ul style="list-style-type: none"> <li>a. RTC; Date and Time</li> <li>b. Current – R phase</li> </ul>
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		<ul style="list-style-type: none"> <li>c. Current – Y Phase</li> <li>d. Current – B Phase</li> <li>e. Voltage - VRN</li> <li>f. Voltage – VYN</li> <li>g. Voltage – VBN</li> <li>h. Signed Power Factor – R phase</li> <li>i. Signed Power Factor – Y phase</li> <li>j. Signed Power Factor – B phase</li> <li>k. System Power Factor – PF</li> <li>l. Frequency</li> <li>m. Signed Active Power – kW (+ Import, - Export)</li> <li>n. Signed Reactive Power – kVAr (+ Import, - Export)</li> <li>o. Apparent Power – kVA</li> <li>p. Cumulative Active Energy (KWH import)</li> <li>q. Cumulative Active Energy (KWH export)</li> <li>r. Cumulative Apparent Energy (While KWH import)</li> <li>s. Cumulative Apparent Energy (While KWH export)</li> <li>t. Cumulative Kvarh – Quadrant 1*</li> <li>u. Cumulative Kvarh – Quadrant 2*</li> <li>v. Cumulative Kvarh – Quadrant 3*</li> <li>w. Cumulative Kvarh – Quadrant 4*</li> <li>x. Average RMS Voltage in % of reference voltage i.e. 63.5 V (Phase to Neutral) (Please refer clause 7.10)</li> <li>y. Total Voltage Harmonic Distortion VTHD</li> <li>z. Total Current Harmonic Distortion ITHD</li> <li>aa. Number of power failure</li> <li>bb. Cumulative power-failure duration</li> <li>cc. Cumulative tamper count</li> <li>dd. Cumulative programming count</li> </ul> <p>Note:</p> <ul style="list-style-type: none"> <li>1. *Refer Annexure 'C' for quadrant definitions.</li> <li>2. The energy values at sl no. (p) To (w) shall be cumulative readings from the date of manufacturing of meter.</li> </ul>
7.2	Block load survey parameters	<p>Following parameters shall be measured and recorded at the end of each 15 min interval for last 60 days.</p> <ul style="list-style-type: none"> <li>a. Real time clock date and time</li> <li>b. Frequency</li> <li>c. Voltage R-Phase</li> <li>d. Voltage Y-Phase</li> <li>e. Voltage, B-Phase</li> <li>f. Active energy Import</li> <li>g. Active energy export</li> <li>h. Net active energy (+ for import and – for export)</li> <li>i. Reactive energy, KVARH ( Quadrant 1)*</li> <li>j. Reactive energy, KVARH (Quadrant 2)*</li> <li>k. Reactive energy, KVARH (Quadrant 3)*</li> <li>l. Reactive energy, KVARH (Quadrant 4)*</li> <li>m. Apparent Energy, KVARH (While active import)</li> <li>n. Apparent Energy, KVAH (While reactive export)</li> </ul> <p>Note:</p> <ul style="list-style-type: none"> <li>1. *Refer Annexure 'C' for quadrant definitions.</li> <li>2. The parameters at sl no. (b) To (e) are the average values of 15 min block and stored at the end of that</li> </ul>

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		time block. 3. The parameters at sl no. (f) to (n) are the actual energy consumption during the 15 min time block.
7.3	Daily Load Profile	<p>Following parameters shall be measured and recorded at each midnight i.e. 00:00 hrs for last 60 days.</p> <ol style="list-style-type: none"> <li>RTC, Date and time</li> <li>Cumulative Active Energy (KWH import)</li> <li>Cumulative Active Energy (KWH export)</li> <li>Cumulative Apparent Energy (While KWH import)</li> <li>Cumulative Apparent Energy (While KWH export)</li> <li>Cumulative Kvarh – Quadrant 1*</li> <li>Cumulative Kvarh – Quadrant 2*</li> <li>Cumulative Kvarh – Quadrant 3*</li> <li>Cumulative Kvarh – Quadrant 4*</li> <li>Net Cumulative KVARH while <math>V &gt; 103\%</math> (+ for Import and – for export)</li> <li>Net Cumulative KVARH while <math>V &lt; 97\%</math> ((+ for Import and – for export).</li> </ol> <p>Note:</p> <ol style="list-style-type: none"> <li>*Refer Annexure 'C' for quadrant definitions.</li> <li>Parameters 'b' to 'K' is the cumulative values since manufacturing of meter.</li> </ol>
7.4	General Purpose Parameters	Following parameters shall be provided in Non Volatile memory (NVM) of the meter.
7.4.1	Name plate details	<ol style="list-style-type: none"> <li>Meter SL no.</li> <li>Manufacture's name</li> <li>Firmware version for meter</li> <li>Meter type (3P-3W/3P-4W)</li> <li>Internal CT ratio</li> <li>Internal PT ratio</li> <li>Month and Year of manufacture</li> </ol>
7.4.2	Programmable parameters	<p>Following parameters can be programmed by BCS or CMRI via proper security. Every transaction shall be logged in non volatile memory of the meter with date and time stamp.</p> <ol style="list-style-type: none"> <li>Real time clock, date and time</li> <li>Demand integration period</li> <li>Profile capture period</li> <li>External CT Ratio</li> <li>External PT ratio</li> </ol>
7.5	Security	Programmable facility to restrict the access to the information recorded at different security level such as read communication, write communication etc.
7.6	Multiplying factor	Meter shall be capable to calculate MF internally as per PT / CT ratio configuration. User shall get the energy values directly from the meter with any external MF.
7.7	Line Voltage Values	The meter shall continuously compute the average RMS values of the three lines to neutral voltages as % of reference voltage i.e. 63.5 V and shall display the same on demand. The accuracy of voltage measurement shall be 0.5% in range of 95-105%.

**8.0 EVENT AND TAMPER MONITORING**

<b>S No.</b>	<b>Parameters</b>	<b>BSES Requirement</b>
8.1	Top Cover Open	Meter shall have top cover open detection and same shall be logged. Detection and logging mechanism shall work even when the meter is de-energized. Top cover open event should not get reset.
8.2	External Magnetic tamper	Meter should either be immune or should log the events of attempt of tampering by external magnetic field as per relevant IS14697/ CBIP 325 with latest amendments.
8.3	Protection against HV spark/ESD	If the meter is subjected to HV spark/ ESD, meter shall continue to record energy or log the event. Upto 35 KV meter should remain immune. Communication port shall also be immune upto 35KV. Bidder should have valid test report from Sameer/ UL lab for the same.
8.4	Neutral disturbance	Meter should log the event when AC/DC/ Pulsating voltage is injected in neutral circuit.
8.5	Phase sequence reversal	Meter should work accurately irrespective of the phase sequence of the supply. Meter should log the event.
8.6	Detection of missing potential	Absence of potential on any phase should be logged. Restoration of normal supply shall also be recorded. The threshold value of voltage should be programmable at factory end
8.7	Low Voltage	Meter should log low voltage event if average voltage is below 75% of Vref.
8.8	High Voltage	Meter should log high voltage event if average voltage is above 115% of Vref.
8.9	Voltage Imbalance	Meter should log voltage imbalance event when the difference between minimum and maximum phase voltage is more than 10% of Vref.
8.10	Abnormal/Invalid Voltage	Meter should log invalid voltage if phase angle between voltages deviates from the standard values by more than +/-10 degrees i.e. 120 +/- 10 degrees.
8.11	Reversal of Current Coil Polarity	Meter should log the event of reversal of C.C polarity. Meter should register energy consumed correctly with any one, two or all three current coils reversed.
8.12	Current Circuit Shorting / Bypass	Meter should log the event of current coil shorting/bypass. Threshold value of current should be programmable at factory end.
8.13	Current Circuit Open	Meter should log the event of current coil open. Threshold value of current should be programmable at factory end.
8.14	Over current	If the current in any phase exceeds the rated current, meter should log overcurrent event.
8.15	Current Imbalance	Meter should log current imbalance event when the difference between minimum and maximum phase current is more than 30% of I average.



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8.16	Invalid Phase Association	Meter should log invalid phase association event if the voltage sequence does not match with the current sequence.
8.17	Power On/Off	Meter shall detect power OFF (minimum power off period 5 mins) if all phase voltages are absent. This event shall be recorded at the time of each power OFF. At the same time power ON event shall be recorded.
8.18	Tamper Logging	Last 200 nos. tamper events shall be recorded in meter memory on FIFO basis excluding top cover open. Last 20 events of top cover open tamper should be recorded in the memory including the first occurrence.
8.18.1	Parameter Snapshot	Snapshot of Date, time, voltage, Phase current, neutral current, power factor, active power, apparent power, cumulative KWH, cumulative KVAH etc should be recorded for each tamper event
8.18.2	Tamper Indication	For each tamper event, appropriate Indication/Icon should appear on the meter display either continuously or in auto display mode. Icons appearing continuously are preferable.
8.19	Tamper Logics	Logic sheet for tamper/ event detection and logging should be submitted for purchaser's approval. Following details should be provided for each tamper in tabular form <ul style="list-style-type: none"> <li>a. Detailed Tamper logic</li> <li>b. Threshold values</li> <li>c. Persistence time</li> <li>d. Restoration time</li> </ul>

**9.0 DISPLAY**

9.1	Type	STN Liquid crystal, Pin type with backlight
9.2	Viewing angle	Minimum 160 degrees
9.3	UV Protection	The display modules should be well protected from the external UV radiations
9.4	Size	Minimum 10X5mm
9.5	Digits	Minimum 8 digits
9.6	Language	English
9.7	Display Parameters	Parameters to be displayed are given below
9.7.1	Auto scroll mode	<ul style="list-style-type: none"> <li>• Meter SL No.</li> <li>• Display test</li> <li>• Real Date</li> <li>• Real Time</li> <li>• Cumulative active energy import</li> <li>• Cumulative active energy export</li> <li>• Cumulative Apparent Energy (While KWH import)</li> <li>• Cumulative Apparent Energy (While KWH export)</li> <li>• Cumulative Kvarh – Quadrant 1</li> <li>• Cumulative Kvarh – Quadrant 2</li> <li>• Cumulative Kvarh – Quadrant 3</li> <li>• Cumulative Kvarh – Quadrant 4</li> <li>• Net active energy (+ for import and – for export) for previous block</li> <li>• Average RMS Voltage in % of reference voltage i.e. 63.5 V (Phase to Neutral) (Please refer clause 7.10)</li> </ul>

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		<ul style="list-style-type: none"> <li>• Number of power failure</li> <li>• Cumulative power-failure duration</li> <li>• Cumulative tamper count</li> <li>• Cumulative programming count</li> <li>• Last tamper occurrence and restoration detail</li> </ul>
9.7.2	Manual Display mode (push button mode)	<p>Following parameters should be displayed in addition to parameters displayed in Auto display mode – Parameters:</p> <ul style="list-style-type: none"> <li>• Meter Serial No.</li> <li>• Real Date</li> <li>• Real Time</li> <li>• Current – R phase</li> <li>• Current – Y Phase</li> <li>• Current – B Phase</li> <li>• Voltage - VRN</li> <li>• Voltage – VYN</li> <li>• Voltage – VBN</li> <li>• Signed Power Factor – R phase</li> <li>• Signed Power Factor – Y phase</li> <li>• Signed Power Factor – B phase</li> <li>• System Power Factor – PF</li> <li>• Frequency</li> <li>• Signed Active Power – kW (+ Import, - Export)</li> <li>• Signed Reactive Power – kVAr (+ Import, - Export)</li> <li>• Apparent Power – kVA</li> <li>• Cumulative Active Energy (KWH import)</li> <li>• Cumulative Active Energy (KWH export)</li> <li>• Cumulative Apparent Energy (While KWH import)</li> <li>• Cumulative Apparent Energy (While KWH export)</li> <li>• Cumulative Kvarh – Quadrant 1</li> <li>• Cumulative Kvarh – Quadrant 2</li> <li>• Cumulative Kvarh – Quadrant 3</li> <li>• Cumulative Kvarh – Quadrant 4</li> <li>• Average RMS Voltage in % of reference voltage i.e. 63.5 V (Phase to Neutral) (Please refer clause 7.10)</li> <li>• Number of power failure</li> <li>• Cumulative power-failure duration</li> <li>• Cumulative tamper count</li> <li>• Cumulative programming count</li> <li>• Net active energy (+ for import and – for export) for previous block</li> <li>• Average Frequency of previous block.</li> </ul> <p>Bidder to submit details of display with technical bid.</p> <p>The meter display should return to Default Display mode (mentioned above) if the 'push button' is not operated for more than 10 seconds. Scroll lock facility should be provided by pressing scroll push button for long duration (10-15 sec). Lock should be released by repeat action.</p>
9.7.3	Tamper indications	As per clause 8.18.2.

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9.7.4	Self Diagnostic Indications	Appropriate indication for each self diagnostic feature should be displayed continuously irrespective of display mode (auto/manual).
9.7.5	Connection check	Appropriate indication to be displayed continuously in case of current/voltage connection error

**10.0 SOFTWARE AND COMMUNICATION**

10.1	Base software computer	<p>Meter shall be supplied along with Base computing software (BCS) compatible with windows based system. BCS should enable meter data downloading from optical / RS 485 port using hand held device and AMR system. BCS should also enable data upload from hand held device to PC. The data shall be stored in binary format only.</p> <p>The BCS shall ensure that data downloaded / displayed cannot be tampered. BCS shall be able to display data in tabular (text) as well as graphical format. Software shall have polling feature with optional selection of parameters to be downloaded through AMR in daily / weekly / monthly / annual format. Any software upgrade shall also be provided free in future by the bidder.</p> <p>Licensed Software with the following features should be supplied for free</p>
10.1.1	Operating System	BCS should be compatible for Windows XP, Vista, 7, 8 and 10.
10.1.2	Security	System shall be password protected where user can login only if login ID is provided by administrator. BCS shall have rights management system so that access rights can be provided as per requirement to maintain security.
10.1.3	Data access	BCS shall be capable of accessing complete data stored in meter memory locally through PC and remotely through modem (RF/ GSM/ GPRS/ PSTN etc.) for connectivity to AMR.
10.1.4	Database	BCS shall maintain master database according to desired area, location, and region etc.
10.1.5	Reporting	<ol style="list-style-type: none"> <li>BCS shall have option of user defined report generation in format of Excel, Word and CSV etc.</li> <li>All the data available in the meter shall be convertible to user defined ASCII file format.</li> <li>BCS shall have capability to export data in ASCII format at desired location so that the same could be integrated with BSES billing data for processing.</li> </ol>
10.2	CMRI Software	Manufacturer has to provide software capable of downloading data through CMRI.
10.2.1	Integration	In the event of order, bidder shall work with BSES IT team to integrate CMRI software with BSES AMR and billing system i.e meter downloading, uploading data on computer etc. Meter reading protocols shall be shared with BSES.
10.2.2	Data access	CMRI software should be capable of downloading complete data stored in the meter memory. Software should have option for selection of parameters to be downloaded from meter i.e billing data, event/tamper logging data etc. Billing data should be downloadable using CMRI within 1 minute.

**TECHNICAL SPECIFICATION FOR ABT/GRID METER**

10.2.3	Suitability	CMRI software shall work both on SANDS & Analogic make CMRI.
10.3	Training	Manufacturer shall impart training to BSES personnel for usage of software
10.4	Communication Ports	Communication ports required in meter are as follows
10.4.1	RS-485 Port	Meter shall have RS485 port capable for communication on open MODBUS protocol. Meter with modular type construction suitable to fit in different modems (GPRS/CDMA/Radio) as per need will be preferred.
10.4.2	Optical Port	In addition to RS485 port, meter shall have optical port in the front for data download. Portable hand held device shall also be provided along with meter for meter reading. One no hand held device shall be provided for every 5 meters and multiple thereof.
10.4.3	Port protection	All ports shall be galvanically isolated from the power circuit.
10.4.4	Operation	Both ports should work independently. Failure of one port (including display) should not affect the working of other port.
10.5	Communication protocol	DLMS protocol. Integration of meters with BSES system will be supplier's responsibility.
10.6	Data transfer rate	BCS and communication ports should support data transfer rate of 9600 bps (minimum).

**11.0 NAME PLATE**

11.1	Meter Serial number shall be of 8 digits. Serial number shall be printed in black colour. Embossing is not acceptable. (Should also be stored in meter memory and should be downloadable)
11.2	Size of the digit shall be minimum 5X3mm
11.3	Bar code shall be printed along with serial number
11.4	BIS registration mark (ISI mark)
11.5	'BSES' logo should be printed above LCD display.
11.6	BSES PO No. & date
11.7	Manufacturers name and country of origin
11.8	Model type / number of meter
11.9	Month and Year of manufacturing (Should also be stored in meter memory and should be downloadable)
11.10	Reference voltage and current rating
11.11	The number of phases and the number of wires for which the meter is suitable. Graphical symbol as per IS 12032 can be used.
11.12	Principal units in which meter reads
11.13	Meter constant
11.14	Class index of meter
11.15	Reference frequency
11.16	Warranty period
11.17	Reference temperature if different from 27 Deg C
11.18	Connections, diagrams and terminals shall be marked / provided in accordance with Indian Standard.

**12.0 APPROVED MAKES OF COMPONENTS**

12.1	Measurement or computing chips	Analog Devices, Cyrus Logic, Atmel, Phillips, Texas Instruments, SAMES, NEC
12.2	Memory chips	USA: Atmel, National Semiconductors, Texas Instruments, Phillips, ST, Microchip Japan: Hitachi or Oki
12.3	Display modules	Japan: Hitachi, Sony Holland / Korea: Phillips Truly Semiconductor Tianma/Hijing Electronics
12.4	Communication modules	USA: National Semiconductors, HP, Optonica, ST, Holland / Korea: Phillips Japan: Hitachi Germany: Siemens
12.5	Optical port	USA: National Semiconductors, HP Holland / Korea: Phillips Japan: Hitachi, Truly Semiconductor, Agilent, OSRAM, Everlight
12.6	Power supply unit	SMPS Type, reputed make
12.7	Active & passive components	USA: National Semiconductors, Atmel, Phillips, Texas Instruments, ST, Onsemi, Japan: Hitachi, Oki, AVX or Ricoh, Samsung, Everlight, Agilent
12.8	Battery	Varta, Texcell, SAFT
12.9	RTC	USA: Philips, Dallas Atmel, Motorola, Microchip, NEC or Oki
12.10	Note	<p>a. Manufacturer shall intimate deviation if any from make of components. Any deviation is subject to approval of BSES based on supporting documents and performance feedback of the components.</p> <p>b. Manufacturer should have complete tracking of material used in meter. BSES reserve the right to carry out audit of inventory/ manufacturing process at manufacturer's works and sub vendor's work.</p>

**13.0 QUALITY ASSURANCE, INSPECTION AND TESTING**

13.1	Quality Assurance Plan (QAP)	To be submitted for Purchaser's approval.
13.1.1	Inspection Hold-Points	To be mutually identified, agreed and approved in QAP.
13.1.2	Sampling Method	Sampling Method for quality checks shall be as per relevant IS/ IEC/ CBIP guidelines and Purchaser's prior approval shall be taken for the same.
13.2	Type Tests	<p>a. The meter shall be of type tested quality as per relevant IS/IEC/CBIP. Type test conducted at CPRI/ ERDA labs will be treated as valid.</p> <p>b. The test report should not be more than 5 years old. In case any modification affecting only part of meter is made after type test, only specific type tests on the affected parts shall be repeated.</p> <p>c. Type test certificate should be submitted along with offer for scrutiny.</p>

**TECHNICAL SPECIFICATION FOR ABT/GRID METER**

		<ul style="list-style-type: none"> <li>d. For a manufacturer supplying meter for the first time, complete type tests will have to be carried out on sample randomly selected from the lot offered for inspection in event of order. 35kV ESD test will also be carried out on the sample at Sameer/UL lab.</li> <li>e. For regular suppliers, revalidation of meter design should be carried out by repeating the type tests on sample randomly selected from BSES lot at CPRI/ERDA every three years</li> <li>f. Any other component supplied in addition to meter shall also be type tested as per IS /IEC if applicable.</li> </ul>
13.3	Routine tests	All test marked "R" as per IS14697
13.4	Acceptance Tests	<ul style="list-style-type: none"> <li>a. All tests marked "A" as per IS14697.</li> <li>b. Dimensional and drawing verification.</li> <li>c. Display parameters/ sequence.</li> <li>d. Data Downloading from CMRI and PC.</li> <li>e. Tamper detection/logging features as per approved documents. Tamper conditions will be simulated at varying load up to I<sub>max</sub>. Accuracy will also be checked during tamper simulation.</li> <li>f. Burn in chamber test.</li> <li>g. Component verification.</li> <li>h. Purchaser reserves the right to formulate any other test method to verify guaranteed parameters of Meter.</li> </ul>
13.5	Inspection	<ul style="list-style-type: none"> <li>a. Purchaser reserves the right to inspect /witness all tests on the meters at Seller's works at any time, prior to dispatch, to verify compliance with the specification/ standards.</li> <li>b. Manufacturer should have all the facilities/ equipments to conduct all the acceptance tests as per IS during inspection. All the testing equipment should be calibrated.</li> <li>c. In-process and / or final inspection call intimation shall be given at least 15 days in advance to the purchaser.</li> </ul>

**14.0 SHIPPING, HANDLING AND SITE SUPPORT**

14.1	Packing	Every meter shall be properly sealed / packed in environmental friendly boxes/ cartons for protection against damage, vibration and ingress of dust and moisture.
14.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label.
14.3	Marking	<p>Following details are required on each packing case:</p> <ul style="list-style-type: none"> <li>a. Individual serial number</li> <li>b. Purchaser's name</li> <li>c. PO number (along with SAP item code, if any) &amp; date</li> <li>d. Equipment Tag no. (if any)</li> <li>e. Destination</li> <li>f. Manufacturer / Supplier's name</li> </ul>

**TECHNICAL SPECIFICATION FOR ABT/GRID METER**

		<ul style="list-style-type: none"> <li>g. Address of Manufacturer / Supplier / it's agent</li> <li>h. Type , rating and other description of equipment</li> <li>i. Country of origin</li> <li>j. Month &amp; year of Manufacturing</li> <li>k. Case measurements</li> <li>l. Gross and net weights in kilograms</li> <li>m. All necessary slinging and stacking instructions</li> </ul>
14.4	Test reports	Routine test report to be provided with each meter
14.5	Shipping	The seller shall be responsible for all transit damage due to improper packing.
14.6	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet /manual to be furnished before commencement of supply.

**15.0 DEVIATIONS**

15.1	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification.
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**16.0 DOCUMENT AND DRAWING SUBMISSION**

16.1	The seller has to submit following along with bid
16.1.1	GTP (duly filled-in) (as per Annexure — A)
16.1.2	Deviation sheet, if any.
16.1.3	GA / cross sectional drawing of Meter showing all the dimensions
16.1.4	1 no's samples along with software and accessories.
16.1.5	Tamper logic sheet.
16.1.6	Detailed reference list of customers using the offered product during the last 5 years with similar design and rating
16.1.7	Manufacturer's quality assurance plan and certification for quality standards
16.1.8	Type test reports for the same type, size & rating of Meter offered
16.1.9	Complete product catalogue and Manual.
16.1.10	Details of recommended accessories / software or any other hardware for five years of operation.
16.2	Seller has to submit following drawings for buyer's Approval/ Reference after award of contract -
16.2.1	Program for production and testing
16.2.3	1 no's samples along with software and accessories for Lab testing
16.2.4	Guaranteed Technical Particulars
16.2.5	GA / cross sectional drawing of Meter showing all the dimensions
16.2.6	Tamper logic sheet.
16.2.7	Makes of components
16.2.8	Terminal arrangement with dimensions
16.2.9	Detailed installation and commissioning instructions
16.2.10	Quality assurance plan
16.3	Submittals required prior to dispatch
16.3.1	Inspection and test reports, carried out in manufacturer's works
16.3.2	Test certificates of all bought out items
16.3.3	Operation and maintenance Instruction as well as trouble shooting charts/ manuals

**TECHNICAL SPECIFICATION FOR ABT/GRID METER**

16.3.4	Drawing and document sizes Standard size paper A4
16.3.5	Duly signed & stamped copies of the drawings / documentation
16.3.6	Consolidated report including routine test, seal record and initial reading record as per BSES format.

**ANNEXURE – A GUARANTEED TECHNICAL PARTICULARS (DATA BY SUPPLIER)**

Bidder shall furnish the GTP as per format provided below. All the clauses of the specification shall be covered in GTP. Any deviation or comments shall be specifically mentioned against each clause. No comments or deviation will be treated as acceptance.

Complete GA drawing, technical literature, operation and maintenance manual of hardware/ software shall be provided with technical bid.

Incomplete technical bids are liable to be rejected without any intimation.

Clause no	Description	Compliance of the clause YES / NO	Deviation / Remarks
1			
2			
3			
4			
5			
6			

Bidder / Vendor seal / signature

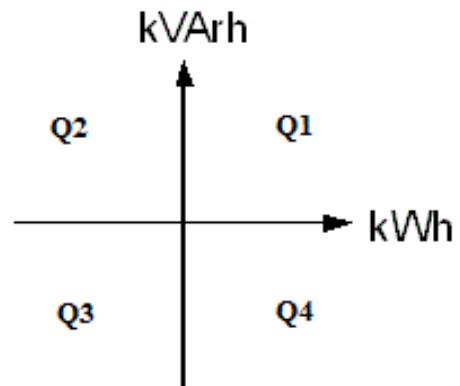
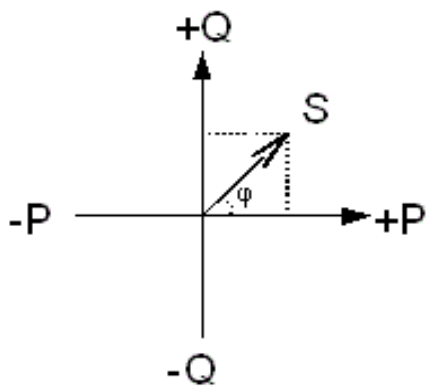
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Name of the bidder	
Address of bidder	
Name of contact person	
Telephone no & email id	



**ANNEXURE – B RECOMMENDED ACCESSORIES / SPARES (DATA BY SUPPLIER)**


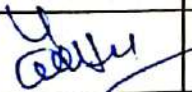
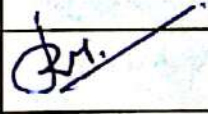
S No	Description of spare part	Unit	Quantity
1			
2			
3			
4			
5			
6			

**ANNEXURE – C – QUADRANT DEFINITIONS:**

# TECHNICAL SPECIFICATION

## FOR FIRE PROTECTION SYSTEM

**For BYPL GRID S/STN.**

Prepared by		Reviewed by		Approved by		Rev	00
Name	Sign	Name	Sign	Name	Sign	Date	2 May 2019
GG		JN		RK			

**TECHNICAL SPECIFICATION FOR FIRE PROTECTION SYSTEM**

1	Automatic fire detection system.....	3
2	First Aid Fire Extinguishers.....	4
3	Fire Bucket with Stand.....	4
4	Fire Hydrant System .....	4
5	10 KG Modular fire extinguishers.....	5
6	Fire Stops.....	5
7	Fire Wall .....	5
8	Nitrogen injection fire protection system / High velocity Spray system.....	6

**TECHNICAL SPECIFICATION FOR FIRE PROTECTION SYSTEM**

## 1 Automatic fire detection system

The new panel room / Switch gear room and cable galleries/ cable cellar to be installed with the fully addressable smoke detectors compactable to the existing panel and the smoke aspiration system.

Details of the panel and the detectors are as follows.

SN O	ITEM	SPECIFICATION	MAKE
1	Digital addressable fire alarm panel (PX-16E/32E)	2-32 zone digitally addressable zones with each zone support 20 addressable devices, Network able, PC based graphic software for easy monitoring, support ASES addressable MCP.	ASES
2	PA console	Keypad with feather touch switch for zone selection, gooseneck mike attached for announcement, main, Ac fail, fuse blown LED indication, inbuilt battery charger and battery upto 25AH.	ASES
3	Aspirating smoke detector system (ASD 531)	Alarm sensitivity range of 0.02%/m to 10%/m.	SECURITON
4	Photoelectric smoke detector	Tested and approved to EN54-7:2000, Bi-color LED detector status indicator. The distance between two detectors shall not be more than 6 meters	SYSTEM SENSOR
5	Rate of rise and fixed temperature thermal detector	Tested and approved to EN54-5:2000 class A1R	SYSTEM SENSOR
6	Digital addressable monitor module (PX-DA-MM)	Digital addressable communications, DIP switch for addressing of module,	ASES
7	Digital addressable manual call point	The points shall be so located to ensure that one or other call box is in approach of 22.5 meters.	ASES
8	Conventional Sounder		ASES
9	Talk Back unit	Compatibility with any make conventional two way communication system, integrated alarm test key features.	ASES
10	Sinages	At all exits, fire fighting equipments, evacuation signs, etc. auto glow type	Reputed

## **2 First Aid Fire Extinguishers**

The first aid fire extinguishers are already place in the conspicuous places in the existing installations. The vendor has to provide the following quantity of first aid fire extinguishers of make Ceasefire or Minimax only.

Minimum Quantity of F.E for 33kV grid:

4.5 kg CO2	----	3 nos
22.5 kg CO2	----	4 nos
6 kg ABC (MAP 90)	----	3 nos
75kg ABC (MAP 90)	----	1 nos

Minimum Quantity of F.E for 66kV grid:

4.5 kg CO2	----	3 nos
22.5 kg CO2	----	8 nos
6 kg ABC (MAP 90)	----	3 nos
75kg ABC (MAP 90)	----	2 nos

## **3 Fire Bucket with Stand**

Fire bucket stand having provision to hang 4 fire buckets with dry sand filled and a suitable top cover to avoid the ingress of water during rain. The fire bucket must comply with the IS 2546.

For 33 kv two stand, 8 buckets with dry sand filled.

For 66 kv Three stand, 12 buckets with dry sand filled

## **4 Fire Hydrant System**

For outdoor grid S/Stn. Fire hydrant system to be installed in loop to cover the entire grid area. All the component of hydrant system to be provided in Red colour and rust free material as per relevant Indian standards.

**TECHNICAL SPECIFICATION FOR FIRE PROTECTION SYSTEM**

S.NO.	ITEM	SPECIFICATION
1	Hydrant point	Hydrant point to be installed to cover whole area. The distance between two hydrant points shall not be more than 30 meters.
2	Water Storage Tank	Minimum storage capacity of 15000 Ltr.
3	Pump	An electric/diesel pump installed at static water tank to charge the wet-riser systems 280 LPM
4	Pump panel	Panel comprising starting, stopping and indicating devices of fire pump.
5	Hose Box with RRL hose pipe (15meter)	With every hydrant point
6	Pressure Switch	A switch connected on delivery line of fire pump, tank at pre-set pressure level so designed to automatically start the fire pump
7	Pressure Gauge	
8	Signage	

## 5 10 KG Modular fire extinguishers

Modular fire extinguisher (MAP 90) extinguishers serving an area of 100 sq. meter to be installed above the oil type distribution transformer and in cable cellar room/ cable gallery so as to cover whole area. The Portable modular FE, ABC (Stored Pressure) shall conform IS 13849. The Dry powder used in FE shall conform IS 4308

## 6 Fire Stops

Fire resistive stops to be provided at the locations where the trenches enter the S/stn., cable penetration as per IS12459.

## 7 Fire Wall

As per IEC/IS/CBIP/IEEE/CEA Guideline.

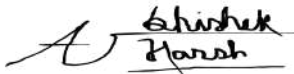


## **8 Nitrogen injection fire protection system / High velocity Spray system**

For transformer of 10 MVA and above rating to be provided with Nitrogen injection fire protection system or with automatic high velocity spray system designed and installed as per IS15325

Note: The power supply to fire protection systems like fire pumps, fire alarm system, PA system, exit signage lighting, emergency lighting shall be from normal and emergency power sources with changeover facility (Ref.CEA guideline 2010).



**Technical Specification  
Of  
Insulated Floor Coating  
Specification no – BSES-TS-75-INFC-R0**

Rev:	0	
Pages:	1 of 7	
Date:	06 May 2022	
Prepared by	Abhishek Harsh	 3267d7e3-82b5-46eb-b5a6-867ee7820a34
Reviewed by	Srinivas Gopu	 5d32525e-ed3a-4f41-b1c7-b8a5e77d1519
Approved by	Gaurav Sharma	 23dc2de2-95de-4472-99a7-dea873f472b6



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**TECHNICAL SPECIFICATION OF INSULATED FLOOR COATING****1 SCOPE**

This specification covers the basic requirement, the testing and inspection, supply and installation/fixing of insulating paints on floors in front of the switchgear panels at BYPL/BRPL grid locations.

**2 STANDARDS AND CODES**

2.1.	IS 15652:2006	Specification of Insulating mats for electrical purposes
2.2.	CEA guidelines, 2010	Measures relating to safety and Electric supply

**3 SERVICE CONDITION**

3.1	Location	Indoor
3.2	Average grade atmosphere	Heavily polluted, Dry
3.3	Maximum altitude above sea level	1000M
3.4	Ambient air temperature	Highest 50Deg C Average 40Deg C
3.5	Minimum ambient air temperature	0 Deg C
3.6	Relative Humidity	100%
3.7	Rainfall	750mm concentrated in four months
3.8	Seismic Zone	IV

**4 GENERAL REQUIREMENTS OF INSULATING PAINTS ON FLOORS**

4.1	General Properties	<p>a. The Insulating coating shall be self-levelling, solvent free, and have high breakdown voltage, loaded with special insulating additives.</p> <p>b. The material of the insulating floor shall be epoxy resin.</p> <p>c. It shall be resistant to chemicals and oils.</p> <p>d. It shall be tough, wear &amp; weather resistant.</p> <p>e. It shall exhibit high build, high adhesion with smooth and glossy finish and slip resistant.</p> <p>f. It shall be easy to apply/install, clean and repair on floors.</p>
4.2	Colour of the finished item	The insulating floors shall be light Grey in colour

**TECHNICAL SPECIFICATION OF INSULATED FLOOR COATING**

4.3	Class of the insulating floor to be used	For 11kV voltage : Class B For 33kV voltage : Class C
4.4	Thickness of the paint on floor	For 33kV voltage : 3 mm +/- 10% For 11kV : 2.5 mm +/- 10%
4.5	AC proof voltage	For 33kV : 36kV minimum For 11kV: 22 kV minimum
4.6	Dielectric strength	For 33kV: 65kV rms For 11kV: 45kV rms

**5 TESTING AND INSPECTION**

5.1	Routine and Acceptance tests in the factory	All the routine and acceptance tests shall be performed as per IS 15652. The purchaser reserves the right to witness the tests at the time of inspection.
5.2	Inspection at site	The purchaser reserves the right to verify the material at the time of applying the insulating floors at site. Following tests shall also be verified at site: 1. Dielectric strength 2. Ac proof voltage 3. Thickness
5.3	Type Test Reports	All the Type test reports of the material to be used as the insulating floors as per IS 15652 from CPRI/ERDA shall be submitted.

**6 INSTALLATION**

**TECHNICAL SPECIFICATION OF INSULATED FLOOR COATING**

6.1	Application of insulating paints	a. The insulating paint shall be applied in accordance with manufacturer's installation procedure. b. The purchaser may witness the painting process.
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**7 INSPECTION AND TESTING**

7.1	Type test	Equipment should be of type tested quality only, type test certificate to be submitted along with offer. If the manufacturer's lab is accredited by govt. / authorized body then it shall be acceptable for type testing.
7.2	Acceptance & Routine tests	As per relevant Indian standard

**8 PACKING, SHIPPING, HANDLING AND SITE SUPPORT**

8.1	Packing Protection	The packing shall be fit to withstand rough handling during transit and storage at destination. The test set should be properly protected against corrosion, dampness & damage.
8.2	Packing for accessories and spares	Robust non-returnable packing case with all the above protection & identification Label. The bidder should get the packing list approved before dispatching the material.
8.3	Packing Identification Label	On each packing case, following details are required:
8.3.1	Individual serial number	
8.3.2	Purchaser's name	
8.3.3	PO number (along with SAP item code, if any) & date	
8.3.4	Equipment Tag no. (if any)	
8.3.5	Destination	
8.3.6	Manufacturer / Supplier's name	
8.3.7	Address of Manufacturer / Supplier / it's agent	
8.3.8	Description	
8.3.9	Country of origin	

**TECHNICAL SPECIFICATION OF INSULATED FLOOR COATING**

8.3.10	Month & year of Manufacturing	
8.3.11	Case measurements	
8.3.12	Gross and net weight	
8.3.13	All necessary slinging and stacking instructions	
8.4	Shipping	The seller shall be responsible for all transit damage due to improper packing.
8.5	Handling and Storage	Manufacturer instruction shall be followed.
8.6	Detail handling & storage instruction sheet / manual to be furnished before commencement of supply.	

**9 DEVIATIONS**

9.1	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.
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**10 DOCUMENT SUBMISSION**

Drawing submission shall be as per the matrix given below. All documents/ drawing shall be provided on A3/A4 sheet in box file with separators for each section. Also provide USB containing pdf with bid for soft copy. Language of the documents shall be English only. Deficient/ improper document/ drawing submission may liable for rejection

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
15.1	Contact Person Name, Email ID and Mobile Number	Required			
15.2	Deviation Sheet	Required	Required		
15.3	Type Test	Required			
15.5	Manufacturer's quality assurance plan and certification for quality standards		Required		
15.6	Datasheet		Required		

**TECHNICAL SPECIFICATION OF INSULATED FLOOR COATING**

15.7	Floor Layout		Required		
15.13	GTP	Required	Required		
15.14	QAP		Required		
15.15	BOQ		Required		
15.19	Make of all Component as per specification		Required		
15.20	Inspection Report			Required	
15.21	As manufacturing Drawings			Required	
15.22	Operation and Maintenance Manual			Required	Required
15.24	As built Drawings				Required
15.25	Test Report				Required




**11 GUARANTEED TECHNICAL PARTICULARS**

Vendor must submit clause wise compliance in Excel sheet against specification at the time of drawing approval clearly highlighting the deviations from specification against each clause.

**TECHNICAL SPECIFICATION**

**FOR**

**SF6 GAS HANDLING KIT**

Prepared by		Reviewed by		Approved by		Rev	0
Name	Sign	Name	Sign	Name	Sign	Date	26 <sup>th</sup> Apr 2019
AH		GS		AA			Page 1 of 7

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**TECHNICAL SPECIFICATION FOR SF6 GAS HANDLING KIT**

## 1.0 SCOPE

- This specification covers design, manufacture, testing at manufacturer's works, packing and delivery of SF6 Gas Handling Kit.
- The SF6 Gas Handling kit shall be complete with all components and accessories, which are necessary or usual for their efficient performance and trouble free operation under the various operating and atmospheric conditions. Such parts that may have not been specifically included, but otherwise form part of the kit as per standard trade and/or professional practice and/or are necessary for proper operation of Gas Handling kit, will be deemed to be included in this specification.

## 2.0 SERVICE CONDITIONS

2.1	Max Ambient Temperature	50 deg C
2.2	Max Daily average ambient temp	40 deg C
2.3	Min Ambient Temp	0 deg C
2.4	Maximum Humidity	95%
2.5	Minimum Humidity	10%
2.6	Maximum annual rainfall	750 mm
2.7	Average no of rainy days per annum	60
2.8	Rainy months	June to Oct
2.9	Altitude above MSL	300 M
2.10	Seismic Zone	IV

## 3.0 PARTICULARS

S. No	Parameter	BYPL Requirement	Vendor Data
3.1	Operating Voltage	230 VAC	
3.2	Operating Frequency	50 Hz	
3.3	SF6 Gas Recovery	Required	
3.4	Evacuation of SF6 gas from breaker into cylinder and refilling into the breaker	Required	
3.5	Residual gas recovery during filter change	Required	
3.6	Vacuum compressor for SF6 gas recovery	Required	
3.7	Vacuum pump for air	Required	

**TECHNICAL SPECIFICATION FOR SF6 GAS HANDLING KIT**

S. No	Parameter	BYPL Requirement	Vendor Data
3.8	Dry filter	Required	
3.9	Particle filter	Required	
3.10	Pressure reducer	Required	
3.11	Weighing scales for SF6 bottles	Digital	
3.12	Indication	In bar / mbar, Pa, psi / torr	
3.13	Dew Point Meter	Required	
3.14	SF6 bottle connection	Required	
3.15	Connecting Cable	3m	
3.16	Storage Device	Separately Required	
3.17	Hose	Two pipes of 5m each	
3.18	Breaker side coupling	Required	
3.19	Optional accessories	Required	
3.20	Recommended Spares	Required	
3.21	Make	Dillo,WIKA	

- Note- Any make other than specified in table above shall be subject to BSES Yamuna Power Limited Approval.

#### 4.0 INSPECTION AND TESTING

4.1	Type test	Equipment of type tested quality only, type test certificate to be submitted along with offer.
4.2	Routine test	As per relevant Indian standard
4.3	Acceptance test as per IS	To be performed in presence of Owner at manufacturer works, as per relevant Indian standard along with BOM.

## 5.0 DEVIATION

Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.

## 6.0 GAURANTEED TECHNICAL PARTICLUARS

Vendor must submit clause wise compliance against specification at the time of drawing approval clearly highlighting the deviations from specification against each clause.

## 7.0 DRAWINGS AND DATA SUBMISSION MATRIX

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
7.1	Contact Person Name, Email ID and Mobile Number	Required	Required		
7.2	Deviation Sheet (as per "Deviations" Clause)	Required			
7.3	GTP		Required		
7.4	Relevant Type Test as per IS/IEC/UL	Required	Required		
7.5	Manufacturer's quality assurance plan and certification for quality standards		Required		
7.6	Sizing Calculation of Associated Equipment		Required		
7.7	Recommended Spares for five years of operation)		Required		
7.7.1	General Arrangement	Required	Required		
7.7.2	Sectional Layout		Required		
7.7.3	SLD	Required	Required		
7.7.4	Schematic Circuit diagram and Scheme		Required		
7.7.5	QAP		Required		
7.7.6	BOQ		Required		
7.8	Installation, erection and commissioning manual		Required		
7.9	Inspection Reports			Required	
7.10	As manufacturing Drawings			Required	
7.11	Operation and Maintenance Manual			Required	

**TECHNICAL SPECIFICATION FOR SF6 GAS HANDLING KIT**

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
7.12	Trouble shooting manual			Required	
7.13	As built Drawings				Required

## 8.0 PACKING

8.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, module may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
8.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label
8.3	Packing Identification Label to be provided on each packing case with the following details	
8.3.1	Individual serial number	
8.3.2	Purchaser's name	
8.3.3	PO number (along with SAP item code, if any) & date	
8.3.4	Equipment Tag no. (if any)	
8.3.5	Destination	
8.3.6	Project Details	
8.3.7	Manufacturer / Supplier's name	
8.3.8	Address of Manufacturer / Supplier / it's agent	
8.3.9	Description and Quantity	
8.3.10	Country of origin	
8.3.11	Month & year of Manufacturing	
8.3.12	Case measurements	
8.3.13	Gross and net weights in kilograms	
8.3.14	All necessary slinging and stacking instructions	
8.4	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, module may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
8.5	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label
8.6	Packing Identification Label to be provided on each packing case with the following details	
8.6.1	Individual serial number	
8.6.2	Purchaser's name	
8.6.3	PO number (along with SAP item code, if any) & date	

**TECHNICAL SPECIFICATION FOR SF6 GAS HANDLING KIT**

8.6.4	Equipment Tag no. (if any)
8.6.5	Destination
8.6.6	Project Details
8.6.7	Manufacturer / Supplier's name
8.6.8	Address of Manufacturer / Supplier / it's agent
8.6.9	Description and Quantity
8.6.10	Country of origin
8.6.11	Month & year of Manufacturing
8.6.12	Case measurements
8.6.13	Gross and net weights in kilograms
8.6.14	All necessary slinging and stacking instructions

**9.0 SHIPPING**

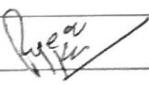
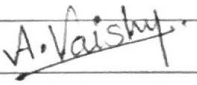
9.1	Shipping	<p>The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, Overhead lines, free access etc. from the Manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed Packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.</p>
		<p>The seller shall be responsible for all transit damage due to improper packing.</p>

**10.0 HANDLING AND STORAGE**

10.1	Handling and Storage	<p>Manufacturer instruction shall be followed. Detail handling &amp; storage instruction sheet / manual needs to be furnished before commencement of supply.</p>
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# TECHNICAL SPECIFICATION

*SCADA RTU/ DCU & NETWORK  
AUTOMATION SYSTEM  
FOR  
66/33/11kV NEW GRID STATION  
(IEC 61850 PROTOCOL)*

PREPARED BY	APPROVED BY	REV	2
		DATE	13 <sup>th</sup> July 2022
RAJEEV V	ANIL V	PAGE	1 of 51
			

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Sr. No.	Topic	Description
1	<b>Scope of the Document</b>	<p>BYPL already has SCADA Control Centre implementation consisting of MCC (Master Control Centre) and (BCC) Business Continuity Centre (commissioned by M/s ABB Ltd. with Network Manager Ver 5.5) through which currently 55 grid stations and approx 400 DMS stations are being controlled and monitored. The present SCADA RTU/ DCU &amp; Network system enable remote monitoring and controlling of all equipment's of the unmanned grid stations. This document states that the new RTU/ DCU &amp; Network automation system supplied will integrate with the existing SCADA infrastructure enabling remote monitoring and controlling of grid equipment's, facilitating unmanned station provision.</p> <p>The scope of this specification covers all the Technical requirements of the RTU/ DCU &amp; Network Automation system including System Architecture design, Manufacturing, Quality, Testing facility at manufacturer's works, packing, forwarding with loading/ unloading at site/ stores.</p> <p>It also states the installation, commissioning and testing of all the equipment's supplied or required for efficient and trouble free SCADA RTU/ DCU &amp; Network Automation system. The scope also covers supply of spares, trainings, configuration tools and documents.</p> <p>This document describes the automation requirement for C&amp;R/ switchgear panels, IEDs, and all other items required for SCADA controlled 66/33/11 kV power system supplied in grid.</p> <p>The specific requirements are covered under technical requirements (Ref.3)</p>
2.	<b>Climate conditions for system</b>	<p>The atmosphere of Delhi/National Capital Region (NCR) is generally laden with mild acid and dust suspended during dry months and subjected to fog in cold months. The design of the equipment's and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1g</p> <ul style="list-style-type: none"> <li>• Max. Ambient Temperature (Working): 50°C</li> <li>• Min. Ambient Temperature: 0°C</li> <li>• Max. Humidity: 95% non-condensing</li> <li>• Min. Humidity: 10%</li> <li>• Avg. no. of Thunderstorm days per annum: 50</li> <li>• Avg. Annual Rainfall: 750mm</li> </ul>

		The supplier/ BA is required to submit climate compliance test certificate for supplied SCADA RTU/ DCU & network Automation system.
<b>3</b>	<b>Technical Requirements</b>	
3.a	General requirements for Supplier/ Business Associates (BA)	<p>The supplier/ BA should have at least 10 years of experience in design, manufacturing and supply of SCADA RTU/ DCU &amp; Network Automation system integrated with the protection system for controlling and monitoring of the electricity transmission and distribution network.</p> <p>The supplier/ BA needs to submit the proof of completing minimum 5 such projects with other Indian utilities/ concerns as its experience certificate.</p> <p>The supplier/BA should have direct business office at Delhi/NCR. In case of support through business partners details of customers supported by the service partners to be submitted to BYPL.</p> <p>The supplier/ BA should have experience of SCADA RTU/ DCU and Network system integration with numerical relays/ IEDs on standard international protocols (Ref 3.d).</p> <p>The supplier/ BA shall produce a well- structured project plan constituting of timelines for installation, commissioning and testing of the SCADA RTU/ DCU and Network Automation system to which he will have strictly abide.</p> <p>The supplier/ BA can offer an innovative and advanced system and the ways and cost to integrate the same in the existing infrastructure. The offer is subjected to an approval from BYPL after a thorough discussion between the supplier/BA and BYPL. In case, an approval is not awarded to the supplier/BA's offered innovative system, BYPLs existing/ desired infrastructure prevails and the supplier/BA shall provide the system accordingly.</p> <p>The supplier/ BA should optimize on the cost of software products offered to BYPL considering already available licenses with BYPL. The supplier/BA should clearly indicate licensing policy for the software tools offered.</p> <p>The supplier/ BA should be technically capable to provide necessary training to the personnel recommended by BYPL to maintain the system and troubleshooting reports (Ref. 10)</p>

<p>3.b</p>	<p>General System Design</p>	<p>The SCADA RTU/ DCU &amp; Network Automation system shall be modular and suitable for remote operation and monitoring of the complete substation including future expansions.</p> <p>The systems shall be state of the art, suitable for operation under electrical environment present in high voltage substations (66/33/11kV), follow the latest engineering practice, and ensure long-term compatibility requirements and continuity of equipment supply and the safety of the operating staff. The housing of the SCADA RTU/ DCU &amp; Network Automation system hardware should be IP class protected suitable for both indoor and outdoor installations.</p> <p>The offered SCADA RTU/ DCU &amp; Network Automation system shall support remote control and monitoring from existing remote SCADA control centers (MCC/ BCC) via gateways.</p> <p>The system shall be designed such that personnel without any background knowledge in Microprocessor-based technology are able to operate the system. The operator Interface shall be intuitive such that operating personnel shall be able to operate the system easily after having received some basic training.</p> <p>The system shall incorporate the control, monitoring and protection functions specified, self-monitoring, signaling and testing facilities, measuring as well as memory functions, event recording and evaluation of disturbance records.</p> <p>Maintenance, modification, diagnosis or extension of components shall not cause a shutdown of the whole SCADA RTU/ DCU &amp; Network Automation system. Self-monitoring of components, modules and communication shall be incorporated to increase the availability and the reliability of the equipment and minimize maintenance.</p> <p>The SCADA RTU/ DCU and Network Automation system should be processor, co-processor, power supply, rack and media redundant.</p> <p>The SCADA RTU/ DCU &amp; Network Automation system should be web accessible with facility to upload/ download the system configuration files and controlling &amp; monitoring of equipment's.</p> <p>The SCADA RTU/ DCU &amp; Network Automation system should be cyber secured with user based configured password protection.</p>
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3.c	System Architecture	<p>The SCADA RTU/ DCU &amp; Network Automation system shall be based on decentralized architecture and on concept of bay-oriented, distributed intelligence.</p> <p>Functions shall be decentralized, object-oriented and located as close as possible to the process.</p> <p>The main process information of the station shall be stored in distributed databases. The typical SCADA RTU/ DCU &amp; Network Automation system architecture shall be structured in two levels, i.e. station and bay level.</p> <p>At bay level, the IEDs shall provide all bay level functions regarding control, monitoring and protection information, inputs for status indications, outputs for commands and measurand/ analog data. The IEDs should be directly connected to the switchgear without any needs for additional interposition or transducers.</p> <p>Each bay control IED shall be independent from each other and its SCADA functioning shall not be affected by any fault occurring in any of the other bay control units of the station.</p> <p>The data exchange between the electronic devices on bay and station level shall take place via the communication infrastructure. Data exchange is to be realized on PRP using IEC 61850 protocol with a redundant managed layer 2 switched Ethernet communication infrastructure. The Ethernet switch must be IEC 61850 compliant and KEMA, CE and FCC certified.</p> <p>The communication shall be made in 1+1 mode (PRP) for IEC 61850 protocol, including the fiber link between the individual bay IEDs to bay switch and Ethernet link between the bay switch to RTU/ DCU, such that failure of one link shall not affect the normal operation of the SCADA RTU/DCU &amp; Network Automation system. However it shall be alarmed in SCADA RTU/ DCU &amp; Network Automation system.</p> <p>Communication shall be on serial link between IEDs (serial communicable devices) like MFMs, DCDBs and the processor with SPD.</p> <p>Clear control priorities shall prevent operation of a single switch at the same time from more than one of the various control levels, i.e. MCC/ BCC, bay level or apparatus level. The priority shall always be on the lowest enabled control level.</p>
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3.d	Communication Interface and Protocol	<p>The communication protocol for gateway to control centers must be on IEC 60870-5-104 protocol. While the communication for sub-station IEDs of Bay level and station level must be on IEC 61850 protocol. In addition the RTU/ DCU should have RTU/ DCU serial Modbus RS485 protocol for communication to MFMs and DCDBs. DCDB, NIDS, NIFPS (8 No. DI signals for integration) and APFC should also interfaced with RTU through hard-wiring.</p> <p>Different protocols to integrate the SCADA RTU/ DCU &amp; Network Automation system are as given in Table 3.d [1]:</p> <table border="1"> <thead> <tr> <th colspan="2"><b>Table 3.d [1]</b></th> </tr> </thead> <tbody> <tr> <td>RTU/ DCU to SCADA Control Centers (MCC/ BCC)</td> <td>IEC 104</td> </tr> <tr> <td>RTU/ DCU to Transformer Monitoring Unit/ NIDS/ APFC</td> <td>IEC 61850</td> </tr> <tr> <td>RTU/ DCU to Bay Control Units/ Relays</td> <td>IEC 61850</td> </tr> <tr> <td>RTU/ DCU to MFMs and Other serial communicable devices</td> <td>RTU/ DCU serial Modbus RS485</td> </tr> </tbody> </table> <p><b>NOTE: Converters (protocol/ media/ power supply) of any sort will not be permitted for RTU/ DCU and Network Automation system.</b></p>	<b>Table 3.d [1]</b>		RTU/ DCU to SCADA Control Centers (MCC/ BCC)	IEC 104	RTU/ DCU to Transformer Monitoring Unit/ NIDS/ APFC	IEC 61850	RTU/ DCU to Bay Control Units/ Relays	IEC 61850	RTU/ DCU to MFMs and Other serial communicable devices	RTU/ DCU serial Modbus RS485
<b>Table 3.d [1]</b>												
RTU/ DCU to SCADA Control Centers (MCC/ BCC)	IEC 104											
RTU/ DCU to Transformer Monitoring Unit/ NIDS/ APFC	IEC 61850											
RTU/ DCU to Bay Control Units/ Relays	IEC 61850											
RTU/ DCU to MFMs and Other serial communicable devices	RTU/ DCU serial Modbus RS485											
3.e	IEC 61850 compliant Managed Ethernet switch & network	<p>The IEC 61850 compliant Managed Ethernet switch shall meet the demand of power system automation systems (IEC 61850-3, IEEE 1613 compliance).</p> <ul style="list-style-type: none"> <li>• Ethernet switch shall be layer 2 industrial grade.</li> <li>• Ethernet switch shall be modular with SFP for copper and fiber port.</li> <li>• Ethernet switch port shall be approve by engineering in charge of SCADA.</li> <li>• Ethernet switch shall be 19" rack mounted.</li> <li>• Ethernet switch shall operate at 36 to 72 VDC power supply.</li> <li>• Operating Temperature: -40°C to +85°C.</li> <li>• All port shall be user configurable with minimum configuration of 100Mbps.</li> <li>• Communication type: Fiber Optics media and ST/LC Connector compatible with IEDs supplied with CRP, As Per Site and Ethernet - copper CAT6/ above cable. Further approval at the time of final</li> </ul>										

		<p>engineering approval.</p> <ul style="list-style-type: none"> <li>• LED indicators on all ports shall be blinking with data transfer.</li> <li>• The switch should have a diagnostic/ error/ warning LED.</li> <li>• It should support remote user setting configuration.</li> <li>• It should own separate maintenance/ console port.</li> <li>• Latency shall be not more than 10ms.</li> <li>• Should be KEMA, CE and FCC Certified.</li> <li>• Switch should be extendable for future expansion.</li> <li>• Minimum 20% spares of utilized hardware and accessories to be provided by the supplier/ BA.</li> <li>• On-site warranty for the switch must be 5 years. The warranty certificate is required to be submitted by the supplier/ BA to BYPL at the time of SAT.</li> <li>• Shall be suitably mounted in CRP/switchgear panel.</li> <li>• Ethernet Switch shall have required nos. of ports (having RJ45 Ports / FO Ports).Minimum 20% spare ports shall be provided. Final approval at the time of detail engineering.</li> <li>• Power Supply of EFS shall be Dual redundant with pluggable terminal block.</li> <li>• Shall have Environmental conditions compliance as per <ul style="list-style-type: none"> <li>IEC60068-2-1 COLD TEMPERATURE</li> <li>IEC60068-2-2 DRY HEAT</li> <li>IEC60068-2-30 HUMIDITY</li> <li>IEC60068-21-1 VIBRATION</li> <li>IEC60068-21-2 SHOCK</li> </ul> </li> <li>• Shall have Features: <ul style="list-style-type: none"> <li>Management through Web-based, Telnet, CLI</li> <li>SNMP supported</li> <li>Remote Monitoring</li> <li>Diagnostics with logging and alarms</li> <li>Console ports</li> </ul> </li> <li>• Shall have Product conformity <ul style="list-style-type: none"> <li>acc. to IEEE 802.3-10BaseT Yes</li> <li>acc. to IEEE 802.3u-100BaseTX Yes</li> <li>acc. to IEEE 802.3u-100BaseFX Yes</li> <li>acc. to IEEE 802.3ab-1000BaseT Yes</li> <li>acc. to IEEE 802.3ad-Link Aggregation Yes</li> <li>acc. to IEEE 802.3x-Flow Control Yes</li> <li>acc. to IEEE 802.1d-MAC Bridges Yes</li> <li>acc. to IEEE 802.1d-STP Yes</li> <li>acc. to IEEE 802.1p-class of service Yes</li> <li>acc. to IEEE 802.1Q-VLAN tagging Yes</li> </ul> </li> </ul>
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		<p>acc. to IEEE 802.1Q-2005 (formerly IEEE 802.1s) MSTP Yes  acc. to IEEE 802.1w-RRST Yes  acc. to IEEE 802.1x-port based Network Access Control</p> <ul style="list-style-type: none"> <li>• Shall have Mode Store and Forward</li> <li>• Shall have Protection class IP4X, Conformal Coating, IPV6</li> <li>• Shall have Authorized Repair center of original Ethernet switch manufacture in India.</li> <li>• Shall have Uplink Rate 1 GBPS and Downlink Rate 100 MBPS</li> </ul> <table border="1"> <caption><b>Table 3.e [1] BYPL approved Makes</b></caption> <thead> <tr> <th>S.No.</th> <th>Make</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Ruggedcom</td> </tr> <tr> <td>2</td> <td>Hirschmann</td> </tr> </tbody> </table> <p><b>The specified makes are to be strictly adhered to and no change will be considered hereto.</b></p>	S.No.	Make	1	Ruggedcom	2	Hirschmann
S.No.	Make							
1	Ruggedcom							
2	Hirschmann							
3.f	RTU/ DCU Enclosure	<p>RTU/ DCU enclosure should be suitably sized minimum 800mm to accommodate all RTU/ DCU and network accessories, self-standing, fabricated 14 gauge, CRC sheet, duly powder coated paint (RAL 7035 Siemens Grey Structure Shade) with black color plinth and IP class IP5X protected suitable for both indoor and outdoor installations.</p> <p><b>Enclosure Details:</b></p> <ul style="list-style-type: none"> <li>• Panel should have a front toughened glass door behind which the RTU/ DCU racks should be mounted on a swing door frame. Doors should have Ergoform- S lock system with key.</li> <li>• The whole RTU/ DCU hardware should be housed in an energy-efficient Air Conditioned cabinet with temperature and humidity controller.</li> <li>• Enclosure should have GI mounting plate fitted on its rear wall. Rear wall shall be fixed.</li> <li>• It should have gland plates suitably sized, fabricated with 3mm CRC sheet, duly powder coated paint (RAL 7035 Siemens Grey Structure Shade).</li> <li>• Enclosure should have sufficient illumination system with door interlocks, crankcase heaters, Rat/ Rodents repellent system, drawing pocket etc.</li> <li>• It should have fan and louvers ,both with filters to dissipate heat.</li> </ul>						

		<ul style="list-style-type: none"> <li>• Copper earth strip of suitable size to be provided for both power and electronics, separately.</li> <li>• A minimum 30% free space should be provided for spares for future expansion.</li> </ul> <table border="1"> <tr> <th colspan="2">Table 3.f [1] BYPL approved Makes</th> </tr> <tr> <th>S.No.</th> <th>Make</th> </tr> <tr> <td>1</td> <td>Rittal and equivalent</td> </tr> </table>	Table 3.f [1] BYPL approved Makes		S.No.	Make	1	Rittal and equivalent
Table 3.f [1] BYPL approved Makes								
S.No.	Make							
1	Rittal and equivalent							
3.g	RTU/ DCU System	<p>In general the RTU/ DCU system design should aim to minimize power consumption and heat generation. The RTU/ DCU shall be modular type, housed in a 19" rack consisting of processor, co-processor, Digital Input/ Output and Analog Input/ Output modules, power supply and communication interface module, Ethernet switches etc. The auxiliary supply of RTU/ DCU and network system should be 48VDC nominal range: 36-72 VDC with copper wire of suitable size.</p> <p>RTU/ DCU system should be completely wired up with all the required accessories like MCB, heavy duty CMRs (miniature contactors), rack mounted DC-DC converters, contactors, screw terminals, PVC duct, galvanized GI mounting channels etc. and should be enclosed in an air-conditioned self- standing enclosure.</p> <p><b>RTU/ DCU system:</b></p> <ul style="list-style-type: none"> <li>• RTU/ DCU shall be modular and expandable.</li> <li>• RTU/DCU shall have temperature range from -25°C to +70°C.</li> <li>• RTU/DCU processor shall have 800Mhz clock frequency.</li> <li>• RTU/ DCU system should have redundant processor, co-processor, power supply, rack, Ethernet switch, bay and station network level.</li> <li>• It should have a under voltage and earth leakage detection system.</li> <li>• RTU/ DCU processor should communicate to MCC and BCC on IEC 60870-5-104 protocol on a single IP address.</li> <li>• Processor and co-processor should be capable to communicate with IEDs (Protection Relays, Digital RTCC relay, bay controller etc.) on IEC 61850 protocol and MFMs, DCDBs etc to communicate on RS485 RTU/ DCU Modbus slave. DCDB, NIDS and APFC should also interface with RTU through hard-wiring.</li> <li>• RTU/ DCU system should have programmable logic capabilities supported by easy to use editing facilities. These capabilities shall</li> </ul>						



enable the RTU/ DCU to perform functions using ladder, FBD and statement language as per IEC standard.

- Internal battery backup to hold data in SOE buffer memory & also Maintain the time & date.
- RTU shall have Integrated HMI/Web based HMI feature.
- RTU shall have security log and event archive feature.
- All digital and analog input-output modules should be housed in a separate rack.
- Digital input and output modules should be 16 channels, 48VDC and potential free contact respectively.
- Analog input should be 8/ 16 channel, 16-bit resolution, and universal type, configurable for all ranges between  $\pm 10VDC$  and  $\pm 20mA$ .
- RTU/ DCU system should have minimum 20% spares of utilized RTU/DCU & Network hardware and accessories, completely wired up to the last terminal.
- RTU shall have DC voltage supply monitoring through transducer and AI module.
- RTU shall have IEC60870-5, IEC61850, MODBUS, PLC, Advance cyber security, integrated HMI, Archive license.
- RTU shall have 3 Nos 16 channel DI, 2 Nos 16 Channels DO, 1 Nos 8 channel AI modules for future hard wiring.

Bidders who are OEM of RTU and Numerical Relays are only acceptable & Pilot with successful test results are main criteria for induction of any new models in BYPL.

Note : System shall be approved if they are agree to fulfil the following terms & Conditions,

It is applicable for all OEM products.

- AMC period should be given 3 years along with this proposal.
- AMC period should be started after handing over the system to BYPL.
- During AMC period all the issues pertaining to RTU/Gateway/BCU should be handled by OEM at site(this included unlimited site visit)
- 5 Year replacement warranty is applicable for all OEM for Electronic cards & Gateway Units...If any hardware (or) Software fails during this period will be rectified by OEM.

**Table 3.g [1] BYPL approved Makes with Type**

S.No.	Make	Type
1	ABB Ltd.	RTU560
2	Schneider	Saitel DP
4	Siemens	A8000

**The specified makes are to be strictly adhered to and no change will**

		be considered hereto.								
3.h	Control Wiring, Name Plate and Marking System	<p><b>Panel Control Wiring</b></p> <p>Suitable size and color control and power wiring to be used for the connection of RTU/ DCU equipment and accessories along with proper and suitable lugs and ferrules. Control wire used inside the panels should be as per international color standards, approved by BYPL.</p> <p><b>Field Control Wiring</b></p> <ul style="list-style-type: none"> <li>• All control and power cables used in the RTU/ DCU and Network Automation system should be multi-core, FRLS, armored with copper multi-strand.</li> <li>• All communication cables used in the RTU/ DCU and Network Automation system should be tinned copper high density shielded or armored with PVC FRLS. All Optical Fiber Cables (OFC) used in the RTU/ DCU and Network Automation system should be of proper size, armored and suitable for multi/ single mode operations.</li> <li>• Laying of control cable from field to RTU/ DCU should be in separate cable trays and armored conduit/ duct of suitable size.</li> <li>• Laying of communication cable is in wall mounted PVC pipe of suitable size.</li> <li>• The field wiring material and laying plan is to be submitted by the supplier/ BA and should be duly approved by the engineering staff of SCADA, BYPL before the commencement of work.</li> <li>• During execution if any replacement/ changes (due to site constraint ) are required in the material/ field wiring and laying that shall be duly made by the supplier/ BA without any additional costs within the committed time (maximum one (1) week).</li> <li>• All field wiring make and model should be approve by SCADA engineering in-charge at the time of detail engineering.</li> </ul> <table border="1"> <thead> <tr> <th colspan="2"><b>Table 3.h [2] Field Control Wiring</b></th> </tr> <tr> <th><b>Description</b></th> <th><b>Approved Make</b></th> </tr> </thead> <tbody> <tr> <td>RS485 Wire</td> <td>Belden or equivalent</td> </tr> <tr> <td>Ethernet</td> <td>D-link, Belden or equivalent</td> </tr> </tbody> </table>	<b>Table 3.h [2] Field Control Wiring</b>		<b>Description</b>	<b>Approved Make</b>	RS485 Wire	Belden or equivalent	Ethernet	D-link, Belden or equivalent
<b>Table 3.h [2] Field Control Wiring</b>										
<b>Description</b>	<b>Approved Make</b>									
RS485 Wire	Belden or equivalent									
Ethernet	D-link, Belden or equivalent									

		<p>Fiber optic cord</p>	<p>Preston or equivalent</p>
		<p><b>Equipment Name Plate</b></p> <ul style="list-style-type: none"> <li>• All equipment's either in RTU/ DCU panel or field should have proper name plate.</li> <li>• The name plate material, size, and text font and size are to be submitted by the supplier/ BA and should be duly approved by the engineering staff of SCADA, BYPL before the commencement of work.</li> <li>• Sample name plates are to submit for approval before field installations, any changes suggested by BYPL shall be duly incorporated.</li> <li>• During the execution any change in name plate size, text font or size suggested by BYPL shall be duly incorporated without any additional costs within the committed time (maximum one (1) week).</li> </ul> <p><b>Marking System</b></p> <ul style="list-style-type: none"> <li>• The panel and field control wiring Marking System should be proper for the system. The name plates should be properly engraved and all wires should have proper size ferrule nos. and printing life for both should be of minimum 10 years.</li> </ul>	
<p>3.i</p>	<p>RTU/ DCU Commissioning</p>	<ul style="list-style-type: none"> <li>• The supplier/ BA will install all network, control and RTU system as per BYPL approved network system architecture.</li> <li>• The supplier/BA will configure existing equipment to RTU if any.</li> <li>• The supplier/ BA will configure, validate and submit the network as per system requirement which will be verified and approved by SCADA engineering in-charge.</li> <li>• The supplier/ BA will be responsible for commissioning of RTU/ DCU with all IEDs as per Annexure 12.b provided.</li> <li>• RTU/ DCU network commissioning engineer (supplier/ BA) will be responsible for IEC 61850 protocol files.</li> <li>• During the local testing, only and only if the punch points are thorough then only final testing will be done.</li> <li>• Final point-to-point testing from SCADA Center is to be necessarily cleared before SAT.</li> </ul>	

3.j	Time synchronization and SOE	<p>A dedicated GPS signal from the SCADA MCC &amp; BCC (FEP) will be provided for the synchronization of the entire system. This GPS signal would be available to the RTU/ DCU at regular specified intervals and the RTU/ DCU in turn should synchronize all devices via the inter bay bus using SNTP protocol as defined in IEC 61850 standard. RTU shall have capability to sync with PTP.</p> <p>To analyze the chronology or sequence of events occurring in the power system, time tagging of data is required which shall be achieved through SOE feature of RTU. The RTU shall have an internal clock with the stability of 10ppm or better. The RTU time shall be set from time synchronization messages received from master station using IEC 60870-5- 104 protocol. In addition, the message can be transmitted using NTP/SNTP. SOE time resolution shall be 1ms or better.</p> <p>The RTU shall maintain a clock and shall time-stamp the digital status data. Any digital status input data point in the RTU shall be assignable as an SOE point. Each time a SOE status indication point changes the state, the RTU shall time-tag the change and store in SOE buffer within the RTU. A minimum of 10000 events shall be stored in the SOE buffer. SOE shall be transferred to Master Station as per IEC 60870-5-104 protocol. SOE buffer &amp; time shall be maintained by RTU on power supply interruption.</p>										
3.k	Response Times and I/O Capacities	<p>The total I/O count in a major substation will become large and it must be ensured that the hardware and communication links have sufficient performance to ensure prompt processing of data, Ref. Tables 3.k [1] Processor shall have minimum 5000 DP capability.</p> <p>As I/O at the bay level, both digital and analog will typically be handled by intelligent relays or specialized IEDs, it is therefore important to ensure that these devices have sufficient I/O capacity and dual communication ports for PRP protocol.</p> <table border="1"> <thead> <tr> <th colspan="2"><b>Table 3.k [1] Minimum system response times for a substation</b></th> </tr> </thead> <tbody> <tr> <td>Digital Input</td> <td>1s</td> </tr> <tr> <td>Analog Input</td> <td>1s</td> </tr> <tr> <td>Digital Output</td> <td>0.75s</td> </tr> <tr> <td>Disturbance Record File</td> <td>3s</td> </tr> </tbody> </table>	<b>Table 3.k [1] Minimum system response times for a substation</b>		Digital Input	1s	Analog Input	1s	Digital Output	0.75s	Disturbance Record File	3s
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Digital Output	0.75s											
Disturbance Record File	3s											

		<p>The above are the minimum capacity which may change during detailed engineering of RTU/ DCU. The RTU/ DCU should have the capability of I/Os expansion.</p>								
3.l	Multi Function Meters (MFM)	<p>A single network loop of MFMs should not have more than eight (8) MFMs. MFM communication network on RTU/ DCU serial Modbus RS485 should be protected against surges and electrical leakages therefore, it is necessary to install Surge Protection Devices placed in between the RTU/ DCU &amp; MFM serial network loop.</p> <p>The inter-looping of MFMs to be made by 22 guage Belden 8761 non-screened cable while the extension of the communication network from MFM to RTU/ DCU to be made by 22 guage Belden 8761 Belden screened cable. The typical diagram for this connection is mentioned in the System Architecture diagram, Annexure 12.a.</p> <p>Minimum two (2) spare links from CRP to RTU/DCU to be provided by supplier/ BA for future extension.</p> <p>All hardware of the RTU/ DCU and Network Automation system and CT &amp; PT wirings to MFMs and its configurations fall in supplier/ BAs scope.</p> <p>The integration of MFM to be done as per the technical document and parameter configuration as per Annexure 12.b.</p> <table border="1"> <thead> <tr> <th colspan="2"><b>Table 3.i [1] Field Control Wiring</b></th> </tr> <tr> <th><b>Description</b></th> <th><b>Approved Make</b></th> </tr> </thead> <tbody> <tr> <td>MFM</td> <td>Delta energy, Conserv 6400NG</td> </tr> <tr> <td>SPD</td> <td>San-tele quip, Phoenix</td> </tr> </tbody> </table>	<b>Table 3.i [1] Field Control Wiring</b>		<b>Description</b>	<b>Approved Make</b>	MFM	Delta energy, Conserv 6400NG	SPD	San-tele quip, Phoenix
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<b>Description</b>	<b>Approved Make</b>									
MFM	Delta energy, Conserv 6400NG									
SPD	San-tele quip, Phoenix									
3.m	Transformer Monitoring cum Automatic Voltage Regulator (AVR) Unit	<p>A digital transformer monitoring cum automatic voltage regulator unit is to be provided as per the tender document for each transformer and it should fulfill the following requirements for SCADA integration and configuration:</p> <ul style="list-style-type: none"> <li>As the name suggests, it should have the functionality of automatic voltage control.</li> <li>A digital transformer monitoring cum automatic voltage regulator unit should have the facility to measure CT, PT, Oil</li> </ul>								

		<p>temperature, winding temperature and tap position etc. further these parameters shall be telemetered to SCADA RTU/ DCU on IEC 61850 protocol.</p> <ul style="list-style-type: none"> <li>• It should have facility to control tap position, fan control etc. further these parameters shall be telemetered to SCADA RTU/ DCU on IEC 61850 protocol for monitoring and controlling.</li> <li>• It shall have Microprocessor based Numerical relay having LCD display along with the software to make the parameters settings of the device and it shall be possible to do the parameter setting through keyboard unit.</li> <li>• It should have the feature to set the parameters related to voltage regulation and fan control from MCC &amp; BCC.</li> <li>• The unit shall have suitable interface to communicate with higher level SCADA system as per the protocol proposed in the integrated package solution.</li> <li>• The unit should be capable of taking tap position, oil temperature inputs directly without any transducers.</li> <li>• The parameters configuration should be as per Annexure 12.b.</li> </ul>
3.n	Maintenance, Diagnostics and Reliability	<p><b>Maintenance:</b></p> <p>It is a requirement that all RTU/ DCUs require no routine or planned maintenance. Therefore, no fans or moving parts shall be used in the RTU/ DCU to avoid any need for maintenance. To ensure this, the RTU/ DCU should be constructed to resist the entry of dust. A single technician shall be able to remove and replace for repair purposes, without special tools and test equipment's involved in the operation of RTU/ DCU. Restoration of equipment to full operational use shall be possible within 15 minutes (nominally) of repairs being completed. It should not be necessary to dismantle (remove multiple pieces of) the RTU/ DCU in order to replace a module.</p> <p><b>Diagnostics:</b></p> <p>The vendor should provide remote maintenance and monitoring diagnostic and configuration tools (Laptop) which should be able to access the RTU/ DCU and all other IEDs using BYPLs TCP/ IP WAN network. The station should use RTU/ DCUs pass through access capability to monitor the station devices and carry out parameterization of the IEDs, Protection Relays and network devices in the station.</p> <ul style="list-style-type: none"> <li>• The supplier is required to provide diagnostic and licensed configuration software to run in the supplied tools and access the RTU/ DCU. This software tool shall allow building of new configuration file,</li> </ul>

modification and configuration of RTU/ DCU configuration file along with the below listed facilities:

- Monitoring of all inputs, control of all outputs and testing of calculation logic. Monitoring of all inputs and logic at card level, logic level and protocol level.
  - Display of communication statistics and eavesdropping of communications channels, including Ethernet, IP, IEC103, IEC 104, IEC 61850 and Modbus.
  - Download & upload of RTU/ DCU software, database configuration and calculations, upload the complete configuration from RTU/ DCU to modify and then download to RTU/ DCU.
  - On-line help.
  - Display time, date, current firmware, software and configuration running in the RTU/ DCU.
  - Configuration and diagnostic software must run on latest Microsoft Windows version.
- The diagnostic and configuration utility software shall be provided on a pen drive which is compatible with laptop/ PC. The current version number of such software shall be provided.

**Reliability:**

The RTU/ DCU and Network Automation system will normally remain in continuous service, 24X7, to provide SCADA facilities. A high level of reliability is required as failure can result in the interruption of the operation and monitoring of the Power System Control.

Predicted availability of equipment supplied should exceed the following:

<b>Table 3.n [1]</b>	
<b>System Function</b>	<b>System Availability</b>
Control and monitoring of any one breaker/ equipment	99.99%
Monitoring of any one status & measurand data indication	99.99%
Monitoring of any one status/ measurand/analog input	99.99%

3.o	Interchangeability & Future Extendibility	<p><b>Interchangeability:</b></p> <p>RTU/ DCU parts like processors, co-processors and interface modules and network hardware shall be interchangeable individually, and as a whole RTU/ DCU without the need of re-configuration with pre-programmed flash memory. Any such change or replacement shall not reduce the capability of the equipment to conform to requirements of this specification.</p> <p>Each module and switch links of the RTU/ DCU and Network Automation system should have Hot Swap feature i.e., at the time of removal/ insertion of modules and switch links, the system should not become faulty and automatically recognize the new module and switch link without any need of system reboot.</p> <p><b>Future Extendibility:</b></p> <p>Offered SCADA RTU/ DCU &amp; Network Automation system shall be suitable for extension in future for additional bays. During such requirements, all the drawings and configurations, alarms/ events list etc displayed shall be designed in such a manner that its extension shall be easily performed by the BYPL user. During such event, normal operation of the existing substation shall be unaffected and system shall not require a shutdown. The BA shall provide all the necessary software tools along with the source codes to perform addition of bays in future and complete integration with RTU/ DCU &amp; Network Automation system by the user. These software tools shall be able to configure IEDs, add additional analog variables, alarm list, event list, modify interlocking logics etc. for additional bays/ equipment which shall be added in future. Offered RTU/ DCU &amp; Network Automation System including switches shall have minimum 20% spare of utilized RTU/DCU &amp; Network Automation system hardware and accessories, completely wired up to the last terminal.</p>
3.p	Service life, Warranty and Replacement Support	<p><b>Service Life:</b></p> <p>BYPL prefers that the major equipment's of RTU/ DCU and Network Automation system shall be capable of complying with this standard, including performing its intended purpose, for a minimum of 10 years from the date of supply.</p>



		<p>The supplier/BA shall provide a service support letter containing:</p> <ul style="list-style-type: none"> <li>• The date at which the product was released for sale.</li> <li>• The anticipated date at which the product will be withdrawn from sale, but support will continue to be supplied.</li> <li>• The anticipated date of when the product support will be withdrawn i.e. spares will no longer be available and technical support will no longer be provided.</li> </ul> <p><b>Warranty and Replacement Support:</b></p> <p>During the guaranteed availability period, the spare parts supplied by the supplier/ BA shall be made available to the supplier/ BA for usage subject to replenishment within the committed time (maximum eight (8) weeks). Thus, after the system is revived the inventory of spares with BYPL shall be fully replenished by the supplier/ BA. However, any additional spares required to meet the availability of the system (which is not a part of the above spares supplied by the supplier/ BA) would have to be supplied immediately by the supplier/ BA free of cost to BYPL.</p> <ul style="list-style-type: none"> <li>• RTU/ DCU and Network Automation System Hardware: Minimum 5 years</li> <li>• RTU/ DCU and Network Automation System Accessories: 2 years</li> <li>• Managed Ethernet Switch: 5 years</li> </ul> <p>At the time of failure or non-availability of the system, during the warranty period, the supplier/ BA is required to visit the site on BYPLs call within 24hrs, free of cost to revive the system.</p> <p>The supplier/ BA should submit a liability warranty support certificate to BYPL.</p> <p>5 years warranty is mandatory for all SCADA/RTU products(Electronic cards,GPS,Switches,HMI,etc...).If any cards fails/burnt due to surges from CT,PT via RS485/serial, Surges through cables then replacement will be in your scope up to 5 years.So suitable SPD to be incorporate in the system according to site requirements for avoid card failures.</p>
3.q	RTU/ DCU & Network Earthing System	Two types of earthing should be provided by the supplier/ BA: power and electronics. Both should be of copper, isolated and suitably sized (as per BYPLs approval). Power earthing should be connected to the RTU/ DCU Enclosure, light, fan, AC while the electronic earthing will be connected to the inside modules of the RTU/ DCU.

		<p>Color of earthing wire: Green and Yellow/ Green</p> <p>In the receiving station, grid earthing will be used for RTU earthing.</p>						
3.r	DR Download	<p>The proposed SCADA network should be configured for remote downloading of DR over WAN from any one (1) location falling under BYPL jurisdiction.</p> <p>All the required configuration settings of the supplied network are to be made by the supplier/ BA.</p>						
3.s	RTU Auxiliary Power supply system	<p>Power for the RTU/ DCU &amp; Network Automation system shall be derived from substation 48/ 220V DC system. The power supply system will have a wide range, 48 VDC nominal : 36- 72 V. The supplier/ BA may use DC- DC converter to convert grid control voltage 220VDC to 48VDC with wide operating range. The power supply system should be redundant and distributed through MCB of suitable ratings. Power supply should also be equipped with surge protection device.</p> <table border="1"> <thead> <tr> <th colspan="2"><b>Table 3.s [1] Field Control Wiring</b></th> </tr> <tr> <th><b>Description</b></th> <th><b>Approved Make</b></th> </tr> </thead> <tbody> <tr> <td>DC DC converter</td> <td>Meanwell or equivalent</td> </tr> </tbody> </table>	<b>Table 3.s [1] Field Control Wiring</b>		<b>Description</b>	<b>Approved Make</b>	DC DC converter	Meanwell or equivalent
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<b>Description</b>	<b>Approved Make</b>							
DC DC converter	Meanwell or equivalent							
3.t	Cyber security	<p>Offered system shall have advance cyber security feature which comply below mentioned standards and certificate shall be provided during detail engineering</p> <p>IEC 62443-4-2 IEC 62443-3-3 IEEE 1686 IEC 62351-3 IEC TS-62351-5 IEC 60870-5-7 security extension</p>						
4	<b>SCADA Commands, Indications &amp; Measurands Data</b>	<p>As per Annexure 12.b.</p>						
5	<b>Quality Control and Checklist</b>	<p>The supplier/ BA is required to submit a plan of different stages of manufacturing and testing based on which subsequent reports and certificates shall be submitted. If during this period the manufacturing and quality is found unsatisfactory as to workmanship or material, the same is liable for rejection and the supplier/ BA will be obliged to provide standardized equipment as per BYPLs specifications.</p>						

		<p><b>Checklist:</b></p> <ol style="list-style-type: none"> <li>1. Space required for future expansion</li> <li>2. Component layout</li> <li>3. Wiring termination details</li> <li>4. Equipment/ component make used in the panel with their specifications</li> </ol>
<p><b>6</b></p>	<p><b>Pre- Dispatch Inspection (FAT) &amp; Minimum Testing Facility</b></p>	<p><b>Pre-Dispatch Inspection (FAT):</b></p> <p>After submitting and on BYPLs acceptance of the Test certificate and Quality Report, the supplier/ BA is required to call BYPL for Pre-Dispatch Inspection. The supplier/ BA should ensure the completion of manufacturing and set-up for Pre-Dispatch Inspection.</p> <p>Pre-Dispatch Inspection will be treated as FAT, which will only be carried on if the minimum testing facility has been arranged by the supplier/ BA. Travel, boarding, lodging and local conveyance etc shall be under vendors scope.</p> <p>In case FAT is waived off, all the below mentioned points will be tested during SAT.</p> <p>The following tests are to be carried out under FAT:</p> <ol style="list-style-type: none"> <li>1) Visual inspection of dimensions, workmanship, quality and specifications of the equipments as per the approved drawing and tender document.</li> <li>2) Test certificate and Quality Report verification as submitted</li> <li>3) Simulation of RTU/ DCU &amp; SCADA Network connectivity, data acquisition from IEDs/ MFMs and functionalities like: <ul style="list-style-type: none"> <li>• Indications, Commands and Measurands data</li> <li>• Time synchronization</li> <li>• Sequence of Events</li> <li>• Redundancy, diagnostic feature</li> <li>• Interchangeability</li> <li>• Hot Swapping</li> <li>• Any other functionality as per the tender document</li> </ul> </li> <li>4) During the Pre-dispatch inspection period if the vendor fails to simulate any of the functionality mentioned above and as per the tender document then BYPL has the rights to scrap the inspection and another FAT will be arranged for which the supplier/ BA will bear the travel expenses including both side airfares, cab rent, food and lodging.</li> </ol>

		<p><b>Minimum Testing Facility:</b> The minimum testing facility should include:</p> <ol style="list-style-type: none"> <li>1) Minimum number of each type of relays being supplied by the supplier/ BA for SCADA RTU/ DCU and Network Automation system.</li> <li>2) Complete SCADA RTU/ DCU and Network Automation system with redundancy connecting to each type of IED, at least two (2), being supplied by the supplier/ BA for the aforementioned system.</li> </ol>
7	<p><b>Packing &amp; Forwarding</b></p>	<p>The supplier/ BA shall ensure that all equipment covered by this specification shall be prepared for rail/ road transport (local equipment) and be packed in such a manner so as to protect it from damage in transit. All equipment/ material are to be transported with proper packing and markings.</p> <p>Any damage to the equipment(s) during the transit will be borne by the supplier/ BA and the replaced damaged equipment(s) will be made available to BYPL within the committed time (maximum eight (8) weeks).</p>
8	<p><b>System Spares, Tools &amp; Software Tools with Licenses</b></p>	<p>The bidder is required to list the spares, which may be required for ensuring the availability during the guaranteed availability period. The final list of spares shall form part of scope and accordingly the price thereof shall be quoted by the bidder and shall be considered in the evaluation of the bids.</p> <p>The list shall include the following:</p> <ul style="list-style-type: none"> <li>• Item identification</li> <li>• Recommended spares quantities (minimum 20% of utilized Hardware of SCADA/ DCU and Network Automation System)</li> <li>• Base price of proposed spares.</li> <li>• Procurement lead time probability of returning the replaced/ repaired spare parts</li> <li>• Procurement lead time probability of the spare material BYPL may need to procure apart from this Tender</li> <li>• Quantity of item held in local office by supplier/ BA as emergency spare parts.</li> </ul> <p>All spare parts shall be fully tested, however BYPL has the right to return the tested spare part on being found faulty for which the BA/ supplier shall</p>

provide with replacement within the committed time (maximum eight (8) weeks).

**Table 8 [1] Mandatory loose Spares material**

S.No.	Item	Qty	UOM
1.	RTU/ DCU & Network Hardware		
1.1	Rack redundant	1	No. each type
1.2	Rack I/O	1	No. each type
1.3	DI module with cable	1	No. each type
1.4	DO module with cable	1	No. each type
1.5	AI module with cable	1	No. each type
1.6	Managed Ethernet switch	1	No. each type
1.7	OFC patch cord	5	No. each type
1.8	Power Supply SMPS	2	No. each type
1.9	MCB	2	No. each type
1.10	Main Processor	1	No. each type
1.11	Co-processor connecting IEC 61850 protocol devices	1	No. each type
1.12	Co-processor connecting serial devices	1	No. each type
1.13	Power supply for RTU rack	1	No. each type
2.	RTU/ DCU Panel Accessories (Converters, Power Supplies etc.)	Minimum 20% of Utilized Hardware of SCADA/ DCU and Network Automation System	No. each type
3.	Communication Cable- RS485, LAN		
4.	Control Cable		

**Table 8 [2] Software Configuration Tools**

S.No.	Item	Qty
1	RTU/ DCU configuration tools with licensed software and cables	2 Nos.
2	Network configuration tools with licensed software and cables	1 Nos.

		<p>Network configuration tool:          10<sup>th</sup> Generation Intel Core TM i5-10210UProcessor(4Cores/8Threads, 1.60-GHZ up          to 2.10 GHZ with Turbo Boost, 6MB Casche),Windows 10 Pro 64,          35.56cms(14.0)FHD (1366x768)TN220nts Anti-glare, 16GB RAM DDR4          5Years Onsite Warranty,Stereo,Dolby@AudioTM          65W Adaptor,Carry Bag &amp; Wired Mouse,Integrated Intel@UHD Graphics          HDMI Port,2xUSB 3.2Gen1, 1xUSB 32 Type-C Gen 1.1xUSB3.2 Type-C Gen2          Laptop Battery 3 Cell,45Wh,CAM 720p HD          Intel Wi-Fi &amp; Blue tooth 5.1,mini 250GB SSD,1TB HDD</p>
<p><b>9</b></p>	<p><b>Drawings &amp; Documents, Configuration Backup and Certificates</b></p>	<p><b>Drawings &amp; Documents:</b></p> <p>Following drawings and documents shall be prepared on BYPLs specifications and statutory requirements and shall be submitted before the starting of manufacturing:</p> <ol style="list-style-type: none"> <li>1. Completely filled in Technical Particulars</li> <li>2. General description of the equipment and all components including brochures</li> <li>3. Bill of material</li> <li>4. Type test certificates</li> <li>5. System Design Architecture Drawing</li> <li>6. Layout drawings of Control cable, communication cable and cable tray linking RTU/ DCU panel, communication panels/ hardware</li> <li>7. Hardware Specification</li> <li>8. Sizing Calculations of various components</li> <li>9. Response Time Calculations</li> <li>10. Functional Design Document</li> <li>11. Power Distribution Schematic Diagrams for each RTU</li> <li>12. Standard documentation per IED, according to IEC 61850</li> <li>13. MICS document (Model Implementation Conformance Statement)</li> <li>14. PICS document (Protocol Implementation Conformance Statement)</li> <li>15. Conformance Test certificate</li> <li>16. ICD File (IED Capability Description file)</li> <li>17. SCD file (Substation Configuration Description)</li> </ol> <p>After the award of the contract four (4) copies of drawings, drawn to scale, describing the equipments in detail shall be forwarded for approval and the supplier/ BA shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto-positive suitable for reproduction, before the dispatch of the equipments. Soft copy (Pen drive) of the drawings, GTP, Test certificates shall be submitted after the final approval</p>

		<p>of the same to BYPL.</p> <p>All the documents and drawings shall be in English language.</p> <p>After execution any minor/ major change(s) made at the site to be incorporated in the documents and As build drawings and duly submitted to BYPL in the form of hard and soft copy.</p> <p><b>Instruction Manuals:</b> Bidder shall furnish two (2) soft copies (Pendrive) and four (4) hard copies of nicely bound manuals (in English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipments as well as the auxiliary devices.</p> <p><b>Configuration Backup:</b> All Configuration files for RTU/ DCU and network automation system should be provided to BYPL. Data Backup along with software shall be handed over to BYPL in Pen drive at the time of project hand over.</p> <p><b>Certificates:</b></p> <ol style="list-style-type: none"> <li>1. Test certificates of all the tests required and conducted by the supplier/ BA.</li> <li>2. System and equipments warranty certificates</li> <li>3. Maintenance and Service Agreement Certificates</li> </ol> <p>The supplier/ BA shall ensure that all the certificates mentioned in this document along with SAT document are submitted to BYPL at the time of SAT.</p>
<p><b>10</b></p>	<p><b>Trainings and Hands-on</b></p>	<p>The supplier/ BA personnel who are experienced instructors and who speak understandable English shall conduct training. The supplier/ BA shall arrange on its own cost all hardware training platform required for successful training and understanding at BYPLs works. The supplier/BA shall provide all necessary training material. Each trainee shall receive individual copies of all technical manuals and all other documents used for training. These materials shall be sent to BYPL at least two (2) months before the scheduled commencement of the particular training course. Class materials, including the documents sent before the training courses as well as class handouts, shall become the property of BYPL. BYPL</p>

reserves the right to copy such materials, but for in-house training and use only. Hands-on training shall utilize equipment identical to that being supplied to BYPL. The schedule, location, and detailed contents of each course will be finalized during BYPL and supplier/ BAs discussions. If the supplier/ BA have utilized 3<sup>rd</sup> party equipment or outsourced work to a 3<sup>rd</sup> party then experienced instructors of the 3<sup>rd</sup> party are required to be part of the training sessions.

**System Hardware Course**

A computer system hardware course shall be offered, but at the system level. The training course shall be designed to give BYPL hardware personnel sufficient knowledge of the overall design and operation of the system, so that they can correct obvious problems, configure the hardware, perform preventive maintenance, run diagnostic programs, and communicate with contract maintenance personnel. The following shall be covered:

- System hardware design architecture overview: Configuration of the system hardware.
- Equipment Maintenance: Basic theory of operation, maintenance techniques and diagnostic procedures for each element of the computer system, e.g., processors, auxiliary memories, Ethernet, routers and printers. Configuration of all the hardware equipment.
- System Expansion: Techniques and procedures to expand and add equipment such as loggers, monitors and communication channels.
- System Maintenance: Theory of operation, maintenance techniques and practices, diagnostic procedures and (where applicable) expansion techniques and procedures. Classes shall include hands-on training for the specific subsystems that are part of BYPLs equipment or part of similarly designed and configured subsystems. All interfaces to the computing equipment shall be taught in detail.
- Operational Training: Practical training on preventive and corrective maintenance of all equipment, including use of special tools and instruments. This training shall be provided on BYPLs equipment or on similarly configured systems.

**System Software Course**

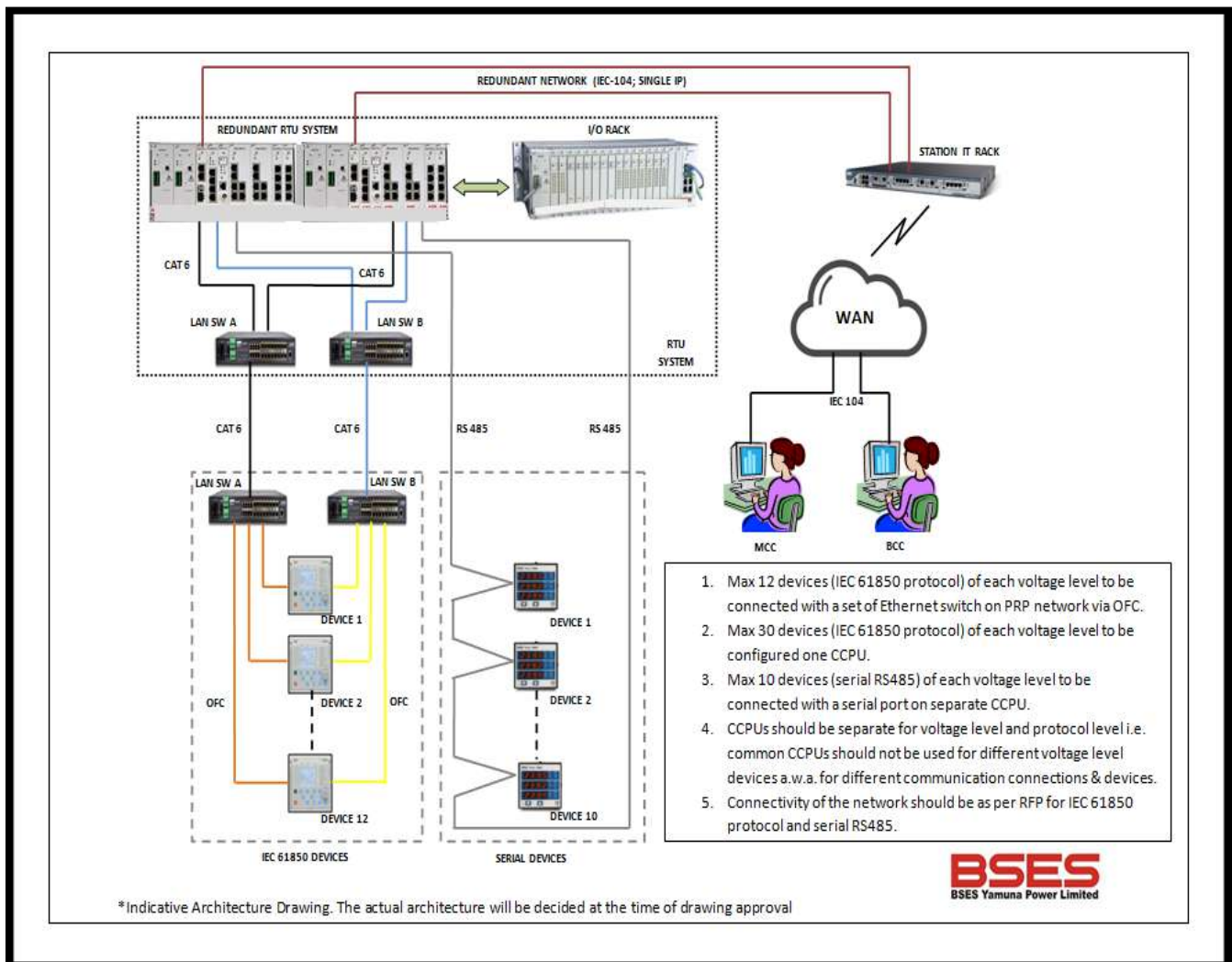
The contractor shall provide a computer system software course that covers the following subjects:



		<ul style="list-style-type: none"> <li>• System Programming: Including all applicable programming languages and all stand-alone service and utility packages provided with the system. An introduction to software architecture, effect of tuning parameters (OS software, Network software, database software etc.) on the performance of the system.</li> <li>• Operating System: Including the user aspects of the operating system, such as program loading and integrating procedures, scheduling, management, service and utility functions and system expansion techniques and procedures.</li> <li>• System Initialization and Failover: Including design, theory of operation and practice</li> <li>• Diagnostics: Including the execution of diagnostic procedure and the interpretation of diagnostic outputs.</li> <li>• Software Documentation: Orientation in the organization and use of system software documentation.</li> <li>• Hands-on Training: One week, with allocated computer time for trainee performance of unstructured exercises and with the course instructor available for assistance as necessary.</li> </ul> <p><b>Application Software Course</b></p> <p>The supplier/ BA shall provide comprehensive application software courses covering all applications including the database and display building course. The training shall include:</p> <ul style="list-style-type: none"> <li>• Overview: Block diagrams of the application software and data flows. Programming standards and program Interface conventions.</li> <li>• Application Functions: Functional capabilities, design and major algorithm. Associated maintenance and expansion techniques.</li> <li>• Software Development: Techniques and conventions to be used for the preparation and integration of new software functions.</li> <li>• Software Generation: Generation of application software from source code and associated software configuration control procedures.</li> <li>• Software Documentation: Orientation in the organization and use of functional and detailed design documentation and of programmer and user manuals.</li> <li>• Hands-on Training: One week, with allocated computer time for trainee performance of unstructured exercises and with the course instructor available for assistance as necessary.</li> </ul> <p><b>Requirement of Training</b></p>
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		<p>The supplier/ BA shall provide training for a batch (maximum of 5 people) for five (5) days in two slots (Time of which will be decided by BYPL and supplier/ BA) on the following courses. Travel, boarding, lodging and local conveyance etc shall be under vendors scope.</p> <p>Name of Course:</p> <ul style="list-style-type: none"> <li>• System Hardware</li> <li>• System Software</li> <li>• Application Software</li> </ul>
<p><b>11.</b></p>	<p><b>SAT</b></p>	<p>This document exclusively covers the SAT for SCADA RTU/ DCU and Network Automation system.</p> <p>After the successful commissioning and testing of the SCADA RTU/ DCU &amp; Network Automation system and liquidation of all punch points, the system will be put on continuous running mode for a cycle of minimum thirty (30) days after clearance on punch-points. During this period, if the RTU/ DCUs performance due to configuration and/ or hardware does not meet the criteria as per points 3.k and 3.n, the cycle will be reset.</p> <p>During the cycle, availability and operational efficacy of the system will be checked and after successful validation SAT will be concluded.</p> <p>SAT will include the validation of the following:</p> <ol style="list-style-type: none"> <li>1. Communication Network</li> <li>2. SCADA RTU/ DCU and Network redundancy</li> <li>3. Validation of SOE</li> <li>4. All approved Indication, Command and Measurand data.</li> </ol> <p>BYPL reserves the right to financially penalize the supplier/ BA on failure of SAT as per the technical and tender document.</p>

**Annexure 12.a (RTU/ DCU System Architecture Drawing)**



**Annexure 12.b (Signal List- 11/33/66kV)**

**A. 11kV Outgoing feeders- IEC 61850 Protocol**

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker ON	✓		DPI
2.	Breaker OFF			SPI
3.	Trip Ckt Healthy 1	✓		SPI
4.	Trip Ckt Healthy 2	✓		SPI
5.	Spring Charge	✓		SPI
6.	Breaker in Service	✓		SPI
7.	Breaker in Test	✓		SPI
8.	Auto Trip (86) Operated	✓		SPI
9.	Panel DC Fail	✓		SPI
10.	Panel AC Fail	✓		SPI
11.	L/R switch in SCADA	✓		SPI
12.	Relay Int Fault	✓		SPI
13.	Over Current Operated(ALL STAGES)	✓		SPI
14.	Earth Fault Operated(ALL STAGES)	✓		SPI
15.	BKR Close COMMAND		✓	DCO
16.	BKR Open COMMAND			
17.	Auto Trip (86) relay reset from Remote		✓	SCO
18.	3Phase R, Y, B- Current & Voltage, Active Power, Reactive Power, Power factor, Max. Demand, Neu. Current	✓		AI/ MV
19.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		AI/MV

**Note:**

- 1.Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel.
- 2.Final signals list will be approved with CRP/Switchgear panel drawing.

**B. 11kV Incomers: IEC 61850 Protocol**

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Trip Ckt Healthy 1	✓		SPI
4.	Trip Ckt Healthy 2	✓		SPI
5.	Panel AC Fail	✓		SPI
6.	Spring Charge	✓		SPI
7.	Breaker in Service	✓		SPI
8.	Breaker in Test	✓		SPI
9.	Auto trip (86) Operated	✓		SPI
10.	VT fuse Blown- Metering	✓		SPI
11.	VT fuse Blown- Protection	✓		SPI
12.	Panel DC Fail			SPI
13.	L/R Switch in SCADA	✓		SPI
14.	Relay Int Fault	✓		SPI
15.	Over Current Operated (All Stages)	✓		SPI
16.	Earth Fault Operated (All Stages)	✓		SPI
17.	Under Voltage Prot. Operated	✓		SPI
18.	Over Voltage Prot. Operated	✓		
19.	REF Operated	✓		SPI
20.	BKR Close COMMAND		✓	DCO
21.	BKR Open COMMAND			
22.	Auto trip (86) relay reset from Remote		✓	SCO
23.	3Phase R, Y, B- Current & Voltage, Active Power, Reactive Power, Power factor, Max. Demand, Neu. Current	✓		AI/ MV
24.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		AI/MV

**Note:**

1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

**C. 11kV Bus Coupler: IEC 61850 Protocol**

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Trip Ckt Healthy 1	✓		SPI
4.	Trip Ckt Healthy 2	✓		SPI
5.	Panel AC Fail	✓		SPI
6.	Spring Charge	✓		SPI
7.	Breaker in Service	✓		SPI
8.	Breaker in Test			SPI
9.	Auto trip (86) Operated	✓		SPI
10.	Panel DC Fail	✓		SPI
11.	L/R Switch in SCADA	✓		SPI
12.	Relay Int. Fault	✓		SPI
13.	PT MCB- Metering operated	✓		SPI
14.	PT MCB- Protection operated	✓		SPI
15.	Over Current Operated	✓		SPI
16.	Earth Fault Operated	✓		SPI
17.	BKR Close COMMAND		✓	DCO
18.	BKR Open COMMAND			
19.	Auto trip (86) relay reset from Remote		✓	SCO
20.	3Phase R, Y, B- Current & Voltage, Active Power, Reactive Power, Power factor, Max. Demand, Neu. Current	✓		AI/ MV
21.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		AI/MV

**Note:**

1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

**D. 11Kv Capacitors: IEC 61850 Protocol**

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Bank ISO ON	✓		DPI
4.	Bank ISO OFF			
5.	Trip Ckt Healthy 1	✓		SPI
6.	Trip Ckt Healthy 2	✓		SPI
7.	Panel AC Fail	✓		SPI
8.	Spring Charge	✓		SPI
9.	Breaker in Service	✓		SPI
10.	Breaker in Test	✓		SPI
11.	Master Trip (86) Operated	✓		SPI
12.	Bus PT fuse Blown- Metering	✓		SPI
13.	Bus PT fuse Blown- Protection	✓		SPI
14.	Panel DC Fail	✓		SPI
15.	L/R Switch in SCADA	✓		SPI
16.	Over Current Operated	✓		SPI
17.	Earth Fault Operated	✓		SPI
18.	Under Volt. Prot. Operated	✓		SPI
19.	Over Volt. Prot. Operated	✓		SPI
20.	Neg. Phase sequence Operated	✓		SPI
21.	Timer Relay operated/ Normal	✓		DPI
22.	Relay Int. Fault	✓		SPI
23.	BKR Close COMMAND		✓	DCO
24.	BKR Open COMMAND			
25.	BANK ISO OPN		✓	DCO
26.	BANK ISO CLS			
27.	Master trip (86) reset from remote		✓	SCO

28.	3phase R, Y, B- Curr & Volt, React. Pow, Neu. Curr	✓		AI/ MV
29.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		AI/MV

**Note:**

1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

**E. 33 & 66 kV Incomers/ Outgoing- IEC 61850 Protocol**

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Bus ISO (89A) ISO ON	✓		DPI
4.	Bus ISO (89A) ISO OFF			
5.	Bus ISO (89B) ISO ON	✓		DPI
6.	Bus ISO (89B) ISO OFF			
7.	LINE ISO (89L) ON	✓		DPI
8.	LINE ISO (89L) OFF			
9.	EARTH SWITCH (89LE) CLOSE	✓		SPI
11.	EARTH SWITCH (89AE) CLOSE	✓		SPI
13.	Breaker in Service (In-case of I/D BKR)	✓		SPI
14.	Breaker in Test (In-case of I/D BKR)	✓		SPI
15.	Trip Ckt Healthy	✓		SPI
16.	Spring Charge	✓		SPI
17.	Master Trip (86) Operated	✓		SPI
18.	SF6 Pressure Low & SF6 Lock Out	✓		SPI
19.	VT fuse Fail	✓		



20.	L/R Switch in Remote	✓		SPI
21.	LBB Operated	✓		SPI
22.	Panel DC Fail	✓		SPI
23.	Relay Int. Fault	✓		SPI
24.	Over Current Operated (All Stages)	✓		SPI
25.	Earth Fault Operated (All Stages)	✓		SPI
26.	DIFF. Prot Operated	✓		SPI
27.	DIST. Prot Operated	✓		SPI
28.	BKR Close COMMAND		✓	DCO
29.	BKR Open COMMAND			
30.	Bus ISO (89A) ISO ON CMD		✓	DCO
31.	Bus ISO (89A) ISO OFF CMD			
32.	Bus ISO (89B) ISO ON CMD		✓	DCO
33.	Bus ISO (89B) ISO OFF CMD			
34.	LINE ISO (89L) ON CMD		✓	DCO
35.	LINE ISO (89L) OFF CMD			
36.	Master trip (86) relay reset from remote		✓	SCO
37.	3phase R, Y, B- Curr & Volt, Active & React. Pow, Pow Factor, Max Demand, Neu. Curr etc.	✓		AI/ MV
38.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		AI/MV

**Note:**

1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

**F. 33 & 66 kV Transformer- IEC 61850 Protocol**

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Bus ISO (89A) ISO ON	✓		DPI
4.	Bus ISO (89A) ISO OFF			
5.	Bus ISO (89B) ISO ON	✓		DPI
6.	Bus ISO (89B) ISO OFF			
7.	LINE ISO (89T) ON	✓		DPI
8.	LINE ISO (89T) OFF			
9.	EARTH SWITCH (89TE) CLOSE	✓		SPI
10.	EARTH SWITCH (89AE) CLOSE	✓		SPI
13.	Breaker in Service (In-case of I/D BKR)	✓		SPI
14.	Breaker in Test (In-case of I/D BKR)	✓		SPI
15.	Trip Ckt Healthy- 1	✓		SPI
16.	Trip Ckt Healthy- 2	✓		SPI
17.	Panel AC Fail	✓		SPI
18.	Spring Charge	✓		SPI
19.	Auto Trip (86) Operated	✓		SPI
20.	Differential Operated	✓		SPI
21.	LBB Operated	✓		SPI
22.	REF/SEF Prot Operated	✓		SPI
23.	SF6 Pressure Low & SF6 Lock Out	✓		SPI
24.	Panel DC Fail	✓		SPI
25.	L/R Switch in Remote	✓		SPI
26.	LBB Operated	✓		SPI
27.	Relay Int. Fault	✓		SPI
28.	Over Current Operated	✓		SPI
29.	Earth Fault Operated	✓		SPI
30.	BKR CLS COMMAND		✓	DCO
31.	BKR OPN COMMAND			
32.	Bus ISO (89A) ISO ON CMD		✓	DCO
33.	Bus ISO (89A) ISO OFF CMD			

34.	Bus ISO (89B) ISO ON CMD		✓	DCO
35.	Bus ISO (89B) ISO OFF CMD			
36.	LINE ISO (89T) ON CMD		✓	DCO
37.	LINE ISO (89T) OFF CMD			
38.	Master trip (86) relay reset from remote		✓	SCO
39.	3phase R, Y, B- Curr & Volt, Active & React. Pow, Pow Factor, Max Demand, Neu. Curr etc.	✓		AI/ MV
40.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay). Fault voltage and phase indication of faulty phase viz. R,Y,B (Voltage Protection Relay). Fault Differential and Bias current in Line and T/F Differential Relay, Fault distance (in distance relay), Disturbance Records, Fault graphs for remote diagnosis purpose.	✓		AI/MV

**Note:**

1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

**G. Signals Related with CRP**

Sr. No.	Signal Detail	Type of Signal on IEC61850
1	<b>Signals of Differential Relay</b>	
	<b>Digital Input Signals</b>	
1	Differential Trip Bph	Single Point Information
2	Differential Trip Rph	Single Point Information
3	Differential Trip Yph	Single Point Information
4	Differential Highset Trip	Single Point Information
5	Differential Trip	Single Point Information
6	Inrush detected	Single Point Information
7	REF Trip	Single Point Information
8	Trafo. Differential lockout operated	Single Point Information

9	Trafo. Differential watchdog operated	Single Point Information
10	Trafo. Differential communication fail	Single Point Information
11	Trafo Trouble Trip	Single Point Information
	<b>Measurement Signals</b>	
1	Current Bph	Measured Float
2	Current Rph	Measured Float
3	Current Yph	Measured Float
4	Fault Current Bph	Measured Float
5	Fault Current Rph	Measured Float
6	Fault Current Yph	Measured Float
7	Fault Current Nph	Measured Float
8	Fault locator in some relays	Measured Float
9	Sigma kA square	Measured Float
<b>2</b>	<b>Signals of Distance Relay</b>	
	<b>Digital Input Signals</b>	
1	Distance Relay Lockout Operated	Single Point Information
2	Distance Trip	Single Point Information
3	Distance Zone-1 operated	Single Point Information
4	Distance Zone-2 operated	Single Point Information
5	Distance Zone-3 operated	Single Point Information
6	Line Distance Relay Communication Fail	Single Point Information
7	Line Distance Relay watchdog operated	Single Point Information
<b>3</b>	<b>Signals of Line Differential Relay</b>	
	<b>Digital Input Signals</b>	
1	Conductor Broken	Single Point Information
2	Differential Trip	Single Point Information
3	Rph Differential Trip	Single Point Information
4	Yph Differential Trip	Single Point Information
5	Bph Differential Trip	Single Point Information
6	Distance Trip	Single Point Information
7	Distance Zone-1 operated	Single Point Information
8	Distance Zone-2 operated	Single Point Information
9	Distance Zone-3 operated	Single Point Information
10	Earth Fault high set trip	Single Point Information
11	Earth Fault IDMT trip	Single Point Information
12	General Trip	Single Point Information
13	Inter-trip	Single Point Information
14	Line differential block	Single Point Information
15	Line differential Channel-1 fail	Single Point Information
16	Line differential Channel-2 fail	Single Point Information
17	Line differential operated	Single Point Information

18	Line differential relay watchdog operated	Single Point Information
19	Phase fault high set trip	Single Point Information
20	Phase fault IDMT trip	Single Point Information
21	PT Fuse Fail	Single Point Information
22	Sync fail	Single Point Information
	<b>Digital Output Signals</b>	
1	General trip	Single Command Output
2	Line Diff. Operated	Single Command Output
	<b>Measurement Signals</b>	
1	Active Power	Measured Float
2	Current Bph	Measured Float
3	Current Rph	Measured Float
4	Current Yph	Measured Float
5	Fault Current Bph	Measured Float
6	Fault Current Rph	Measured Float
7	Fault Current Yph	Measured Float
8	Fault Current Nph	Measured Float
9	Fault Locator in some relays	Measured Float
10	Frequency	Measured Float
11	Power Factor	Measured Float
12	Reactive Power	Measured Float
13	Sigma kA square	Measured Float
14	Voltage BR	Measured Float
15	Voltage RY	Measured Float
16	Voltage YB	Measured Float
<b>4</b>	<b>Signals of Overcurrent Earthfault Relay</b>	
	<b>Digital Input Signals</b>	
1	50BF/LBB Operated	Single Point Information
2	86 Supervision	Single Point Information
3	Relay Communication fail	Single Point Information
4	Relay watchdog operated	Single Point Information
5	Isolator A status	Double Point Information
6	Isolator B status	Double Point Information
7	Cable door open	Single Point Information
8	CB in Remote	Single Point Information
9	CB Status	Double Point Information
10	Earth Fault General Trip	Single Point Information
11	Earth Fault High set Trip	Single Point Information
12	Earth Fault IDMT Trip	Single Point Information
13	Earth Switch AE status	Double Point Information
14	Earth Switch BE status	Double Point Information

15	Earth Switch LE status	Double Point Information
16	Line Isolator status	Double Point Information
17	Breaker L/R switch	Single Point Information
18	Negative Phase Sequence	Single Point Information
19	Phase Fault General Trip	Single Point Information
20	Phase Fault Highset Trip	Single Point Information
21	Phase Fault IDMT Trip	Single Point Information
22	Phase Fault Overload Trip	Single Point Information
23	PT Fuse Failure	Single Point Information
24	Relay Reset	Single Point Information
25	SF6 Gas Pressure Low	Single Point Information
26	SF6 Lockout Operated	Single Point Information
27	Spring Charged	Single Point Information
28	TCS Alarm-1	Single Point Information
29	TCS Alarm-2	Single Point Information
	<b>Digital Output Signals</b>	
1	CB Command	Double Command Output
2	Relay Reset	Single Command Output
	Spare Output	
	<b>Measurement Signals</b>	
1	Active Power	Measured Float
2	Current Bph	Measured Float
3	Current Rph	Measured Float
4	Current Yph	Measured Float
5	Fault Current Bph	Measured Float
6	Fault Current Rph	Measured Float
7	Fault Current Yph	Measured Float
8	Fault Current Nph	Measured Float
9	Fault Locator in some relays	Measured Float
10	Frequency	Measured Float
11	Power Factor	Measured Float
12	Reactive Power	Measured Float
13	Sigma kA square	Measured Float
14	Voltage BR	Measured Float
15	Voltage RY	Measured Float
16	Voltage YB	Measured Float

**H. Transformer- TM cum AVR relay Signals- IEC 61850 Protocol**

S.No.	Signal List	DI/ AI soft through TM cum AVR	DO soft through TM cum AVR	Signal Type
1.	DC Fail	✓		SPI
2.	Oil Temp Alarm	✓		SPI
	Relay Int Fault	✓		SPI
3.	Oil Temp Trip	✓		SPI
4.	Winding Temp Alarm	✓		SPI
5.	Winding Temp Trip	✓		SPI
6.	Buchholz Alarm	✓		SPI
7.	Buchholz Trip	✓		SPI
8.	PRV Trip	✓		SPI
9.	OLTC OSR	✓		SPI
10.	MOG/LOW Oil Level Alarm	✓		SPI
11.	SPR Trip	✓		SPI
12.	OSR Main Tank	✓		SPI
13.	L/R Switch in Local	✓		DPI
14.	L/R Switch in Remote	✓		
15.	Auto Mode	✓		DPI
16.	Manual Mode	✓		
17.	Fan Fail	✓		SPI
18.	Tap Changer Fail	✓		SPI
19.	OLTC Out of Step/ Stuck up/ Motor trip	✓		SPI
20.	Tap Rise/ Low Command		✓	RCO
21.	Oil Temp	✓		AI
22.	Winding Temp	✓		AI
23.	Tap Position	✓		AI

**Note:**

1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

**I. 33 & 66kV Bus Coupler- IEC 61850 Protocol**

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Bus ISO (89A) ISO ON	✓		DPI
4.	Bus ISO (89A) ISO OFF			
5.	Bus ISO (89B) ISO ON	✓		DPI
6.	Bus ISO (89B) ISO OFF			
7.	EARTH SWITCH (89AE) CLOSE	✓		SPI
8.	EARTH SWITCH (89BE) CLOSE	✓		SPI
9.	Breaker in Service (In-case of I/D BKR)	✓		SPI
10.	Breaker in Test (In-case of I/D BKR)	✓		SPI
11.	Trip Ckt Healthy- 1	✓		SPI
12.	Trip Ckt Healthy- 2	✓		SPI
13.	Panel AC Fail	✓		SPI
18.	Spring Charge	✓		SPI
19.	Auto Trip (86) Operated	✓		SPI
20.	SF6 Pressure Low	✓		SPI
21.	SF6 Lock Out	✓		SPI
22.	VT fuse-1 Blown	✓		SPI
23.	VT fuse-2 Blown	✓		SPI
24.	Panel DC Fail	✓		SPI
25.	L/R Switch in Remote	✓		SPI
26.	LBB Operated	✓		SPI
27.	Relay Int. Fault	✓		SPI
28.	Over Current Operated (All Stages)	✓		SPI
29.	Earth Fault Operated (All Stages)	✓		SPI
30.	BKR Close COMMAND		✓	DCO
31.	BKR Open COMMAND			
32.	BUS (89A) ISO OPN COMMAND		✓	DCO
33.	Bus (89A) ISO CLS COMMAND			
34.	Bus (89B) ISO OPN		✓	DCO



	COMMAND			
35.	Bus (89B) ISO CLS COMMAND			
36.	Auto trip (86) relay reset from remote		✓	SCO
37.	3phase R, Y, B- Curr, BUS PT-01 & BUS PT-02 3 phase voltages	✓		AI/ MV
38.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbaethernetce (O/C & E/F Relay). Fault voltage and phase indication of faulty phase viz. R,Y,B (Voltage Protection Realy). Fault Differential and Bias current in line and T/F Diff Relay, Fault distance (in Distance Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		AI/ MV

**Note:**

1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

**J. 33 & 66kV CAP Bank- IEC 61850 Protocol**

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Bus ISO (89A) ISO ON	✓		DPI
4.	Bus ISO (89A) ISO OFF			
5.	Bus ISO (89B) ISO ON	✓		DPI
6.	Bus ISO (89B) ISO OFF			
7.	LINE ISO (89C) ON	✓		DPI
8.	LINE ISO (89C) OFF			

9.	EARTH SWITCH (89CE) CLOSE	✓		SPI
10.	EARTH SWITCH (89AE) CLOSE	✓		SPI
11.	Trip coil Ckt Healthy- 1	✓		SPI
12.	Trip coil Ckt Healthy- 2	✓		SPI
13.	Panel AC Fail	✓		SPI
12.	Spring Charge	✓		SPI
13.	Auto Trip (86) Operated	✓		SPI
14.	SF6 Pressure Low & SF6 Lock Out	✓		SPI
15.	VT fuse Blown	✓		SPI
16.	Cap Discharge Time	✓		SPI
17.	Neutral Displacement	✓		SPI
18.	Panel DC Fail	✓		SPI
19.	L/R Switch in Remote	✓		SPI
20.	LBB Operated	✓		SPI
21.	Relay Int. Fault	✓		SPI
22.	Over Current Operated	✓		SPI
23.	Earth Fault Operated	✓		SPI
24.	Under Voltage Prot. Operated	✓		SPI
25.	Over Voltage Prot. Operated	✓		SPI
26.	BKR Close COMMAND		✓	DCO
27.	BKR Open COMMAND			
28.	Bus (89A) ISO OPN COMMAND		✓	DCO
29.	Bus (89A) ISO CLS COMMAND			
30.	Bus (89B) ISO OPN COMMAND		✓	DCO
31.	Bus (89B) ISO CLS COMMAND			
32.	CAP Bank ISO OPN Command		✓	DCO
33.	CAP Bank ISO CLS Command			
34.	3phase R, Y, B- Curr & voltage, Reactive Pow, Neu Curr	✓		AI/ MV

<b>35.</b>	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbaethernetce (O/C & E/F Relay). Fault voltage and phase indication of faulty phase viz. R,Y,B (Voltage Protection Realy). Fault Differential and Bias current in line and T/F Diff Relay, Fault distance (in Distance Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		<b>AI</b>
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**Note:**

1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

**K. BUS PT-1 & 2- IEC 61850 Protocol**

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	BUS A (89A) ON	✓		<b>DPI</b>
2.	BUS A (89A) OFF			
3.	BUS B (89B) ON	✓		<b>DPI</b>
4.	BUS B (89B) ON			
5.	Earth Switch (89LE)-1 ON	✓		<b>DPI</b>
6.	Earth Switch (89LE)-1 OFF			
7.	Earth Switch (89LE)-2 ON	✓		<b>DPI</b>
8.	Earth Switch (89LE)-2 OFF			
9.	BUS-A ISO OPN COMMAND		✓	<b>DCO</b>
10.	BUS-A ISO CLS COMMAND			
11.	BUS-B ISO OPN COMMAND		✓	<b>DCO</b>
12.	BUS-B ISO CLS COMMAND		✓	<b>DCO</b>

**L. Smoke Detector- ALL sensors, Manual Call Points- Modbus Protocol**

S.No.	Signal List	Soft Signals	Signal Type
1.	All Sensors Alarm operated Signals All Sensors Alarm operated Signals (10 to 20 Sensors)	✓	SPI
2.	All Manual Call Points- MCP- 1, MCP- 2, etc.	✓	

**M. Battery Charger- Modbus Protocol**

S.No.	Signal List	DI/ AI soft through RTU	Signal Type
1.	Battery CHG Mains AC Fail	✓	SPI
2.	Charger A AC MCCB Trip	✓	SPI
3.	Charger A DC MCCB Trip	✓	SPI
4.	Charger B AC MCCB Trip	✓	SPI
5.	Charger B DC MCCB Trip	✓	SPI
6.	Charger A/B in boost	✓	SPI
7.	Charger A/B rectifier Capacitor Fuse Blown	✓	SPI
8.	Battery MCCB Trip	✓	SPI
9.	DC system Earth	✓	SPI
10.	Insulation Fault	✓	SPI
11.	Charger A Current	✓	AI
12.	Charger A Voltage	✓	AI
13.	Charger B Current	✓	AI
14.	Charger B Voltage	✓	AI
15.	Battery Current	✓	AI
16.	Battery Voltage	✓	AI

**N. LT Board**

S.No.	Signal List	DI Hard Wire to RTU	Signal Type
1.	LT AC Fail	✓	SPI
2.	R,Y,B Phase Current		AI/ MV/ MFI

**O. Fire Fighting (All T/Fs)**

S.No.	Signal List	DI Hard Wire to RTU	Signal Type
1.	SYSTEM OPERATED	✓	SPI
2.	SYSTEM OUT OF SERVICE	✓	SPI
3.	TCIV CLOSED	✓	SPI
4.	FIRE DETECTOR TRIP	✓	SPI
5.	N2 CYLINDER PRESSURE LOW	✓	SPI
6.	FIRE SYSTEM ALARM	✓	SPI
7.	DC SUPPLY FAIL	✓	SPI

**P. MFM- BUS PT- 1, 2 Signals (Front & Rear Bus)- Modbus Protocol**

S.No.	Signal List	Data Type
1.	R-Ph Current	MV/ MFI
2.	Y-Ph Current	MV/ MFI
3.	B-Ph Current	MV/ MFI
4.	Neutral Current	MV/ MFI
5.	R-Y Ph Voltage	MV/ MFI
6.	Y-B Ph Voltage	MV/ MFI
7.	B-R Ph Voltage	MV/ MFI

**Q. MFM- Signals- All Feeders (Including Bus Section/ Coupler)- Modbus Protocol**

S.No.	Signal List	Data Type
1.	R-Ph Current	MV/ MFI
2.	Y-Ph Current	MV/ MFI

3.	B-Ph Current	MV/ MFI
4.	Neutral Current	MV/ MFI
5.	R-Y Ph Voltage	MV/ MFI
6.	Y-B Ph Voltage	MV/ MFI
7.	B-R Ph Voltage	MV/ MFI
8.	Active Power	MV/ MFI
9.	Active Energy	MV/ MFI
10.	Reactive Power	MV/ MFI
11.	Power Factor	MV/ MFI
12.	Max Demand	MV/ MFI
13.	Phase angle 1	MV/ MFI
14.	Phase angle 2	MV/ MFI
15.	Phase angle 3	MV/ MFI
16.	THD Mean Current	MV/ MFI
17.	THD Mean Voltage	MV/ MFI

### **Annexure 12.c (List of Abbreviations)**

1. SCADA: Supervisory Control and Data Acquisition
2. RTU: Remote Terminal Unit
3. DCU: Data Concentrator Unit
4. C&R: Control and Relay
5. BA: Business Associates
6. I/O: Input/ Output
7. MFM: Multi Function Meter
8. TM: Transformer Monitoring
9. BYPL: BSES Yamuna Power Ltd.
10. MCC: Master Control Center
11. BCC: Business Continuity Center
12. IED: Intelligent Electronic Devices
13. NCR: National Capital Region
14. IEC: International Electrotechnical Commission
15. KEMA: Keuring van Elektrotechnische Materialen te Arnhem
16. CE: Conformité Européene
17. FCC: Federal Communications Commission
18. PRP: Parallel Redundancy Protocol
19. LAN: Local Area Network
20. NIDS: Network Intrusion Detection System
21. NIFPS: Nitrogen Injection Fire Protection System
22. DCDB: DC Distribution Board
23. APFC: Automatic Power factor Controller
24. HMI: Human Machine Interface
25. TCP/ IP: Transmission Control Protocol/ Internet Protocol
26. GPS: Global Positioning System
27. FEP: Front-End processor
28. SNTP: Simple Network Time Protocol
29. CRC: Cold Rolled Close
30. MCB: Miniature Circuit Breakers
31. CMR: Contact Multiplying Relay
32. PVC: Polyvinyl Chloride
33. GI: Galvanized Iron
34. RTCC: Remote Tap Changer Control
35. CT: Current Transformer
36. PT: Potential Transformer
37. WAN: Wide Area Network
38. DI: Digital Input
39. DO: Digital Output
40. AI: Analog Input
41. FRLS: Fire Retardant Low Smoke

- 42. OFC: Optical Fiber Cable
- 43. GTP: Guaranteed Technical Particulars
- 44. DCO: Double Command Input
- 45. DPI: Double Point Indication
- 46. MV: Measured Value
- 47. SCO: Single Command Input
- 48. SPI: Single Point Indication
- 49. BCU: Bay Control Unit
- 50. SAT: Site Acceptance Test
- 51. AVR: Automatic Voltage Regulator
- 52. SPD: Surge Protection Device





## Technical Specification

For

IT Works

Specification no – BSES-TS-130-ITW-R0

Rev:	0	
Date:	18 August 2022	
Prepared by	Rakesh Nayak	<i>Rakesh Nayak</i> d733ee1c-3392-4877-a8f4-841b41791764
Reviewed & Approved by	Ashwani Aggarwal	<i>Ashwani Aggarwal</i> 5f0ce1de-7a97-4b55-96af-424b60034ade

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**TECHNICAL SPECIFICATION FOR IT WORKS****1 SCOPE**

- This specification covers the design, manufacture, testing, supply, erection & commissioning of IT Equipment.

**2 SERVICE CONDITIONS**

2.1	Max Ambient Temperature	50 deg C
2.2	Max Daily average ambient temp	40 deg C
2.3	Min Ambient Temp	0 deg C
2.4	Maximum Humidity	95%
2.5	Minimum Humidity	10%
2.6	Maximum annual rainfall	750 mm
2.7	Average no of rainy days per annum	60
2.8	Rainy months	June to Oct
2.9	Altitude above MSL	300 M
2.10	Seismic Zone	IV

**3 GENERAL FEATURES**

S. No	Items	Qty	Product Specification
3.1	Rack 24 U with three tray	1	a. Rack 19" 8U/600MM(W)800mm(D) (Along with Side Panels), b. Make: APW/ Comrack / TE c. Each Rack consisting of following accessories. Front Steel Perforated Door 18U =1 No, Rear Steel Perforated Door 18U = 1 No. Levelling Screw Leg (Set of 4 Nos)= 1 Set, 19"Stationary Self 475mm(D) =3 Nos. d. PDU 3 Points AC 5 Amp, Socket =1 No, PDU 3 Point DC with MCB=1 No. e. Hardware Front Panel (Pkt of 10 Nos) = 4 Pkts, Cable Manger 1U (MS)=2 Nos. f. Fan 90CFM 230VAC (Directly Mounted on top Panel)=4 Nos.

**TECHNICAL SPECIFICATION FOR IT WORKS**

3.2	Jack panel 24 Ports.	1	Make : TE/ AMP
3.3	Shockproof power AC extension board	1	Make : ISI mark preferred Wipro North West
3.4	Cisco Router /Switch	1	Cisco Catalyst IR8340 Rugged Router (The IR8300 platform has 2 NIM slots and 2 PIM slots as well as a timing module. IR8300 has 12 LAN interfaces. 4 copper with POE, 4 combo SFP/copper and 4 SFP ports as well as 2 combo SFP/copper ports for WAN connectivity. All LAN & WAN are 1 GE)
3.5	Lan Cable UTP CAT 6	10	AMP/TE
3.6	DC convertor		ISI Mark, As per Standard OEM
3.6.1	66 KV GRID		
3.6.1.1	220 V to 12 V for Router switch	1	
3.6.1.2	220 V to 48 V for Sify POE	1	
3.6.2	33 KV GRID		
3.6.2.1	48 V to 12 V for Router switch	1	
3.6.2.2	220 V to 48 V for Router switch	1	
3.7	LAN cable as per site requirement	1	Quantity is in Box

**4 DEVIATIONS**

Deviation from this specification shall be stated in writing with the tender by reference to the specification clause/ GTP/ Drawing and description of alternative offer. In absence of such a statement, it shall be assumed by the buyer that the seller complies fully with this specification.

**5 QUALITY, INSPECTION & TESTING**

5.1	Vendor quality plan	To be submitted for purchaser approval
5.2	Inspection points	To be mutually identified & agreed in quality plan
5.3	Type test	Equipment shall be type tested from CPRI/ERDA/NABL accreted lab as per IEC/IS/UL standard.

**TECHNICAL SPECIFICATION FOR IT WORKS**

5.4	Routine test	As per relevant standard
5.5	Acceptance test	To be performed in presence of Owner at manufacturer works shall be as per approved QAP

**6 GTP**

Vendor must submit clause wise compliance against specification at the time of drawing approval.

**7 DRAWING AND DATA SUBMISSION MATRIX**

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
7.1	Contact Person Name, Email ID and Mobile Number	Required	Required		
7.2	Deviation Sheet (as per "Deviations" Clause)	Required			
7.3	GTP	Required	Required		
7.4	Relevant Type Test as per IS/IEC/UL	Required	Required		
7.5	Manufacturer's quality assurance plan and certification for quality standards		Required		
7.6	Sizing Calculation of Associated Equipment		Required		
7.7	Recommended Spares for five years of operation)		Required		
7.8	Drawings	Required	Required		
7.9	QAP		Required		
7.10	BOQ		Required		
7.11	Make of all Component as per specification		Required		
7.12	Installation, erection and commissioning manual		Required		
7.13	Inspection Reports			Required	
7.14	As manufacturing Drawings			Required	

**TECHNICAL SPECIFICATION FOR IT WORKS**

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
7.15	Operation and Maintenance Manual			Required	
7.16	Trouble shooting manual			Required	
7.17	As built Drawings				Required

**8 PACKING**

8.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, module may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
8.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label
8.3	Packing Identification Label to be provided on each packing case with the following details	
8.3.1	Individual serial number	
8.3.2	Purchaser's name	
8.3.3	PO number (along with SAP item code, if any) & date	
8.3.4	Equipment Tag no. (if any)	
8.3.5	Destination	
8.3.6	Project Details	
8.3.7	Manufacturer / Supplier's name	
8.3.8	Address of Manufacturer / Supplier / it's agent	
8.3.9	Description and Quantity	
8.3.10	Country of origin	
8.3.11	Month & year of Manufacturing	

**TECHNICAL SPECIFICATION FOR IT WORKS**

8.3.12	Case measurements
8.3.13	Gross and net weights in kilograms
8.3.14	All necessary slinging and stacking instructions

**9 SHIPPING**

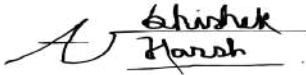


9.1	Shipping	The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, Overhead lines, free access etc. from the Manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed Packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.
		The seller shall be responsible for all transit damage due to improper packing.

**10 HANDLING AND STORAGE**

10.1	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.
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**Technical Specification**  
**of**  
**Illumination and Lighting System**  
**Specification no – BSES-TS-98-ILS-R0**

Rev	0	
Page	1 of 12	
Date	06 May 2022	
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**TECHNICAL SPECIFICATION OF ILLUMINATION AND LIGHTING SYSTEM****1. SCOPE**

The specification covers the design, engineering, manufacture, assembly and testing at manufacturer's work, supply and installation of Illumination system for substation including normal distribution pillars, normal lighting board, emergency distribution pillar, emergency lighting board, Junction boxes, Illumination lamps with required lux level.

**2. STANDARDS AND CODES**

<b>Standard Code</b>	<b>Standard Description</b>
IS 16101 : 2012	General Lighting -LEDs and LED modules – Terms and Definitions
IS16102(Part 1) 2012	Self-Ballasted LED Lamps for General Lighting Services, Part 1 Safety Requirements
IS16102(Part 2) 2012	Self-Ballasted LED Lamps for General Lighting Services, Part 2 Performance Requirements
IS16103(Part 1) 2012	Led Modules for General Lighting, Part 1 Safety Requirements
IS16103(Part 2) 2012	Led Modules for General Lighting, Part 2 Performance Requirements
IS15885(Part2/Sec13)	Safety of Lamp Control Gear , Part 2 Particular Requirements , Section 13 dc. or ac. Supplied Electronic Control gear for Led Modules
IS16104 : 2012	d.c. or a.c. Supplied Electronic Control Gear for LED Modules - Performance Requirements
IS16105 : 2012	Method of Measurement of Lumen Maintenance of Solid State Light (LED) Sources
IS16106 : 2012	Method of Electrical and Photometric Measurements of Solid-State Lighting (LED) Products
IS 16107(Part 1)2012	Luminaires Performance ,Part 1 General Requirements
IS 16107(Part 2)2012	Luminaires Performance, Part 2 Particular Requirements ,Section 1 LED Luminaire
IS 16108 : 2012	Photo biological Safety of Lamps and Lamp Systems
IS 10322 : 2012	Luminaires: Part 5 Particular requirements, Section 3 Luminaires for road and street lighting
IS 5	Colours for Ready Mixed Paints and Enamels
IS 613	Copper Rods and Bars for electrical purposes
IS 694	PVC Insulated cables for working voltages up to and including 1100 V
IS 2551	Danger notice plates
IS 5082	Wrought Aluminium and Aluminium alloy bars, rods, tubes and sections for electrical purpose
IS 6665	Code of practice for industrial lighting
IS 13703	LV Fuses for voltage not exceeding 1000V ac or 1500V dc
IS 10118	Code of Practice for Selection, Installation and Maintenance of Switchgear and Controlgear
<b>International Standard</b>	

**TECHNICAL SPECIFICATION OF ILLUMINATION AND LIGHTING SYSTEM**

IEC 62612	Self-ballasted LED lamps for general lighting services for voltage above 50 V — Performance requirements
IEC : 60598-2-3	Particular requirements - Luminaires for road and street lighting
IEC 62471	Photo biological safety of lamps and lamp systems
IEC 62778	Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires
IEC 61000-4-5	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
IEC 60439	Low Voltage Switchgear and Controlgear assemblies - Type tested and partially type tested assemblies
IEC 60529	Degrees of protection provided by enclosures (IP Code)
IEC 60947-1	Low Voltage Switchgear and Controlgear - General Rules
IEC 60947-2	Low Voltage Switchgear and Controlgear - Circuit breakers
IEC 61643	Low-voltage surge protective devices

**3. ILLUMINATION SYSTEM**

3.1.	Lux level requirement	<p>3.1.1. The design of the illumination system shall ensure availability of the average illumination levels as specified below with the maximum possible uniformity in the entire substation. The illumination system shall consist of the normal lighting system and emergency lighting system. The minimum illumination levels shall be as specified below(Reference IS3646(Part II)).</p> <table style="margin-left: 20px;"> <tr> <td>3.1.1.1. Outdoor Substation</td> <td>:</td> <td>20 lux</td> </tr> <tr> <td>3.1.1.2. Roads within substation</td> <td>:</td> <td>20 lux</td> </tr> <tr> <td>3.1.1.3. Boundary wall of the substation</td> <td>:</td> <td>10 lux</td> </tr> <tr> <td>3.1.1.4. Control room</td> <td>:</td> <td>300 lux</td> </tr> <tr> <td>3.1.1.5. Switchgear Room</td> <td>:</td> <td>200 lux</td> </tr> <tr> <td>3.1.1.6. Battery room</td> <td>:</td> <td>100 lux</td> </tr> <tr> <td>3.1.1.7. Stair case</td> <td>:</td> <td>100 lux</td> </tr> <tr> <td>3.1.1.8. Transformers</td> <td>:</td> <td>100 lux</td> </tr> </table> <p>3.1.2. The illumination level of specific spots such as operating mechanisms of Capacitor bank isolator, oil level and temperature gauges of transformer etc. shall be minimum 50 Lux. Contractor shall design the lighting system with the help of desired software. Owner shall verify the same post commissioning with lux meter to check the levels. In case desired lux levels are not met contractor has to install addition fitting in outdoor and indoor location as per requirement.</p> <p>3.1.3. Complete design calculation sheets for arriving at the number of luminaires required for the normal and emergency requirements shall be furnished by the bidder. Design calculation sheets for the selection of cables, MCB, HRC fuses, bus bars, etc. are also required to be furnished for Owner's approval.</p>	3.1.1.1. Outdoor Substation	:	20 lux	3.1.1.2. Roads within substation	:	20 lux	3.1.1.3. Boundary wall of the substation	:	10 lux	3.1.1.4. Control room	:	300 lux	3.1.1.5. Switchgear Room	:	200 lux	3.1.1.6. Battery room	:	100 lux	3.1.1.7. Stair case	:	100 lux	3.1.1.8. Transformers	:	100 lux
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3.2.	Illumination circuit	<p>3.2.1. The illumination system load and welding load in the substation area shall be supplied from 415/230 volt ACDBs to be provided in the substation control room. Requisite numbers of 3-phase, 4-wire, cable circuits for illumination system and welding socket outlets shall be extended from the above board. The laying of cables from the Board to the illumination system/welding socket outlets and their installation are included in the Bidder's scope.</p> <p>3.2.2. Each outgoing cable circuit for illumination loads from the 415 volt switchboard shall terminate in the respective outdoor pillar boxes located in the substation. Outgoing feeders from the illumination shall be taken to the various illumination points in the substation. Necessary fuses shall be provided near light fixtures in the substation.</p> <p>3.2.3. The emergency illumination load shall be supplied from the main emergency illumination board located in the control room. Necessary cable circuits with appropriate fuses shall be provided by the Contractor for the supply system for emergency illumination load of the substation.</p> <p>3.2.4. Emergency DC lighting system shall be provided in the substation wherever required. The emergency lighting shall be adequate for safe movement by the operating personnel in the substation in the event of failure of normal lighting system. Number of lights shall be decided at the time of detailed engineering. A total of minimum 12 no's individually controllable 60 watt lamps shall be provided in the substation.</p>
3.3.	Wiring	<p>3.3.1. All lighting fixtures and 5A convenience outlets shall be wired with 1.1 KV grade PVC insulated extra flexible, multistranded, copper conductor cables of size not less than 2.5 sq.mm.</p> <p>3.3.2. For 15A heavy-duty outlets copper conductor cables of size not less than 6 sq. mm shall be used.</p> <p>3.3.3. The wiring shall consist of phase, neutral and ground. For grounding the lighting fixtures/convenience outlets etc., GI wire of size not less than 14 SWG shall be used. The phase and neutral conductor shall be suitably colour coded.</p> <p>3.3.4. Supply shall be looped between the lighting fixtures of the same circuit by using junction boxes. For this purpose one (1) 100 mm x 100 mm square junction box shall be provided for each lighting fixture. For recessed lighting fixtures, supply shall be extended from the junction boxes to the fixtures by means of flexible conduits. While for stem-mounted/wall-mounted lighting fixtures the junction box shall be mounted below one of the mounting stems.</p> <p>3.3.5. For lighting branch circuits the nos. of lighting switches shall be decided keeping in mind the ease of control, as well as to limit the current to 2.5A per circuit.</p> <p>3.3.6. For convenience outlets, the bidder shall design the wiring scheme so as to limit 6 nos. of 5A outlets per branch</p>

**TECHNICAL SPECIFICATION OF ILLUMINATION AND LIGHTING SYSTEM**

		<p>circuit and two nos. of 15A outlets per branch circuit.</p> <p>3.3.7. All wiring materials such as terminals, crimping lugs, ferrules etc. shall also be provided by the Contractor.</p> <p>3.3.8. No section of the conduit shall be filled with more than 70% of its area. Any consumable material that is required for pulling the wires through conduit shall also be provided by the Contractor.</p> <p>3.3.9. Lighting fixtures coming in one area shall be evenly distributed between three phases so that tripping of one phase or two phases does not cause total loss of illumination in that area.</p>
3.4.	Required documents to be submitted	Complete manufacturer's literature/catalogues, performance curves, illumination distribution curves, G.A. drawings, specification sheets, etc. as relevant in respect of all materials/equipment to be supplied shall be submitted by the Contractor.
3.5.	Illumination system check after installation	After completion of installation of the illumination system in the substation, the actual illumination level at different locations shall be measured by the Contractor in the presence of Owner's authorised representative. If the average value of the measured illumination levels is found to fall short of the specified levels, the Contractor shall have to provide additional lighting fixtures so as to achieve the specified levels of illumination at no additional cost to the Owner. While measuring the illumination levels due allowance shall be made on account of maintenance factor. The specified lux levels shall be suitably increased to cover maintenance factor of 0.6 for outdoor areas.

**4. DISTRIBUTION PILLARS FOR NORMAL ILLUMINATION SYSTEM**

4.1.	Construction	<p>4.1.1. Distribution pillars of adequate dimensions shall be constructed from sheet steel having a thickness not less than 2 mm.</p> <p>4.1.2. The pillars shall be totally enclosed weather-proof, dustproof, vermin-proof, having hinged doors with locking arrangement and shall be capable of being mounted in the substation.</p> <p>4.1.3. The pillars suitable for cable entry at the bottom shall be designed for easy access of connections to terminals and inspection of equipment mounted therein.</p> <p>4.1.4. The degree of protection of the board shall be IP55.</p> <p>4.1.5. The enclosure shall be painted externally with Shade No., 692 of IS:5 and internally with brilliant white of semi-glossy finish of IS:5.</p>
4.2.	Configuration	<p>4.2.1. Each pillar shall accommodate the following:</p> <p>4.2.2. One incoming, 4-pole (3 phase and neutral) isolating switch with MCB of appropriate current rating.</p> <p>4.2.3. 3-phase and neutral bus bars of appropriate current rating.</p> <p>4.2.4. Single-pole earth leakage circuit breakers of suitable current ratings on all outgoing circuits.</p>

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		<p>4.2.5. Neutral links for all outgoing circuits.</p> <p>4.2.6. Cable lugs, compression type cable glands, name plates, circuit numbers, earthing lugs, etc. to make the pillar complete in all respects.</p> <p>4.2.7. 20% spare outlets shall be provided for outgoing feeders.</p> <p>4.2.8. Three (3) indicating lamps with fuses to indicate that supply is 'ON'.</p>
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**5. LIGHTING DISTRIBUTION BOARDS**

5.1.	Construction	<p>5.1.1. Metal-clad enclosure with minimum 2 mm CRCA sheets for load-bearing members and 1.6 mm for non load-bearing members suitably reinforced with structural.</p> <p>5.1.2. 3-phase, 4-wire bus bar system with high conductivity aluminium busbars mounting on FRP insulators having anti-tractive property with minimum 25 mm phase-to-phase and minimum 19 mm phase-to-earth clearances. The busbars shall be uniform throughout the length of the LDB and busbar joints shall be silver plated and covered with shrouds.</p> <p>5.1.3. All cables shall enter from the bottom.</p> <p>5.1.4. The degree of protection for the LDB shall be IP-54.</p> <p>5.1.5. The enclosure shall be painted externally with Shade No., 692 of IS:5 and internally with brilliant white of semi-glossy finish of IS:5.</p>
5.2.	Configuration	<p>Each LDB shall accommodate the following:</p> <p>5.2.1. One incoming, 4-pole (3 phase and neutral) isolating switch with MCB of appropriate current rating.</p> <p>5.2.2. 3-phase and neutral bus bars of appropriate current rating.</p> <p>5.2.3. 4 Pole outgoing MCBs of appropriate rating</p> <p>5.2.4. Cable lugs, compression type cable glands, name plates, circuit numbers, earthing lugs, etc. to make the pillar complete in all respects.</p> <p>5.2.5. 20% spare outlets shall be provided for outgoing feeders.</p> <p>5.2.6. Three (3) Nos. indication lamps (Red, Yellow, Blue) shall be provided to indicate that the incoming supply is available. Similarly, 3 Nos. indication lamps shall be provided to indicate that the busbar is energised.</p>
5.3.	Busbar	<p>5.3.1. The busbars shall be suitable for short-time current rating of 40KA for 1 Sec.</p> <p>5.3.2. The busbar temperature rise shall not exceed 35 Deg C over an ambient of 50 Deg C.</p> <p>5.3.3. The LDBs shall be provided with a continuous busbar of 25 x 6 sq.mm (electrolytic copper) with suitable hardware for connection to the main grounding grid</p>

**TECHNICAL SPECIFICATION OF ILLUMINATION AND LIGHTING SYSTEM****6. MAIN EMERGENCY LIGHTING BOARD**

6.1.	Construction	<p>6.1.1. Metal-clad enclosure with minimum 2 mm CRCA sheets for load-bearing members and 1.6 mm for non load-bearing members suitably reinforced with structural.</p> <p>6.1.2. All cables shall enter from the bottom.</p> <p>6.1.3. The degree of protection for the LDB shall be IP-54.</p> <p>6.1.4. The enclosure shall be painted externally with Shade No., 692 to IS:5 and internally with brilliant white of semi-glossy finish to IS:5.</p>
6.2.	Configuration	<p>6.2.1. Each Board shall accommodate the followings:</p> <p>6.2.2. Automatic changeover contactor.</p> <p>6.2.3. Voltage sensing relays.</p> <p>6.2.4. Time delay relay.</p> <p>6.2.5. Bus Bars.</p> <p>6.2.6. Two pole MCBs of adequate ratings for incoming and outgoing feeders.</p> <p>6.2.7. Test switch, push button type.</p> <p>6.2.8. Indicating lamps, ac - Green, dc - Red.</p> <p>6.2.9. Terminals for remote indication</p> <p>6.2.10. Cable lugs, compression type cable glands, name-plates, circuit numbers, earthing lugs and remote indication wiring upto substation 415V a.c. control board, to make the board complete in all respects.</p>
6.3.	Changeover facility	The main emergency lighting board shall have an automatic changeover switch to energise the dc lighting system in the event of AC power failure. It shall have voltage-sensing relays to perform the changeover automatically when AC voltage of any one phase falls below 60 percent of 240 volts and continues at that low level for more than 10 seconds. These shall changeover from DC to AC again when 70 percent of 240 volt is restored and this continues for 10 seconds.
6.4.	Emergency Lighting Pillar	Local Emergency Lighting Pillar shall be identical in details to Lighting Distribution Pillar specified in clause 4 except that it shall have two pole isolating switch fuse unit on the incoming side and only two busbars and shall be without neutral links.

**7. LUMINAIRES**

7.1.	Luminaires type	<p>Luminaires for use in normal and emergency illumination systems in the substation shall be suitable for LED lamps. All the luminaires shall be supplied complete with all accessories and lamps. The LED lamps ratings shall be adequate to achieve the required Lux level and calculation for number of luminaires shall be in the bidder's scope. Minimum rating shall be as follows -</p> <p>7.1.1. Outdoor – 90W minimum</p> <p>7.1.2. Indoor – 36W minimum</p>
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7.2.	Flood lights	The flood light luminaires in the substation shall be fixed at suitable height on the substation structures/ building, so as to provide the specified average illumination in the substation area without causing any glare to the operational/ maintenance staff working in the substation. While fixing the luminaires it shall be ensured that the stipulated electrical clearances are not violated. The Contractor shall supply and install suitable type of non-metallc street light poles or octagonal galvanized poles required for installing the fittings for illuminating the roads, fence boundary wall etc.
7.3.	Reliability	Substation lighting circuits shall be divided into two or three sections and provided with time switches of suitable ratings.
7.4.	Design features for Outdoor Luminaires	
7.5.	Fixture	<p>7.5.1. The luminaries housing shall be either extruded or pressure die casted aluminium of minimum 1.6 mm thickness. Body must be Corrosion Resistant Powder Coated and UV resistant.</p> <p>7.5.2. The entire housing shall be dust and waterproof having Ingress protection of housing as IP65 or above as per IEC 60529.</p> <p>7.5.3. Luminaire should be covered with suitable Glass or diffuser with high Transitivity. All luminaires shall be supplied with either clear toughened glass or clear polycarbonate cover for better IP retention and higher life.</p>
7.6.	LED	<p>7.6.1. The luminous efficacy of LED luminaire shall be at least 85 lumen/watt.</p> <p>7.6.2. LED module efficacy shall not be less than 90 percent of the rated LED module Efficacy.</p> <p>7.6.3. Color Rendering Index (CRI) shall be at least 70</p> <p>7.6.4. Color Temperature shall be 5500-6500K</p> <p>7.6.5. Uniformity <math>E_{min}/E_{avg} &gt; 0.4</math>, <math>E_{min}/E_{max} &gt; 0.33</math></p>
7.7.	LED Driver	<p>LED driver shall have following features:</p> <p>7.7.1. LED driver shall be applicable for Power supply 240V AC<math>\pm</math>10%, at 50Hz+3% / -5%.</p> <p>7.7.2. Output voltage of the driver shall be designed to meet the Power Requirements of the system.</p> <p>7.7.3. Power factor of complete fitting shall be more than 0.90 at full load.</p> <p>7.7.4. Total Harmonic Distortion (THD) shall be &lt; 10 %</p>
7.8.	General Requirements	<p>7.8.1. The connecting wires used inside the Luminaire, shall be low smoke halogen free, fire retardant e-beam cable and fuse protection shall be provided in input side.</p> <p>7.8.2. The lumen maintenance of all the LED fixtures shall not be less than 70% after 50,000 hours.</p> <p>7.8.3. Built in protection features for Short circuit, Surges (at least upto 5kV), and overvoltage shall be provided.</p>



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		7.8.4. High /Low voltage cut-off shall be provided. 7.8.5. The whole luminaire shall be eco-friendly green technology based i.e. mercury free. 7.8.6. No UV and IR radiations shall be produced. 7.8.7. Access of driver for maintenance shall be provided at the top/side of the luminaire fixture. 7.8.8. All fasteners must be of stainless steel.
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**8. JUNCTION BOXES/WALL BOXES**

8.1.	Size	100 mm x 100 mm junction boxes and wall boxes of standard size shall be provided.
8.2.	Construction	Wall boxes and junction boxes shall be made of FRP with a thickness of 2.0mm. Necessary conduit termination fittings such as bushings, locknuts etc. also be provided.

**9. AUTOMATIC LIGHTING CONTROLLER**

9.1.	Size	Contractor shall provide microprocessor based automatic lighting controller for controlling switching arrangement of indoor and outdoor lighting. The controller shall have provision of setting 52 week ON / OFF time as per astronomical clock or as per user requirement. All abnormal events shall be recorded in the controller. Secure / Genus or equivalent are approved makes.
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**10. SOCKETS & SWITCHES**

10.1.	Indoor	All sockets and switches shall be modular and universal type suitable for 5/15A
10.2.	Outdoor	Two nos transformer oil filtration sockets shall be provided, one at each transformer bay. These sockets shall be three phase industrial type and rated for 100A.

**11. NAMEPLATE & MARKING**

11.1.	Name plate details of LED housing	<p>Followings shall be clearly engraved / embossed on the die cast housing of LED: Rated voltage or voltage range (marked 'V' or 'Volt');</p> <p>11.1.1. Rated current (marked 'A' or 'Ampere'); 11.1.2. Rated wattage (marked 'W' or 'Watts'); 11.1.3. Rated frequency (marked in 'Hz') 11.1.4. Rated lumen 11.1.5. Indian/International Standards to which it is manufactured 11.1.6. Month and year manufacture 11.1.7. Customer Name - BSES Yamuna / Rajdhani Power Ltd 11.1.8. Fitting serial number 11.1.9. PO no and date 11.1.10. Guarantee period</p>
11.2.	Panel nameplate and marking details	
11.2.1.	Panel nameplate	<p>Panel shall have a nameplate clearly indicating the following:</p> <p>11.2.1.1. Panel Serial No.- 11.2.1.2. Customer Name - BSES Yamuna/Rajdhani Power Ltd 11.2.1.3. PO No. &amp; date - 11.2.1.4. Panel Name - 11.2.1.5. Current rating - 11.2.1.6. Guarantee period -</p>
11.2.2.	Feeder nameplate	Large and bold name plate carrying the feeder identification shall be provided on the top of each module.
11.2.3.	Danger plate	Panel shall have a danger plate of anodized Aluminium clearly indicating the danger logo and voltage details.
11.2.4.	Material	Anodized Aluminium 16SWG. Nameplates shall be satin silver in colour with black letters engraved on them. Stickers are not allowed.
11.2.5.	Fixing	All nameplates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.

**12. APPROVED MAKE OF COMPONENTS**

12.1.	Relays	ABB/Jyoti/Omran
12.2.	HRC Fuse Links	GE/ Siemens/ L&T
12.3.	AC Contractors/ DC contactor	L&T/Siemens/Telemecanique/GE/ABB

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12.4.	Terminals	Connectwell/Elmex/Wago/Phoenix
12.5.	Push buttons / Actuator	L&T/Siemens/Vaishno/Schneider
12.6.	MCB	Legrand/Hager/Schneider/ABB
12.7.	LED	NICHIA/ OSRAM/ CREE/ PHILIPS//EDISON
12.8.	Luminaire fittings	GE/Philips/Crompton/Bajaj
12.9.	Indicating lamps	Vaishno/Binay/Teknic/Siemens/Mimic/C&S

**13. INSPECTION & TESTING**

13.1.	Type test	All Equipment should be of type tested quality only, type test certificate to be submitted along with offer. If the manufacturer's lab is accredited by govt. / authorized body then it shall be acceptable for type testing.
13.2.	Acceptance & Routine tests	As per relevant Indian standard

**14. DEVIATION**

14.1.	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.
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